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Date: May 7, 2010 Name: John F. Nethery Signature:

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In re Appln. of: Jay Hedley et al.

For: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Attorney Docket No.: 10022/1726

UTILITY PATENT APPLICATION TRANSMITTAL

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

1. TRANSMITTED HEREWITH: A new application under 37 CFR §1.53(b), including the following elements and other papers:
   - ☒ Application Data Sheet (see 37 CFR §1.76)
   - ☐ Title page
   - ☒ Specification, including claims and Abstract (86 pages)
   - ☒ Drawings (29 sheet(s))
   - ☐ Appendices: _____
   - ☒ Declaration of Deepak Raghu (2 pages; ☒ Executed ☐ Unexecuted)
   - ☒ Declaration of Boris Tsypin (2 pages; ☒ Executed ☐ Unexecuted)
   - ☒ Declaration of Jay Hedley (2 pages; ☐ Executed ☒ Unexecuted)
   - ☐ Combined Declaration and Power of Attorney (_____ pages; ☐ Executed ☐ Unexecuted)
   - ☒ Information Disclosure Statement, including Form PTO-1449 (1 sheets), and any required copies
   - ☐ Power of Attorney (_____ pages; ☐ by inventor ☐ by Assignee identified in Assignment)
   - ☐ Nonpublication Request under 35 USC §122(b)(2)(B)(i)
   - ☐ Other: _____

2. SMALL ENTITY STATUS: ☐ Applicant is small entity (per 37 CFR §1.27).

3. FEE CALCULATION:

Claims as Filed	Col. 1	Col. 2		Small Entity			Not a Small Entity	
For	No. Filed	No. Extra		Rate	Fee	or	Rate	Fee
Basic Fee					$ 82	or		$ 330
Total Claims	20-20	0		x$26=	$	or	x$52=	$
Independent Claims	4-3	1		x$110=	$	or	1x$220=	$220
Multiple Dependent Claims Present				+$195=	$	or	+$390=	$
Utility Application Size Fee when filing via EFS (see MPEP 607 Filing Fee)				No. of pages _____ X .75 = _____ - 100 = _____ / 50 = x $135=	$	or	No. of pages _____ X .75 = _____ - 100 = _____ / 50 = x $270=	$
Search Fee				+$270=	$	or	+$540=	$540
Examination Fee				+$110=	$	or	+$220=	$220
*If the difference in col. 1 is less than zero, enter "0" in col. 2.				Total	$	or	Total	$1310

4. FEE PAYMENT:
   - ☐ Please charge Deposit Account No. 23-1925 in the amount of $.
   - ☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).
   - ☐ The Director is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 23-1925:
     - ☐ Any addtl. filing fees required under 37 CFR §1.16. ☐ Any patent application processing fees under 37 CFR §1.17.

5. CORRESPONDENCE ADDRESS: Please recognize the correspondence address for this application as the address associated with the following Customer Number:
   Customer No.: 28164 - Accenture/BHGL (Chicago)

6. PLEASE DIRECT all telephonic communications to: John F. Nethery (tel: (312) 321-4200).

May 7, 2010
Date

Respectfully submitted,

John F. Nethery (Reg. No. 42,928)

PTO/SB/14 (11-08)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10022/1726
	Application Number	
Title of Invention	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Applicant Information:

Applicant 1

Applicant Authority	◉ Inventor	○ Legal Representative under 35 U.S.C. 117	○ Party of Interest under 35 U.S.C. 118

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Applicant 3

Applicant Authority	◉ Inventor	○ Legal Representative under 35 U.S.C. 117	○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Deepak		Raghu	

Residence Information (Select One)	◉ US Residency	○ Non US Residency	○ Active US Military Service

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Citizenship under 37 CFR 1.41(b)	IN		
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City	Gurgaon	**State/Province**	HR
Postal Code	122001	**Country**	IN

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	28164		
Email Address	jnethery@usebrinks.com	Add Email	Remove Email

Application Information:

Title of the Invention	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM		
Attorney Docket Number	10022/1726	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		**Sub Class (if any)**	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	29	**Suggested Figure for Publication (if any)**	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S. C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10022/1726
	Application Number	
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Customer Number	28164

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	non provisional of	61176855	2009-05-08
Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	non provisional of	61176790	2009-05-08

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

Remove

Application Number	Country[i]	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			(•) Yes ( ) No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1

If the Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information:

Address 1			
Address 2			
City		**State/Province**	
Country[i]		Postal Code	
Phone Number		Fax Number	
Email Address			

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10022/1726
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Title of Invention	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

Signature				Date (YYYY-MM-DD)	2010-05-07
First Name	John F.	Last Name	Nethery	Registration Number	42928

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

INVENTORS:

Jay Hedley
Boris Tsypin
Deepak Raghu

BACKGROUND OF THE INVENTION

1. Cross Reference to Related Applications

[001] This application claims priority to U.S. provisional patent application serial numbers 61/176,855 and 61/176,790, both filed 8-May-2009 and titled Building Sensor Operational Data Analysis for Energy Saving System Control.

2. Technical Field.

[002] This disclosure relates to obtaining and analyzing building energy data. This disclosure also relates to engaging in an energy analysis to determine analysis results, and optionally responsively controlling building systems, such as lighting, heating, air-conditioning, and other energy consuming systems.

3. Related Art.

[003] Energy consumption, monitoring, and management are crucial components of sustainable, eco-friendly infrastructures now and into the future. A need exists to provide energy data focused analysis results to accurately determine building energy expenditures, performance and costs.

SUMMARY

[004] An energy analysis system provides energy analysis results. The energy analysis system may include a processor, a communication interface coupled to the processor, and a memory coupled to the processor. The memory may include energy analysis logic that, when executed by the processor, causes an

energy analysis system to: establish a data connection from a network operations center through an energy data connectivity interface to an energy data source, obtain energy data at the network operations center through the data connection to the energy data source, and perform an energy analysis in the network operations center on the energy data to produce an analysis result.

[005] The energy analysis may include: determining control building data within the energy data, determining user-defined data within the energy data, and determining, as the analysis result, an exception rank by comparing the control building data and the user-defined data. The exception rank may identify specific data in the user defined data for further review.

[006] As another example, the energy analysis may include: determining a balance point set from the energy data as the analysis result. The balance point set may include both a heating balance point and a cooling balance point. The system may display any analysis result in a user interface on a display.

[007] Other systems, methods, features and advantages will be, or will become, apparent to one with skill in the art upon examination of the following figures and detailed description. It is intended that all such additional systems, methods, features and advantages be included within this description, be within the scope of the invention, and be protected by the following claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[008] The systems and methods may be better understood with reference to the following drawings and description. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. Moreover, in the figures, like referenced numerals designate corresponding parts throughout the different views.

[009] Figure 1 shows a system for building energy analysis.

[010] Figure 2 shows an operational diagram.

[011] Figure 3 shows a foundation diagram.

[012] Figure 4 shows a benefit diagram.

[013] Figure 5 shows an energy and savings impact analysis.

[014] Figure 6 shows an end-to-end analysis process that the system may implement.

[015] Figure 7 shows findings that the system may generate from its analysis.

[016] Figure 8 shows example baseline reports 800 that the system may generate.

[017] Figure 9 shows examples of automated analysis of intelligent alarms and detection of maintenance activities.

[018] Figure 10 shows an example of a development framework for the system.

[019] Figure 11 shows a system architecture for building energy analysis.

[020] Figure 12 shows a phased implementation plan for the system.

[021] Figure 13 shows a threshold-based alerting process that the system may implement.

[022] Figure 14 shows a process flowchart.

[023] Figure 15 shows business rules, controls and technology (including data configuration) to provide a secure environment.

[024] Figure 16 shows a program management methodology.

[025] Figure 17 shows a scalability scenario.

[026] Figure 18 shows dashboard screenshots for reporting screens that the system may generate.

[027] Figure 19 shows a dashboard screenshot for an analytics reporting screen that the system may generate.

[028] Figure 20 shows a dashboard screenshot for a trend reporting screen that the system may generate.

[029] Figure 21 shows a dashboard screenshot for a monitoring reporting screen of historical energy comparison that the system may generate.

[030] Figure 22 shows a dashboard screenshot for a monitoring reporting screen of actual energy usage versus budged amount that the system may generate.

[031] Figure 23 shows a dashboard screenshot for a monitoring reporting screen of Interactive Automated Fault Detection and Diagnosis that the system may generate.

[032] Figure 24 shows a sample reporting format for measuring and optimizing comfort, efficiency, and operations within each building space, including reporting

on operations of building equipment and systems, specifically regarding Analysis Focused on Equipment Performance.

[033] Figure 25 shows an example of a particular machine for implementing the system for building energy analysis.

[034] Figure 26 shows balance point determination logic.

[035] Figure 27 shows a kilowatt hour consumption and exception ranks analysis.

[036] Figure 28 shows comparison logic for determining exception ranks.

[037] Figure 29 shows alert logic for determining building level alerts.

DETAILED DESCRIPTION

[038] Figure 1 shows an overview of a system 100 for building energy analysis. The system 100 converges buildings systems 102 with Information Technology (IT) 104 to facilitate a new level of data analysis and continuous control 106. The system 100 gathers data and indicators for fact-based decision-making and sound environmental management. The system 100 drives continuous improvement and facilitates managers to mark progress and reach productivity goals. As IT converges with building technologies, the system 100 permits ongoing system optimization, making it more feasible and more effective for companies to sustain performance of their existing real estate portfolio. In some cases, the system may reduce building operating costs by 20 - 30% or more, yielding an increase in building value of $10 - $20 / sqft or more. The system 100 focuses on providing data focused services to optimize building operations and costs.

[039] The system 100 may be implemented with a wide range of technologies. The technologies may span data capture and analysis over a wide range of building systems, as shown in the operational diagram 200 in Figure 2. Such building systems include automation systems 202, high voltage air conditioning (HVAC) systems 204, lighting system 206, power systems 208, security systems 210, radio frequency identification systems (e.g., to track assets, personnel, and inventory) 212, and sensor system 214 (such as pressure, motion, vibration,

temperature, and contact sensors). Energy and consulting services 216 may provide input into the system 100 as well. Such technologies are available from, as examples, Richards Zeta(TM) company, Interval Data Systems(TM) company, Facility Solutions Group(TM) company, Sensus(TM) company, Constellation NewEnergy(TM) company, and other providers. Accordingly, the system 100 may implement Installation of equipment and on the ground repair & maintenance services, Integration, Configuration, Protocol Translation, Portal for Remote Building Automation Systems (BAS) Programming & Optimization, Automated Fault Detection Diagnostics (AFDD), Maintenance Optimization, BAS Analysis, Baseline Scorecard (BOSS), and System Optimization, and other features.

[040] Figure 3 shows a foundation diagram 300 based on the system 100 data centric approach that helps deliver additional services in the future. The system 100 may focus on data services and deliver benefits based on information from the building sensor and control infrastructure. Accessing the operational data and using it to control system operations can facilitate significant additional savings and revenue-generating opportunities.

[041] Figure 4 shows a benefit diagram 400. The benefit diagram 400 illustrates qualitative and quantitative benefits delivered by the system 100. The benefit diagram 400 also illustrates several example main benefits drivers.

[042] Figure 5 shows an energy and savings impact analysis 500. The analysis 500 explains an example scenario under which company share price is increased due to energy saving which the system 100 may help achieve.

[043] Figure 6 shows an end-to-end analysis process 600 that the system 100 may implement. The analysis process 600 may, for example, include full optimization and monitoring over a multi-year period. In one implementation, the process 600 may include systems information collection and integration (602) (e.g., using information from energy bills or other documents), preliminary data collection (604), analysis (606) (e.g., to generate scorecards and baseline reports), detailed data collection (608), and generate recommended actions (610) (e.g., in the form of a solutions report), and corrective actions (612) (e.g., in the form of a verification report). Beyond initial installation and analysis, the system 100 may continue to be optimized to provide continuous monitoring for each

integrated facility, with options for further integration of enterprise systems. The system 100 may be implemented in or under a gain sharing agreement that facilitates the system 100 implementer or provider to share both the up-front cost and the continuing benefits. This establishes a long-term relationship that leads to continuously increasing benefits.

[044] For example (602) and / or (604) may include an analysis of the historical billing information and interval data, such as that showing building power usage measured every 5 to 15 minutes. Figure 7 shows findings 700 that the system 100 may generate from the analysis. The findings 700 may include building efficiency deterioration 702, unnecessary peaking 704, sub-optimal occupancy schedules 706, and temperature correlations 708.

[045] As a further example, (602) and / or (604) may further include setting a baseline of building performance. In other words, the system 100, based for example on access to Building Management System (BMS) information, may create a baseline performance so that the system 100 shows a room by room picture before and after picture of energy consumption. Figure 8 shows example baseline reports 800 that the system 100 may generate, including a room detail scorecard 802, consumption / demand graph 804, a top level scorecard baseline (e.g., comfort / efficient / operations) charts 806, or other baseline reports.

[046] Analysis (606) may include programming and maintenance activities to improve system performance. This may include continuous, real-time, and/or automated analysis of systems operation. Figure 9 shows examples 900 of automated analysis of intelligent alarms and detection of maintenance activities.

[047] The inputs to the system 100, concerning Data Collection – Analytics – Fault Detection - Continuous Control, and other aspects may include:

[048] Utility bills and interval data

[049] Building blueprints and BAS design diagrams

[050] Building control system information

[051] Contact information for controls vendor and building engineers

[052] Access to facility (e.g., physical or remote access).

[053] The system 100 may combine strategies to improve the efficiency of a building's energy and maintenance by delivering an energy framework to support

new solutions for the strategic new market of high performing buildings and energy management. The system 100 leverages the development of a robust energy management framework, through the connectivity and data management of buildings worldwide and associated implementation technologies. Such technologies may include Outlook, Office Communicator, Sharepoint, and other technologies for use in the energy framework and Building Management Systems. The system 100 and system implementation may also align with the leading energy management companies (e.g., Sensus MI, ION EEM), improving data collection, and delivering advanced applications managed, as examples, through Azure and Microsoft's Cloud architecture. The system 100 may further leverage Microsoft (TM) Dynamics to facilitate integration between Utilities and Owners of Building Data, generating dashboards of KPIs, SMART city, SMART grid, carbon tracking, energy consumption, SMART Grid integration, INDE, demand response, and other systems.

[054] Figure 10 shows an example of a development framework 1000 for the system 100. The following may be undertaken with regard to developing the system 100:

[055] Create the strategy and roadmap for co-developing the Energy Management Framework (EMF).

[056] Internally pilot the SMART Buildings platform to be the proving grounds of the EMF and serve as the credential for the EMF and its premier energy management application.

[057] Co-develop the EMF leveraging .NET, SQL Server, Dynamics, Virtual Earth, Azure, and Sharepoint to lead the industry in defining a unique platform to develop, deployed, and manage energy related applications.

[058] Deploy the EMF using, e.g., Azure's cloud services OS to manage advanced engineering calculations and data management requirements.

[059] Investigate leading technologies for building system connectivity and integration (i.e. Plexus) and help scale additional drivers, scalability, and security with a platform for any company to leverage.

[060] Further define the strategy of the EMF to leverage additional MSFT technologies as the market develops (e.g., Office Communicator, carbon tracking with Sharepoint, Outlook integration with BAS, as examples).

[061] Integrate into existing Energy systems and technologies deployed at MSFT (i.e. ION/EEM & MRO).

[062] Align with utility companies to leverage Dynamics as part of the world's energy / carbon dashboards (SMART Grid, CCF Project 2 degrees, INDE, demand response programs, carbon tracking/management/trading, Utility Performance Engine, SMART City).

[063] Figure 11 shows an architecture 1100 for the system 100. The system 100 may provide an energy data focused approach based on data management and analytics of existing systems and equipment versus a capital intensive approach. The system 100 may connect and integrate in a hardware and software agnostic way with multiple vendor solutions & protocols (e.g., provided by Trane, Siemens, Johnson Control, Honeywell, and others). The system 100 may provide an open IP-based two way (read/write) infrastructure connecting one or more buildings in a portfolio to a network operations center with web-based control capabilities. The system may, as examples:

[064] 1) deliver continuous re-commissioning through setpoint control and schedule optimization;

[065] 2) delivers 24 hours a day x 7 days a week (24x7) automated equipment fault detection and diagnosis down to one-minute intervals and prioritized by user defined options: rank, severity, cost of fault, location, and others;

[066] 3) establish operational guidelines for setpoints and schedules across all equipment and BAS data for a portfolio of buildings, managed through a central command center;

[067] 4) deliver measurable calculated monthly results tracking energy reductions: (10% min in year 1);

[068] 5) integrate to existing Maintenance Repair & Operations applications and Energy Management systems;

[069] 6) include the ability to install, connect, and integrate additional meters, sub-meters, sensors into the common platform as required;

[070] 7) be supported by world class project management, change management, and training organization; and

[071] 8) be delivered on a scalable architecture to easily and securely scale with the client's needs.

[072] With reference still to Figure 11, the architecture 1000 includes:

[073] At the building (e.g., company facility): a mediator 1102 (e.g., a Richards-Zeta Mediator 2500) that provides a connectivity interface for connecting to one or more meters and sub-systems in a facility. The meters may include utility meters as well as any Building Automation System (BAS), lighting or security control system, or other systems.

[074] Site Web Services 1104: The mediator 1102 communicates the data it collects to the System Network Operations Center (NOC) 1106. The mediator 1102 may received the energy data from web services 1104 installed onsite at any desired facilities. In other words, the web services 1104 may establish a data connection to the mediator 1102 and send building energy data to the mediator 1102. However, any other type of connectivity interface as a data transmission mechanism may be employed to communicate data to the mediator 1102, including file transfer, message passing (whether web services based or not), shared memories, or other data transfer mechanisms.

[075] System NOC 1106: The NOC 1106 may use a Service-Oriented Architecture (SOA) to aggregate data across all facilities. Its core services provide analytics and other data management services to the user via a Web-based portal, or Rich Internet Application (RIA). Examples of the specific implementation of the NOC 1106 and the analysis results that the NOC 1106 may provide are discussed below, and in particular with regard to Figures 25-28.

[076] External Data sources 1108: In addition, the NOC collects relevant data from external data sources, such as the National Weather Service, and may also obtain reports on regional energy prices and 3rd-party or company systems.

[077] Additional Services 1110: Because of the versatility of the system 100 infrastructure, additional services may be layered onto the core. The mediator 1102 has 2-way communication that supports Demand Response programs. Additional services also include a collaborative social network in which company

facility managers and operators can share information on operations. They may also drive LEED certification of company buildings, perform carbon tracking and mitigation services, and others.

[078] The system 100 energy management data services offer a unique approach at delivering a comprehensive view of a facility's operations. The system 100 may implement continuous optimized control through real time/interval data acquisition and analysis of all relevant facility data. The System Enterprise Energy Management System (EEMS) may include or involve: (1) a physical site assessment, (2) historical utility bill analysis, (3) utility meter interval data analysis, (4) holistic facility controls analysis, (5) real-time automated equipment fault detection and (6) energy sourcing and demand-response energy management. From these inputs the System energy management system generates insight in the form of reports, dashboards, and alerts that provide actionable information that leads to realized energy reduction and cost savings.

[079] The system 100 may begin with a detailed audit of the facility premises. Facilities are surveyed to fully document machine type, layout and building structure, operating hours, building automation capabilities and potential need for additional metering and sub-metering. Specific care is given to observe the unique properties of each building. The walkthrough provides critical baseline information on the premises' layout, engineering, and operational health.

[080] Historical utility bill analysis is the next phase of the system 100 implementation. The historical utility bill analysis provides an in-depth look at utility bill trends over time, including general or seasonal trends energy trends. This information is crucial to understanding the way a building has been operating so energy saving opportunities can be recognized. It also provides a benchmark against which later energy saving measures can be compared. Additionally, it is common to find billing errors during this phase, which are immediate opportunities for savings.

[081] Meter interval data analysis is a third phase of the system 100 solution. To obtain data about energy consumption, an energy data mediator 1102 is installed and connected to on-site utility meters. The mediator 1102 is used to collect utility data from each of the meters and sub-meters in a building, including the building

automation system. This data is then cleansed and collected to get a consumption breakdown by building, section or floor and can be viewed in the robust EEMS tool. Much like the billing analysis, this information is used to spot trends and benchmark future energy saving strategies.

[082] A holistic picture of the building emerges during the facility controls analysis, where the system 100 team analyzes and report on the "design intent" of the building controls versus the current performance of the building. Here, the mediator 1102 extracts data from each building system and piece of equipment in the building. This data is tracked over time to observe subtle features in the way the equipment works and the building operates as a whole. As months and even years of data are collected, macro-scale trends related to seasonality, occupancy, and utilization rates all emerge. These trends help contextualize power usage and other metrics, allowing for even greater insight into building operations and further opportunities for savings.

[083] The system 100 solution utilizes data captured by the mediator 1102 on a per-minute basis. This fine level of granularity facilitates the System solution to identify real-time trends and problems which were previously undetectable. Additionally, it provides real-time actionable reporting that prioritizes problems and suggests a tangible cost to their continued neglect or systematic inefficiencies. Automatic fault detection begins with as little as three weeks of collected data, and continues for the life of the System contract.

[084] The mediator 1102 provides for bi-directional (read/write) capability with any integrated system. This facilitates for 24/7 continuous optimized control of the systems connected to it. The mediator 1102 has an intelligence layer allowing for full closed loop advanced math and logic between any of the previously disparate systems. The mediator 1102 also sends and consumes Web services. An example Web service would be an Automated Demand Response (ADR) notice and pricing level signal from Constellation New Energy (CNE) triggering the mediator 1102 on board logic and control to automatically shed electrical loads by turning off non essential lighting and changing set points on chilled water and HVAC zones.

[085] Thus, the system 100 and NOC 1106 may establish a data connection from the network operations center 1106 through an energy data mediator 1102 to an energy data source 1104. They may then obtain energy data at the network operations center 1106 through the data connection to the energy data source 1104. The system 100 and NOC 1106 may also perform an energy analysis in the network operations center 1106 on the energy data to produce an analysis result, as described below, for example in connection with Figures 25-28.

[086] Another component of the system 100 solution is the strategic energy sourcing and demand-response energy planning. Energy sourcing experts will help each facility to find the lowest cost and/or greenest power available in that market. Green options include offsetting a facility's energy requirements with renewable sources of energy, including wind, small hydroelectric, landfill gas, and biomass, providing an electricity choice that can directly support the building of new renewable power plants. The system demand response solution is an additional service that can provide direct revenue to a facility. Facilities sign up with the regional ISO's demand response program and receive annual payment for participation, in exchange for agreeing to shed load an agreed number of times. System helps to engineer a demand response solution that minimizes impact on facility operations. Both energy sourcing and demand response are administered to meet regional regulations while delivering value to the customer.

[087] The system 100 solution achieves cost savings on several fronts. Most notably, savings are realized through reductions in total energy consumption and decreases in both scheduled and unscheduled maintenance.

[088] Energy savings occur when building control sequences are optimized to run in the most economic fashion. Wasteful situations like running an unoccupied building at/near full capacity are easily eliminated. More subtle improvements can be identified through system 100 analytic solutions which identify mis-configured and even machines needing repairs. The system 100 solution's automatic fault detection and diagnosis tool not only provides a clear understanding of a problem, but suggests a financial consequence with letting the problem go unresolved. The EEMS' reporting gives a level of detail which requires less man-

hours to investigate – freeing the facility team to address the most promising energy saving opportunities rather than simply assessing the state of the building.

[089] Efficient building operations leads to decreases in scheduled maintenance costs. This increases the lifespan of the equipment and decreasing the replacement frequency, thus allowing a facility to optimize its operations with the equipment it has, rather than recommending new capital purchases. Unscheduled maintenance costs also decrease based on detection of inefficient machines. Some machines may achieve the desired end result (say, cooling a room to 72 degrees), but do so in a highly inefficient manner which cuts its lifespan by as much as half. As an example, a machine which is operating in both heating and cooling mode may be able to achieve a final temperature of 72 degrees by mixing hot and cold air. However, this is highly inefficient and could cause the machine to break unexpectedly.

[090] Altogether, the system 100 solution provides direct, continuous, and reliable energy savings without requiring major capital purchases. The system 100 solution helps a facility makes the best use of the equipment it already has, by optimizing energy consumption and maximizing the lifespan of the equipment. Through its data-driven solution, the system 100 provides an approach that is unique in the marketplace for bringing an information-technology-driven business intelligence capability to the world of facility energy management.

[091] Figure 12 shows a phased implementation plan 1200 for the system 100:

[092] 1. EEMS Database Repository

[093] Initial Setup

[094] The mediator 1102 may be installed directly into the existing metering infrastructure to retrieve available metering data. The system configuration may occur remotely once there is established network connectivity. The EEMS database may be configured while installing the mediator 1102. Configuration may include commissioning each meter and facility within the database and cleansing, validating and normalizing the data points retrieved.

[095] Utility/Energy Consumption Data Retrieval from Meter/Sub-meter data

[096] The system 100 will support data retrieval from meters and sub-meters through the mediator 1102, which may serve as a unifying platform for intelligent

and connected buildings. The mediator 1102 also can connect to building automation and other building sub-systems, including lighting and security, via its Multi-Protocol Exchange (MPX) platform and framework.

[097] Key Performance Indicators Tracking

[098] The system 100 tracks data points such as temperatures, flow rates and weather conditions as interval data points. The system 100 will store this information with a timestamp, point value and data-quality rating for each collected point/interval. The system 100 can then normalize time values into any interval the user desires to align points for output/reporting.

[099] Most key performance indicators (KPIs) are the result of calculations based on these data values. The system 100 can calculate ongoing consumption and operating cost rates (e.g., $/hour) at the desired data collection rate (e.g., every 15 minutes) or via KPIs normalized by size (e.g., Btu/square foot). In addition to cost and consumption-based KPIs, comfort and indoor air quality (IAQ) indicators are available to show how well the system meets thermal comfort and ventilation requirements.

[0100] Utility/Equipment Data Retrieval from company Enterprise Applications and External Resources

[0101] Through systems integration, the system 100 may retrieve data from existing company enterprise applications or external resources. The system's open, service-oriented architecture (SOA) can interface with existing company enterprise systems to deliver a fully-integrated energy and maintenance management solution.

[0102] The specifics of the communications link will depend on the system's details. The system EEMS will be able to read and extract data from SQL-compliant databases (e.g., OracleDB, SQL Server, MySQL), subscribe to a Web services data feed, or build a custom interface, as required. The EEMS may be linked to or import data from existing databases and Excel files and process other flat files in formats specified by the utility company. These may be continuous feeds or regularly scheduled updates (e.g., daily, monthly).

[0103] Data Transfer and Uploads into the EEMS Data Repository

[0104] The system solution collects and transfers data via the mediator 1102. The mediator 1102 integrates, collects, logs and exports information into the EEMS data repository either through the internet via a routed network (e.g., the postal system routed network PRN) or by using a built-in cellular wireless link. Data is aggregated locally on the mediator 1102, and then transferred at specified frequencies over the active communication link. The EEMS receives the data via Web service and processes and loads it into the database in real-time. Thus, the system EEMS supports real-time access to facility metering data via the mediator 1102 HTML and XML (AJAX) Web page dashboards and Graphical User Interfaces (GUI) and up to one-minute to the EEMS data exported Network Operations Center.

[0105] Data Normalization (Weather and Time Series/Interval)

[0106] The database architecture may be based on the need to manage interval data and normalize it on a time basis from many different resources (metering systems, building automation systems, weather, eFMS, UMS etc). The database may manage data of any frequency, whether it will be in set intervals or collected on a change-of-value (COV) basis. The EEMS will align data from different sources with a uniform time coding system so that values can be normalized to whatever interval the EEMS user chooses to display. In agreement with industry proven practices, the system will perform weather normalization as part of the Baseline Energy Record and various tracking and analysis reports included in system EEMS.

[0107] Calculation of Key Values for Interpretation of Consumption and Cost Information

[0108] The system EEMS may include a calculation engine that facilitates performance of nearly any type of calculation at 15-minute intervals. Example calculations include normalized usage and cost parameters, such as Btu/square foot, to facilitate comparisons across facilities. The EEMS will derive the cost data from integration with a bill consolidation platform that provides indices such as cost/square foot or consumption/hour.

[0109] 2. Data Collection and Connectivity

[0110] Data Collection and Connectivity Requirements

[0111] Data Collection/Transfer With and Without Connectivity to the network

[0112] The system solution will accommodate any company's connectivity requirements:

[0113] In cases where a routed network connectivity is not available, the mediator 1102 will use an on-board dial-in/dial-out modem for communicating to a remote monitoring system via wireless cellular or other connection mechanism.

[0114] In cases where routed network connectivity is available, the mediator 1102 will not require any additional network infrastructure beyond a connection to the network. From the perspective of an IT manager, no difference exists between a mediator 1102 and normal Web traffic.

[0115] The system solution will confirm that data security through Linux-based security features that include packet filtering firewalls, secure shell, SSL, IPSec and data logging. The mediator 1102 firewall uses the Netfilter packet-filtering subsystem built into the Linux operating system. It will support the secure shell protocol, which will provide strong authentication and secure communications over insecure networks such as the Internet. SSL will facilitate encrypted transmission of data between Web browsers and Web servers. The IPSec protocol will provide security in network-to-network connections. It will provide access control, data-integrity, authentication and confidentiality for secure private communication across insecure public networks such as the Internet. Data logging will record a variety of connection attempts and authentication requests to determine if there is an attempt to access information without authorization.

[0116] Communication Data Rates, Speed and Volume

[0117] The system solution will have little impact on network traffic. The mediator 1102 only transmits the value associated with a data point when that value changed. This will reduce strain on the network.

[0118] For connections to existing building automation systems, data rates above the controller may be 100mb TCP/IP, while data rates below the controller will increase all possible throughputs from the legacy systems. Data rates below the controller will depend on the actual installed legacy systems. The mediator 1102 will translate these disparate systems' physical layers, communications protocols

and data-network speeds (baud rates) into a high speed IT standards object model.

[0119] Data Collection Requirements

[0120] List of Data Points Collected by system EEMS for Each Facility

[0121] The system EEMS may collect a wide range of data points to perform operational analysis, corrections, and measurement and verification (M&V). The system will attempt to collect every existing networked data point in a facility.

[0122] The following list represents a subset of additional operational points the EEMS collects:

[0123] Space temperature setpoints (min/max, occupied/unoccupied)

[0124] Space/zone occupancy status

[0125] Variable air volume system (VAV) operational data such as supply air temperature, reheat valve position, heating mode, reheat valve type, supply air setpoints (min/max, heating/cooling, occupied/unoccupied), air flow, damper position, etc.

[0126] Variable frequency drive (VFD) operational data such as speed, fan optimal start/stop, warm-up, etc.

[0127] Air handler units (AHU) supply/return/mixed air temperature, outside air temperature, return air humidity, etc.

[0128] Hot/chilled water supply and return temperature, hot/chilled water flow, cooling valve position, hot water valve position, lockout temperature, etc.

[0129] Duct static pressure and static setpoint

[0130] The system platform may provide the ability to determine required data collection durations and customize this upon request. System controllers extract data in instances where on-board controllers cannot transmit data.

[0131] Criteria, Logic and Level of Data to be Collected

[0132] The system may collect all available data points. The system 100 collects data in support of operational analysis, recommended corrections, and M&V activities. The system uses utility consumption and weather data for building-performance analysis, baseline and benchmark calculations, and M&V tracking. The system may use operational and facility data points to understand at a holistic level the performance of each facility regarding comfort, air quality, and

energy and operational efficiency. The system may use equipment inventories to measure energy consumption at the equipment level and rank the impact of improvements. In the end, every data point generated within a facility may be used by the system, which may attempt to collect that data on a frequent basis for EEMS.

[0133] Justification and Cost/Risk Benefits for Metering & Sub-metering

[0134] The system may be expanded by adding additional metering after analyzing the available data. If a modern digital control system exists with data readily available, then additional metering may represent an unnecessary expense. This approach to making the best use of existing equipment and control-systems represents a change in the way the organization can make decisions using the system. Note the recurring system theme of using data and facts to make business decisions, versus investing in additional assets that may be unnecessary for achieving benefits.

[0135] For older facilities, inexpensive sub-metering can provide additional information without the expense of a full control-system upgrade.

[0136] Data Collection and Frequency Schedule

[0137] The system EEMS solution will meet the company minimum requirements and offers an even better data-collection capability. The system may collect real-time data, which may be defined as having a one-minute interval. The real time collection interval is adjustable, e.g., up to a 15-minute interval or other interval. The table below lists a specific data collection and frequency schedule example.

Company EEMS Requirements			System Solution
Categories	Type/Unit	Requested Frequency	Data Reading Frequency
Electrical	kW, kWh	15 minutes	real-time
Natural Gas	CCF	15 minutes	real-time
Water	gal.	15 minutes	real-time
Steam	lbs., mmbtu, F degree, psi and mmbtu	15 minutes	real-time

Company EEMS Requirements			System Solution
Categories	Type/Unit	Requested Frequency	Data Reading Frequency
Chillers	kW, tons of cooling, F degree, flow rates	15 minutes	real-time
Boilers	Fuel use, steam/hot water production, auxiliary load (pumps, blowers and fans)	n/s	real-time
Room/Zone Temperatures	F degree	n/s	real-time
Indoor/outdoor Temperatures	F degree	n/s	real-time
Load Consumption	Peak demand, date/time of peak consumption, etc.	n/s	real-time
Power Outage Information	date/time and restoration	n/s	real-time
Instantaneous Demands	watts, vars, volts, amps, kVA power, factor, etc.	n/s	real-time
UMS data	Utility data	daily	daily
eFMS data	Facilities inventory information & energy related projects	as needed	as needed
MTSC data	Maintenance Contact Information	monthly	monthly

[0138] EEMS Data Storage Capability for 15 Minute/Hourly Real-time Access and Reporting

[0139] The system solution may deliver real-time access and reporting of collected data. For most points, the system may poll at one-minute intervals. However, data is generally stored at the data collection rate. This means 15-minute-interval data is stored every 15 minutes, and hourly data is stored hourly. Data that infrequently changes (e.g. set points) is stored only when changed. No limit to the number of points collected and stored exists. Not only will the EEMS meet company three-year archiving requirements, but it also will extend the time requirement at the company request. The database architecture will not impose a performance penalty for increased volume of data storage.

[0140] Item 3.2.2.1 Metering and Sub-metering of Major Systems

[0141] Meter, Sub-meter, and Pulse Data Collection and Analysis

[0142] The system EEMS will collect data at each facility by installing a mediator 1102. The mediator 1102 currently supports standard protocols such as BACnet, Modbus, LonTalk, SNMP and dozens of proprietary current and legacy protocols of control equipment and building automation systems. The mediator 1102 can be configured quickly to the appropriate protocols, making building sensor and controller information available to centralized analysis applications in a common format. The mediator captures data elements from these systems.

[0143] Overview of Proposed Metering/Sub-Metering Solution

[0144] The system solution will include required metering and/or sub-metering infrastructure as requested, meeting or surpassing the company's data collection requirements. This infrastructure will be connected to a facility mediator 1102 to provide connectivity to the central EEMS.

[0145] Integration of Meter/Sub-meter into Existing company and Utility Equipment

[0146] The system will connect to utility-owned equipment via a KYZ pulse output for electric that can be installed on the utility IDR meters, and pulse outputs for gas and water. The system may maintain a real-time connection at each site with all assets required to meet these specifications.

[0147] Installation includes labor, materials, equipment and incidentals required to configure and integrate the EEMS systems including mobilization and setup, data collection, equipment and storage, communications linkage to EEMS data repository, and an established web interface to dashboards and reports. Installation may also include connection to one (1) utility provided meter pulse outputs to Mediator panel (wiring 100 feet or less), connection to one (1) utility provided pulse output from water meter (wiring 100 feet or less), connection to one (1) utility provided pulse output from gas meter (wiring 100 feet or less), installation of two (2) Modbus outputs from electric sub-meters, (less than or equal to 400 amps, wiring 100 feet or less) connect from customer provided Ethernet to Mediator panel (wiring 100 feet or less).

[0148] Maintenance & Repair Support for Installed Metering Equipment

[0149] The system 100 may be managed through the system Network Operation Center (NOC) and may manage service requests via the EEMS.

[0150] Additional Data Points

[0151] For each equipment type (RTU, VAV, AHU, etc.), the system may identify the minimum point types required to evaluate existing operations. Beyond those, the system will determine on a case-by-case basis if it can obtain more actionable information from additional points. As a rule of thumb, the system may pull all available points, because the more points available, the more powerful the analysis. Generally, though, point lists are not generic; they are identified on an equipment-by-equipment and/or system-by-system basis since the individual manufacturer, model, controller, and system design affect point recommendations.

[0152] Calculated Energy Requirements

[0153] Calculations, Parameters & Algorithms Supporting Identification of Anomalies & Diagnostics

[0154] The system 100 creates and displays a virtually unlimited number of calculations of almost any complexity. The EEMS will store and manage the calculation results in the same way as other interval data points, including viewing, reporting and further analysis, or even as a factor in another calculation. When the company adds new calculations to the system, the calculation engine will go back to the earliest point where all factors are available and can perform the calculation historically, as well as the ongoing calculations every 15 minutes going forward. This will facilitate the company experimenting with different scenarios and determine the impact of a change based on actual historical operational data.

[0155] Calculations range from simple (e.g., Delta T) to complex (regression-based Baseline Energy Model normalized for weather and occupancy patterns). The EEMS may support industry standards such as indices for thermal comfort (ASHRAE 55-2004) and minimum ventilation requirements (ASHRAE 62.1-2007). The ventilation index is an example where the system first will integrate data from external systems (space planning data for room sizes and uses).

[0156] Algorithms and Options for Customization/Expanding These Algorithms

[0157] The system may implement numerous defined algorithms (e.g., delta T, pump brake horsepower, variable speed drive kW, cooling tons, make-up water Btu, heating coil MBtu). These operate by specifying the data points (or constant values) to use as calculation factors.

[0158] The EEMS will provide the company with options to customize its calculations. Users typically need this capability for more complex calculations where the system design will affect the calculation requirements. For example, calculating the CFM of outside air delivered to a specific room depends on the air handler design and available data points from the control system. The calculation engine also will allow company users to add entirely new calculations to the system.

[0159] Data Feed from Local Airport/Weather Station for Energy Data Normalization

[0160] The EEMS may collect local weather data at the facility level by using standard Web services provided by NOAA's National Weather Service. It will normalize weather data to the NOAA standard if drawn from an alternate source.

[0161] EEMS Interface with company Enterprise and External Systems (eFMS, UMS, MTSC) & Frequency of Data Transfer, Storage and Analytics

[0162] The system will integrate with existing company systems via standard interface protocols through its open, SOA architecture. The system design facilitates a rapid, low risk and seamless integration with these various systems. Details on the form and complexity of the interface depends on the systems, but the system EEMS may accept these systems' data at appropriate frequencies and volumes. The system 100 may include automated interfaces to the external systems where the system may scan for data updates to these systems. The system may then be able to transfer data easily as it is updated, at whatever frequency is required to build a complete picture of facility operations.

[0163] Calculation of Initial Cost and Consumption Baselines and Demand Profiles

[0164] The system 100 may generate a Baseline Energy Record that is a formal baseline of energy usage. To that end, the system 100 may implement an energy model such as that shown in U.S. Patent #5,566,084 to normalize for weather

and occupancy variables. The baseline calculations may employ at least 12 months of utility data and corresponding weather data, with 24 or 36 months of data preferred, and can use any level of detail from monthly utility bills to 15-minute interval data. Thus, access to utility billing data will facilitate the system to provide immediate analytical value.

[0165] The Baseline Energy Model calculation may use a polynomial regression methodology that factors in weather variables and occupancy patterns (weekdays/weekends, etc.), which is important at company facilities that are not 24x7 operations. Each utility meter has its own baseline model. Once calculated, the models may be converted to common units (e.g., MBtu) and mathematically combined for a total building energy baseline. (Water use also has a baseline model, but is not part of an energy total.) The system interface includes roll up baselines and benchmark the resulting performance against other facilities, districts, areas, or to the national level. The Baseline Energy Model may provide the basis for forecasting and budgeting, M&V, and greenhouse gas tracking.

[0166] Collection Process of Historical Utility Data That is not Available in UMS

[0167] The system may gather utility bill and time of use (TOU) information. With the a company-supplied Letter of Agency, system implementers may acquire historical data from the local utility companies, which the EEMS can load directly into its repository to fuel baseline calculations.

[0168] EEMS Capture and Storage Capabilities of Maintenance Contact Information

[0169] The system EEMS will store maintenance contact information and other company organizational data at various levels of the facility hierarchy. EEMS will store national, regional, and facility-specific information as meta-data attached to each node in the company facility network.

[0170] Integration of building automation and lighting systems (and any future such systems) are a core function of the system platform, and require no additional infrastructure beyond the initial installation of the mediator 1102.

[0171] Integration Capability through the Use of Open Communication Protocols

[0172] The system platform is open, as defined by modern IT standards. No additional downloads are required. The system platform may be DHTML,

dynamic XML, and AJAX both at the NOC and mediator 1102 (local site) level. The platform is open on both the I/O side and the GUI, and the data is bi-directional. The mediator 1102 Multi-Protocol Exchange (MPX™) software framework normalizes both IP and legacy serial-based protocol. The mediator 1102 supports building systems standards like BACnet, Lonworks, Modbus, and SNMP. The mediator 1102 supports IT and networking standards like TCP/IP, HTTP, HTTPS, FTP, and SMTP. This facilitates for intra-protocol communication and uniform application of services such as logging. This also facilitates the common presentation of information from all intelligent machines found in buildings.

[0173] The system's open architecture supports proven building systems engineering and selection which will work well with company's advised plan to add and upgrade lighting control, building automation and metering systems. The open architecture also supports proven enterprise applications, services and service providers never locking company into one proprietary provider or building systems manufacture. The system open architecture will empower company with choices and ultimate flexibility in engineering and procurement.

[0174] Company EEMS User Interface

[0175] Item 3.3.1 Dashboard

[0176] Dashboard Features and Functionality

[0177] The system user interface (UI) is a rich internet application (RIA) that provides an interactive framework for viewing dashboards and reports. The UI will present a holistic overview of facility performance by combining key items such as scorecards, recommendations, alerts, and energy/equipment data into a common format. Additionally, direct integration with the system NOC will permit real-time data analysis of HVAC interval data and energy consumption.

[0178] The EEMS dashboard has three main views: trends, real-time monitoring, and analysis. Each has a set of customizable dashboard elements relevant to the specific view. The user can select the data elements he/she wishes to analyze on their dashboard dynamically by clicking on a list of available elements and dragging the element to the frame. This will allow comparison of similar equipment or facilities, for example.

[0179] The EEMS has the ability to tailor the list of dashboard elements for each user based on their profile and privileges. An executive profile, for example, may have access to operating expenses, energy savings, and enterprise-wide energy consumption. A facilities manager may have access to building energy consumption, room comfort, and costs. An operations engineer may have access to detailed HVAC or Air Handling Unit interval data.

[0180] In addition to the dashboard, the system provides the user with additional insight and complimentary content, such as geographical analysis, financials, alerts, and relevant news.

[0181] System Navigation and Available Customized Views

[0182] The system EEMS has user friendly navigation that begins with a secure user sign-on. The system will authenticate the user and return the user profile, in addition to the user's customized view of dashboard elements. The user will navigate between each dashboard view by clicking on the respective dashboard tab.

[0183] Each dashboard element will have a collapsed and expanded view. By clicking on an individual element, the element will expand to a larger view. In certain cases, the expanded view will permit user interaction. Examples of user interactions include (but are not limited to) increasing the time axis on interval or meter data, entering new dates, browsing to view data on a specific machine or system.

[0184] List of System Generated Dashboard Elements

[0185] Dashboard elements may include the following elements:

[0186] -30 day rolling consumption

[0187] -30 day rolling demand

[0188] -Worst meter consumption

[0189] -Worst meter demand

[0190] -YTD energy costs

[0191] -Savings

[0192] -Baseline Energy Record

[0193] -Calendar View Consumption versus Baseline/Cost

[0194] -Tracking versus Baseline Energy Record

[0195] Dashboard Identification and Alert of Abnormalities Features

[0196] The EEMS dashboard includes the following capabilities to detect abnormalities, identify predictive maintenance and provide actionable information:

[0197] Real Time Interface: A user will be able to select a certain number of data values or formula results for any combination of machines or systems and then view them on a real time page with any active fault information. This will be valuable if a technician wants to view the data values together. The real time interface will facilitate a user to proceed through timestamps for items that do not connect in real time.

[0198] Interactive Graph: After configuration, a fault will link to an interactive graph. The user will be able to select from one of the time ranges on which the fault occurred or will enter a customized range. Pre-selected values and a multiple graph template will load, which will provide more information about that particular fault. The user can modify the interactive graphs to analyze the problem further or to create a new graph.

[0199] Interactive Graph Features include: This includes the ability to plot the graphs at once; the ability to graph any stored data value or formula (even with different conversions such as C or F for example); and the ability to zoom or expand into the graph with the mouse, scroll forward and backward in time, draw trend lines, and save or email graphs.

[0200] Alerts: The system EEMS will generate and display alerts based on faults that the analytics will identify. These faults could range from machine-level maintenance issues to zone comfort or performance issues and to holistic facility-wide energy management issues (such as a Demand Response event or a significant change in local energy prices)

[0201] Reporting

[0202] The system 100 may implement the following Reports and Reporting Points:

system EEMS Reporting	
Greenhouse Gas/Carbon Footprint - SWAG conversion (CO2/kWh, etc.)	- Periodic Carbon Footprint Report
ENERGY STAR Reporting Baseline report with weather normalized data Energy consumption profiles matched with operational characteristics Energy metrics - i.e. ENERGY STAR benchmark score, btu/SqFT Benchmarking reports - i.e. past vs. current performance, industry average, best practice, etc. Periodic survey results reports Periodic audit reports	Energy Summary/Usage Report (i.e. Dashboard Reports) Current Reading/Current Reading Summary Daily Comparison/Daily Comparison Summary Daily Consumption/Daily Consumption Summary Electric Utility Monthly Consumption /Electric Utility Monthly Consumption Summary Benchmarking reports Historical Energy Comparison Report Portfolio benchmarking Report Building Pattern of Operations - i.e. TOUs consumption data
Monthly and Annual Overall Energy Consumption Reports All utility consumption Energy usage index (EUI) in Btu/SqFt Weather normalized data per facility	Energy Summary/Usage Report (see above) Building Energy Use Comparative to Baseline Building Operations Scorecard Systems (BOSS) reports Room Summary/Detailed Scorecard
Performance Analysis - Comparison of developed EUI to normalized baseline budget per facility	Reporting Dashboard Energy Summary/Usage Report (see above) Actual Energy Costs vs. Budget Amount Summary Report

Equipment Analysis Reports Sub-meter data of power feed to the equipment load in kW compared to predetermined operational threshold Associated system temperatures and/or equipment operation for major equipments	BOSS Reports (see above) Interactive AFDD Reports (refer to question d above) Fault Summary Report System/Sub-system Scorecard
Exception/Variance Reports by facility and equipment type	BOSS reports (see above) Interact AFDD reports (refer to question d above)
Measurement & verification plan report per facility List of installed Energy Conservation Measures (ECM)\ Installed ECM compared against weather normalized baseline data Energy savings calculation based on historical billing data	Baseline Development Reports Building's Savings Potential Based on Benchmark Comparison

[0203] Type of Report Definition

[0204] The reporting Dashboard may show a top-level view of most critical energy management elements that will facilitate users to drill down information to site level.

[0205] Periodic Carbon Footprint Report: provides monthly/quarter/yearly carbon measurement of energy consumption per facility/region and/or of the enterprise real estate portfolio

[0206] Energy Summary provides energy consumption information summarized by site, type of building, and type of energy

[0207] Usage Report includes the usage data displayed as the daily average of the total usage in a billing cycle.

[0208] Benchmarking reports include:

[0209] Historical Energy Comparison Report shows comparison of energy usage between the prior and the current years and

[0210] Portfolio Benchmarking Report shows Comparison of energy usage among similar buildings within the enterprise portfolio (per region or at the nation level) and/or against industry best practices

[0211] Building Pattern of Operations - i.e. TOUs consumption data demonstrates TOU consumption pattern and long term energy consumption in kwh/day and cost trend ($/month)

[0212] Building Energy Use Comparative to Baseline consists of annual/monthly snapshot cost at the baseline level and unit energy cost ($/SqFt) per facility

[0213] Building Operations Scorecard Systems (BOSS) reports

[0214] Room Summary Scorecard contains ranking of room portfolios within a facility/building based on comparing their actual performance against the facility/building service level objectives – i.e. comfort, efficiency, and operations

[0215] Room Detail Scorecard shows each individual room, organized by air handle and the pass/fail ratings and indication of which operational data led to failure ranking

[0216] Actual Energy Costs vs. Budget Amount Summary Report displays graphs up to 12 months' worth of data in one report

[0217] Web-based Exception Reporting and Alarming provides a list of alarm and

[0218] Interactive AFDD Reports

[0219] Fault Summary Report contains advanced sorting capabilities for a summary of quantity of faults identified by the location and machine or system within any selected specific period. It also lists fault descriptions, severity ranking, and the fault monetary impact. This information helps prioritize corrective actions

[0220] Subsystem Scorecard includes assessment results and explanation failure rankings of various primary and secondary systems and equipment throughout the building, such as air handlers, chilled water, steam and hot water, pumps, heat recovery units, etc.

[0221] Baseline Development Report contains weather-normalized energy consumption based on regression analysis

[0222] Building's Savings Potential Based on Benchmark Comparison comprises measurement and verification information – i.e. before and after savings and median savings – per facility that has implemented Energy Conservation Measures

[0223] Trend Analysis and Benchmarking Reports Capabilities

[0224] system EEMS performs trend analysis and benchmarking by creating sophisticated graphics from interval data stored in the repository. Graphics for trend analysis include, but are not limited to time-series daily load profiles, multi-daily profiles, averages, highs and lows, point overlays and 3-D charts. The EEMS also provides a monthly consumption profile during a fiscal/calendar year or comparison of these monthly profiles over the years. These graphics will facilitate the company to analyze their building performance quickly over time.

[0225] The EEMS will generate benchmarking reports by plotting whole-building energy consumption for each building in a bar chart. The company also will have options to compare their facilities by size, climate zone, building types, and will be able to benchmark their portfolio to industry proven practices and typical industry benchmarks such as annual energy use intensities (EUIs), etc

[0226] Ad hoc Reporting Capability

[0227] Users will be able to customize and design trend analysis reporting for interactive, ad hoc usage. Users can create reports with a simple drag-and-drop interface and save the results, if desired. Users may export data and charts into Excel, .csv, or other common formats. Additionally, for users with limited access, predefined reports will offer a variety of selection criteria and will be downloadable into a variety of formats, including PDF, XML, .csv, and Excel.

[0228] Software for Accessing the Dashboard

[0229] Users may access the dashboard through a standard Web browser with Adobe Flash player to access the system EEMS.

[0230] Greenhouse Gas/Carbon FootPrint and Energy Star Reporting

[0231] The system EEMS will be able to track greenhouse gas (GHG) emissions and identify options for carbon footprint reduction, including priority areas, reduction initiatives, and timeframes to achieve results with a reasonable commitment range. The methodology may be aligned with GHG protocol and

Carbon Trust approach. system can assist the company with Greenhouse Gas/Carbon Footprint and Energy Star reporting by:

[0232] Providing carbon equivalencies (with select REC products) and annual reconciliation reports based on actual utility-billed usage.

[0233] Public relations management through joint press releases, press events, and alliance acknowledgements.

[0234] Assisting with applications to the EPA Power Partnership Program or to the CRS/Green-e Logo Program (if applicable) to the Energy Star Certification and/or Partnership Program, EPA Power Partnership Program or to the CRS/Green-e Logo Program (if applicable).

[0235] EEMS Capabilities to Accommodate the company Geographical Hierarchy & Equipment Analysis

[0236] Data configuration supports both functional and geographical hierarchies. The system will support an array of hierarchical views of the underlying data that the company can organize on a geographical or equipment basis. The system will roll up Baseline Energy Models, tracking and reporting by facility/geography, department, or utility type, etc. Similarly, the Building Operations Scorecard analysis with summary level reporting can roll up by geography, equipment types, or building functions, etc.

[0237] Integration Capability through the Use of Open Communication Protocols

[0238] Performance tracking reports will compare operations against the Baseline Energy Record. These reports will provide ongoing measurement and verification of operational performance, normalized for weather and occupancy/schedule variations.

[0239] Remote Monitoring & Analysis Operational Support

[0240] Certified Energy Managers

[0241] The system may be operated or monitored by two full-time, on-site, certified energy managers.

[0242] Remote Monitoring & Analysis and Diagnosis

[0243] Notification, Escalation and Verification (auto-correct) Process

[0244] As shown in Figure 13, system's EEMS supports threshold-based alerting and notification 1300 of raw input data and data derived through the analytics

engine. The user can configure threshold criteria. The system EEMS incorporates notifications and prioritizes them based on customizable business rules. These notifications can be integrated into a users work queue.

[0245] Detailed Automated System Functions and Repeatable Processes

[0246] The flexible EEMS user interface facilitates a user to manage directly his/her alerts and the notification process. Alerts and notifications are integrated into the user's work queue, permitting detailed tracking and resolution of alerts.

[0247] Overview of Business Rules and Data Configuration

[0248] The first step in the monitoring process will be configuring site data, meter data, temperature data and utility data into monitoring groups. The EEMS will process these groups automatically, making them quickly accessible for visual review.

[0249] The business rules may be based on standardized set points and proven practices, as agreed in discussions between the system and the company. Typically these rules are organized around a balance of comfort, efficiency and operational performance. The AFDD (Automated Fault Detection & Diagnostics) system can be configured to send alerts and notifications automatically, based on these business rules

[0250] Business Rules for Detection of System Anomalies and Corrective Measures

[0251] system EEMS will apply business rules in a systematic manner to identify common issues that drive inefficiencies. The BOSS energy scorecard system will identify issues associated with Comfort, Efficiency and Operations indices. These indices are created on a room-by-room basis, allowing for granular detection of system anomalies, and the illumination of a clear path to apply corrective measures.

[0252] Key Outputs of Reactive and Proactive Monitoring and Analysis

[0253] The EEMS for the company is created to achieve the right balance of comfort, efficiency and improved operations. Outputs take the form of identified problems rooted in hardware or programming. Built-in mediator 1102 capabilities will identify and resolve the majority of programming issues remotely. Maintenance personnel will correct identified hardware issues, whether

mechanical or electrical/electronic. The associated work order will include detailed information about the identified problem so that problem resolution is rapid and straightforward. The solution will then confirm that the work undertaken resolves the identified problem.

[0254] Process for identifying, recommending and prioritizing

[0255] In general, priorities are based on the level of effort (labor and materials) to achieve design intent. Priorities may also be determined by a collective decision of the EEMS and the facility representative. The highest priority fixes are typically those with the least cost and greatest impact.

[0256] Scorecards may be Re-run periodically to assess building operations by their key performance indicators. The scorecard will determine areas for operational concentration. Simultaneously, the AFDD system will identify equipment issues in advance of failure, turning reactive maintenance events into proactive ones.

[0257] The system 100 may prioritize Energy Efficiency Measures (EEMs) and demand management opportunities based on the level of effort (labor and materials) to achieve the predicted level of impact. This business case will be shared with and approved by the facility representative. Highest priority fixes are identified by the highest level of potential positive impact. The system would achieve and maintain optimum building performance through the use of baselines and scorecards. The system may periodically and automatically rerun standardized scorecards to assess the building operations against key performance indicators. The scorecard will determine areas for operational improvements focused on comfort, operations, and efficiency. Simultaneously, the AFDD system will continuously identify equipment inefficiencies in advance of failure, turning reactive maintenance into proactive maintenance.

[0258] EEMS Capability to Implement Recommendations

[0259] system may, as examples, implement recommendations in one of two ways. system could implement most software changes through remote access/control of a facility's systems using the two-way communication capability of the Mediator™. system could also implement fixes that require physical corrections through its established national network of maintenance personnel

(assuming that the company prefers that the system implement the changes instead of the company employees).

[0260] Cost Estimating and Budget Forecasting

[0261] The Baseline Energy Model builds on cost estimating and budget forecasting. The EEMS creates the model using historical energy usage, weather and schedule data. It develops an energy/utility forecast using the energy model, anticipated weather (with ranges for more extreme and more moderate weather) and expected building occupancy schedules. The last step applies building tariff information and targeted energy savings to determine the utility budget.

[0262] Minimal Requirements for the company Involvement

[0263] the company implementation team supporting the project would include project managers to coordinate with local offices, regions and project personnel. Some personnel would obtain engineering information about sites and re-integrate findings into the company engineering organization. The system does not require the company to provide its own resources for installation, programming, service, maintenance or controls-system repair.

[0264] the company' support with giving vendors access to its facilities is a key factor in the project's success. This would help define communication methods, establish connectivity and perform initial validations. the company would need to provide standard operating guidelines such as sequences and set points for each facility so that the system can to measure and verify compliance and performance. Helping the system understand the company' existing processes for managing and solving faults is important to the joint success. The company may also help with setting the financial thresholds and business rules to trigger specific work activities.

[0265] Ability to Plan and Implement Measurement and Verification (M&V)

[0266] Process and Prior Experience with Tracking, Validating and Reporting M&V

[0267] The system may have the capability for Measurement and Verification (M&V) of "installed energy conservation measures." One approach would be to establish a baseline and then track numerous quantitative measures of building health and efficiency (efficiency, comfort, and maintenance). The system may

base the method for measuring a wide range of performance factors on indices that track thermal comfort and ventilation based on ASHRAE standards. The system may track these factors in addition to tracking the traditional power and efficiency indices (i.e., kWh, kW, Therms, Btu/square foot, etc.).

[0268] The system uses a combination of utility bill, utility time of use data, whole meter data, and 15-minute building-control data to analyze building operations and to find and verify energy savings. Each data source provides insights into building operations and energy-reduction opportunities. The system will track system-change recommendations against a baseline set using a standardized methodology. This confirms that the system will verify and track results against a pre-determined goal.

[0269] As the company requested, the system may calibrate the baseline to the FY2003 utility bills. The system may normalize the baseline by using additional inputs such as weather independent load and cooling/heating loads.

[0270] The system provides data-rich methods for tracking system performance should not require sub-metering. With information already available through existing sensor systems, the system can calculate the energy consumption in the building systems easily and accurately. The system may use sub-meters selectively should the company wish to isolate lighting, postal equipment, and miscellaneous plug loads.

[0271] The system may provide the following post-implementation support services:

[0272] Help-Desk (at Network Operating Center)

[0273] A multi-tiered help desk will augment the support team with skilled resources to resolve user needs quickly. The Post Implementation Support team will provide customer support throughout the deployment cycle.

[0274] System Maintenance & Enhancement

[0275] Some issues and requests may need system changes through configuration or code changes. The system application maintenance resources will triage problems to assess priorities, and then will begin completing the work using the extensive tools, resources, and knowledge capital available to them.

[0276] Subject Matter Advisors'(SMA) Support

[0277] system SMA/E supports are ongoing throughout the project deployment until the end of the service contract. Their primary roles to provide in-depth energy management analysis whenever necessary

[0278] Risks and Possible Constraints

[0279] The system may be implemented with a standardized project management process to provide a smooth startup and will extend through the initial pilot of any number of buildings and the subsequent rollout to any number of additional buildings. System implementation schedule often depends upon:

[0280] Access to building facility managers

[0281] Limited building control system documentation (site plans, control drawings, etc)

[0282] Uncommon protocols not currently supported by more than 65 interfaces built into the mediator 1102

[0283] mediator 1102processing ability across devices installed on oversaturated networks

[0284] Operational back-up and maintenance/repair plan in the event of system outages or lost communication

[0285] The system NOC may operate 24/7 and will receive immediate notice in the event of communication loss to a facility. The system will monitor connectivity and data storage continually and confirm that the system sends out automated SMS, email, RSS and phone-call notifications to a designated list of people who can solve or further investigate the issue. The system will use local and regional affiliates to provide efficient response times for any level of support. It also can integrate the response system into the existing the company incident tracking system, if appropriate.

[0286] system employs robust technology at the control level that is highly resilient to loss of power or external communications. In the event of power failures, the mediator 1102supports optional gel cell battery, on-board trickle charger, and uninterruptible power supply (UPS). The mediator 1102 will continue to log data locally until issues are resolved.

[0287] Role and Responsibilities of Program Manager(s)

[0288] The system implementation may engage a program manager (PM) to direct and coordinate the activities within an EEMS program rollout to obtain high efficiency and economy of operations. He or she will manage all contractors. The PM will have a complete and thorough understanding of energy management and will have a deep knowledge of large EEMS implementations. The PM will interpret, organize, execute and coordinate assignments. The PM will make decisions about the budget and all program-relevant issues. He or she will escalate strategic issues to the program sponsor for joint decision-making.

[0289] The PM's primary responsibilities will include:

[0290] Developing and maintaining the rollout schedule with program priorities

[0291] Developing and managing project scope, budget and schedules in accordance with approved plans

[0292] Allocating and managing project resources

[0293] Monitoring progress of and providing support for global efforts and implementation programs on a weekly basis

[0294] Reporting on status and performance

[0295] Managing alliance partners, contractors and subcontractors

[0296] Resolving outstanding risks and issues

[0297] Developing necessary communication and training material

[0298] Question j – Proposed EEMS Open Architecture

[0299] The mediator 1102 design is based on open systems and technologies, including the Linux Operating System, standard RS-232 and RS-485 communication ports, Dallas 1-Wire bus ports, 10/100 base TX Ethernet connectivity, support for a wide range of TCP/IP related protocols including UDP, TCP, SMTP, IP, FTP, HTTP, HTTPS, SNMP and more. The mediator 1102 supports data retrieval by communicating wired or wirelessly to the meter/sub-meters and via more than 65 protocol drivers that the mediator 1102 supports.

[0300] The data warehouse, data-analysis tools, publishing, reporting, GUI, and other tools/protocols may meet any standard.

Protocol Description	Example
Operating System	Microsoft Windows, Web (Microsoft or Linux Servers)

Database Management	SQLServer, Oracle
Data Collection	OLE, BACnet, LonWorks, Modbus
Data Analysis Tools	Excel, CVS, PDF, Access
Publishing	Microsoft Office (Excel, Word, PowerPoint), XML, HTML, PDF
User Interface	Web
Other protocols	XML, Web Services, TCP/IP, SQL

[0301] Open Architecture Solution

[0302] EEMS Open Architecture

[0303] The system has designed and built every aspect of the EEMS architecture and platform using the latest development methodologies, open protocols and advanced technologies. This begins with the mediator 1102 and its ability to connect seamlessly to existing and often proprietary protocols of Trane, Barber Coleman, Invensys, Johnson, Staefa, etc. Building data accessed through this device is Web-facilitated and securely transmitted to the system NOC. Advanced data services and analytics platform then manages the data. The NOC is built on an SOA, and the portal capabilities facilitate the clients to access data easily and drill into more advance analytics to monitor and manage their buildings' performance.

[0304] These facts combine to create an open platform that isn't tied to any one supplier's proprietary protocols. the company can make software, infrastructure and capital investments independent of considerations for the system EEMS because system's solution is free to interface with any standard or proprietary protocol.

[0305] Integration with Non-standard Equipment

[0306] The mediator 1102 supports more than 65 proprietary communication protocols for non-standard equipment. The mediator 1102 integrates into the physical device either via RS-485, RS-232 or IP and extracts the data in the framework of the Mediator™. The mediator 1102 normalizes the data and facilitates it to be moved bi-directionally back down to the building systems or

through the enterprise. Due to this versatility of the system solution, system can integrate with whatever equipment the company is using, standard or not.

[0307] Training Program

[0308] Training on the system may include a pilot and national training plan, such as the postal service Instructional System Design (ISD) Model and Training Management Procedures (resulting, e.g., in a customized two-hour training course that includes instruction on: How to Use the EEMS Reporting Tool (i.e., navigation, functionality and creating ad hoc reports) and How to Use the Reports to Manage Energy Usage to Improve Business Results. The training material will include instructor notes and class exercises to reinforce learning. In addition, on-screen help files will be available within the EEMS to support a user at time of use. Training may include the "train-the-trainer" method.

[0309] The system training may be delivered via the Web through the company Automated Enrollment System to complement the instructor-led training. According to ASTD industry learning standards, an interactive, Web-based training course can increase retention by 70 percent and reduce training time by 50 percent. This option provides an easy-to-access approach for ongoing refresher training.

[0310] Ancillary Services

[0311] The system solution will lay the groundwork for integrating all system expansions and potential ancillary services into a common, open platform. With the mediator 1102 as the hub, the company could integrate any existing or future technologies into the EEMS. The proposed solution will use existing infrastructure and provide an open pathway to future upgrades and system expansions. Future system expansions would be accomplished without requiring controller upgrades or proprietary, single-source systems or equipment. The mediator 1102 ability to send and receive data will give the company a powerful tool for remote facility control. The mediator 1102 open architecture is the sensible technology platform for seamless integration with other business systems.

[0312] Modifications/Upgrades to Standardize Operational Sequences and Control Points

[0313] No additional modifications and/or upgrades will be necessary for standardizing operational sequences and control points. The mediator 1102 can connect to any existing (legacy or upgraded) system and, through its two-way communication capability, send standardized operational sequences and control points to any site.

[0314] Technical Approach for Identification, Integration, and Standardization of the company Systems

[0315] system's EEMS abstracts the data from existing and future the company systems into a common object model. This permits uniform processing, presentation and sharing of data among sub-systems. The mediator 1102 acts as a foundation layer to interface with existing building management and metering systems via its standardized and flexible array of IP-based services, while the EEMS uses an SOA to maintain high flexibility for integration into other the company enterprise software systems.

[0316] Remote Control of Equipment

[0317] Question a – EEMS Remote Control Capability

[0318] A significant benefit of system's tight integration with local control networks and equipment is the capability to configure and control securely the remote building-sensor logic and control-system sequencing from the NOC. All systems and data integrated into the mediator 1102 may be accessed remotely. Local mediator 1102 applications (closed loop math/logic, schedules, trends, alarms, events, Web page GUI, systems and data configuration, data exporters, ADR, and AFDD services, etc.) can be modified and enhanced remotely based on agreed business rules.

[0319] EEMS Capabilities and Deployment for Demand Reduction Strategies

[0320] system NOC can send real time pricing of electricity for ISO DR programs. The mediator 1102 can be programmed via on board closed-loop logic to shed electrical loads when the DR signal is sent.

[0321] Optimization of Equipment Configuration

[0322] AFDD can remotely improve control-system sequencing (based on operational requirements, design intent and space comfort) and resolve many

control systems faults (depending on fault level). This continuous monitoring, improvement and fault resolution facilitates better equipment operations.

[0323] Preventative Maintenance and Repair

[0324] Monitoring, Tracking and Reporting Capabilities for Preventive Maintenance Activities

[0325] system may employ a thin Client Service order and project-management tracking system to log, report, track and verify service deployments. The system facilitates real-time customer updates on daily service calls and large project rollouts. For all future scheduled visits, the system includes the routine maintenance items to be performed, the time allocated, and the time available to solve identified faults.

[0326] Continuous analysis and AFDD system is tightly integrated into the project-management tracking system. The majority of preventative maintenance tasks are handled as "condition-based maintenance" tasks. Service work orders are automatically dispatched as a product of the continuous commissioning and AFDD process. The EEMS M&V process independently verifies the performance of serviced equipment.

[0327] Scheduling and Deployment of Preventive Maintenance Activities

[0328] The Fault Resolution Scheduler (FRS) tracks and resolves faults. Faults are assigned to scheduled service visits (or expedited in cases of urgency) and are sent to the system field services. The majority of faults found do not normally justify urgent unscheduled action. The FRS specifies the action the system technician should take (investigate or solve). The FRS also estimates the time to accomplish the required action for the fault. Faults are automatically scheduled with future service visits once the FRS assigns the visit type, time and action. Actions included as part of routine maintenance are automatically assigned to the next visit.

[0329] EEMS Capability to Incorporate Electrical Signature Analysis for System Diagnostics

[0330] Level three of the system AFDD platform can handle condition-based detection and diagnostics of mechanical faults using electrical signature analysis incorporating voltage and amp data. This technology works well on the company

sorting equipment. This electrical data is not often available without additional sensors on HVAC equipment. The system can apply similar technology used for electrical signature analysis to perform automated early detection and diagnosis of problems to thermodynamic data points that are often available without adding extra sensors.

[0331] List of Client Credentials for EEMS Preventive Maintenance Management Capability

[0332] Equipment Types and Application List

[0333] Process Flow Chart and Average Response Time

[0334] Figure 14 show a process flowchart 1400 for responding to work orders.

[0335] Responding to:

[0336] Emergency: 4 hours

[0337] Urgent: 24 hours

[0338] Routine: 3 - 5 days

[0339] Maintenance And Repair

[0340] Technicians and Engineers Deployment Capability for System Repair

[0341] The system may be supported by an extensive fleet of sign trucks and cranes operated by a highly trained professional staffs and broad nationwide affiliate network. When a work order is created in the system system, it searches a database for the appropriate technician by ZIP code. The system then narrows the search to a specific field, such as EMS controls, electrical only or sign repair.

[0342] Tracking, Scheduling and Reporting of Maintenance & Repair Activities

[0343] The FRS specifies the action the system technician should take (investigate or solve). The FRS also estimates the time to accomplish the required action for the fault. Fault details are sent to special client teams in the NOC. These teams issue work orders, obtain schedule dates, and note the cause of the problem, the repairs that they made, the repairs pending, and the parts ordered to complete the work. The teams also obtain quotes from the technician's office, obtain customer approval and complete the job. Customers can access the current status of their orders and issues within the EEMS.

[0344] Equipment Types Repaired and Repair Actions List

[0345] The system provides maintenance, repair and upgrade services for various electrical, lighting and mechanical systems. The repair services include equipment/computer design and re-build, repair of light controls, UPS systems, dedicated circuits and sub-metering troubleshooting.

[0346] Integration with Trouble Ticketing and Maintenance

[0347] The system's EEMS continuously identifies and prioritizes equipment faults. The prioritized punch list can be sent to eMARS, based on pre-defined rules. The eMARS can communicate completion of various trouble tickets for energy-conservation measurement and verification purposes.

[0348] Bill Management and Payment

[0349] EEMS Utility Bill Management and Payments Features

[0350] system provides a comprehensive and industrialized solution for utility-bill management and payment. The system may provide an end-to-end solution to facilitate an efficient and tightly controlled invoice processing and payment service. The system may realize utility spend reductions through auditing at scale/depth and rate analysis. The system provide flexible reporting of detailed utility data to drive future conservation and sustainability initiatives.

[0351] Integration of Utility Billing and Consumption Data via EDI 810

[0352] The system can receive and process utility bill data via an EDI (Electronic Data Interchange) transmission from a vendor. A dedicated EDI group may develop the technical relationships and maintains strict requirements for quality in the transmission and to confirm that all key data elements are received. They also monitor daily feeds/rejects for process integrity.

[0353] Value-added Interfaces through APIs or Other Open Non-Priority Protocols

[0354] The EEMS solution uses an open architecture and SOA design principles, enabling integration with endless Web services and Web 2.0 APIs. Additionally, connectivity to enterprise data stores and applications facilitates integration to ERP systems and other back-end corporate data. Value-added interfaces could include Web applications, mobile widgets (for delivery of information to mobile phones), or RSS feeds.

[0355] The information retrieved and/or delivered through these interfaces could include facility information such as utilization of the parking structure, position of

the elevators, lighting status, room-reservation status/occupancy, status of blinds, sprinklers, air filters, fire alarms and a host of other facility properties. General connectivity to the Web can permit delivery of blogs, podcasts, RSS news feeds, video streams, and other data for direct integration into the EEMS portal.

[0356]

[0357] APPLICATION AND system FUNCTIONALITY & TRAITS

[0358] EEMS Infrastructure Support Capacity

[0359] The system may support an unlimited number of users and user groups effectively. It grants permissions for data access to user groups according to any of the appropriate 255 levels available for read, update, add, and delete access. Access control applies to both properties of data items and controlling hierarchical views (e.g., specific facility) of data the user can view.

[0360] System Access, Navigation and User Access Functionality

[0361] System access may require a username/password. The system supports strong passwords (length, character mix, and character repeat restrictions) with configurable options for features such as password expiration and reuse frequency. The EEMS uses role based security to determine the menu options and functionality that a user can access.

[0362] Support Services for Potential Upgrades and Customization

[0363] The proposed solution is fully scalable and compatible with almost any upgrade pathway. the company could extend, upgrade, and customize the EEMS as it sees fit without being bound to any specific equipment manufacturers.

[0364] Overview of Business Rules and Data Configuration

[0365] Figure 15 outlines the business rules, controls and technology (including data configuration) to provide a secure environment 1500 for analysis and monitoring. The system also would work with the company IT Security personnel to establish and facilitate joint methods for monitoring security procedures, mitigating identified security risks, and training system personnel on the company security policies and procedures. The system plans to conduct annual review activities including self-assessments, contingency plan testing, and vulnerability scans.

[0366] Process for Data Access, Storage and Retrieval

[0367] The system may implement application security controls to govern the protection of the company data as it resides within the application. The role-permissions and user-profile definitions define user access and restrict users to only access data that their profile is authorized to see, keeping the core security principles of least privileges and separation of duties. The system would establish detailed account set-up procedures for users applying for access to the system.

[0368] Compliance Procedures for Secure Environment

[0369] At a macro level, the system may implement a security solution includes keeping the company data separate from other companies' data. Only company-cleared personnel will have access to the company data. The system has secure communication processes between the company and the solution.

[0370] The system facility may be guarded by on-site security personnel and monitored 24 hours a day, seven days a week by a private security firm. The system controls the facility's entrances by proximity control, and monitor them by closed-circuit television cameras, which record on time-lapse recorders. All user access is logged and can be tracked and reported on if necessary. Floor and server room access requires badge and card key access.

[0371] Security Policies and Procedures Compliance

[0372] The system EEMS and approach may meet any desired security policies and procedures, such as postal service Handbooks- AS-895-A, Application Information Security Access, AS-805D Information Security Connectivity Process, Administrative Support Manual Issue 13, Section 272.3 Clearances and Public Law 102-569, Section 508, Electronic and Information Technology Accessibility Guidelines.

[0373] Database Security Requirements

[0374] Overview of system Information Security Policies, Procedures and Compliance

[0375] The system may reside in an environment that meets any desired security requirements and the EEMS solution may run from one of a Department of Defense (DoD)-approved facility, for example, or any other systems, data centers, and facilities to meet or exceed Government data security requirements. The environment may use standard operation procedures (SOPs) to comply with

Federal privacy requirements, applicable laws, regulations, and the company policies and procedures for developing, implementing, and operating information systems. The system may deliver performance and integrity reports to provide transparency into services the system provides, including elevation of security breaches in a timely manner based on established protocols , with layers of security authentication in the solution, down to the individual user and task level.

[0376] The environment may include running a separate instance of the solution on dedicated virtual local area network. Each standard environment includes the required firewalls, LDAP and SSL. All access to the system may happen via the Internet over SSL, with transmission of data feeds via a secure VPN connection using 128-Bit SSL encryption. All support personnel may have passed rigorous screening requirements and obtained whatever required security clearance.

[0377] Data Encryption and/or Other Access Controls

[0378] All data facilities containing client information may be encrypted.

[0379] Business Continuity, Contingency and Disaster Recovery Planning

[0380] In the event of a severe impairment of operations at the NOC, the system implementation may include or would transfer operations to the most appropriate back-up site within a network of similar facilities within the United States.

[0381] The system approach may include planned, tested and documented procedures and processes to restore mission-critical business functions and avert unacceptable business interruptions in the event of an unplanned outage. The strategy places emphasis on business functions that are critically impacted. Identification of business continuity requirements early in the project provide the opportunity to develop options that minimize cost and increase flexibility by using existing capabilities.

[0382] In the event of a disaster and the implementation of the business continuity plan, the solution would support the following activities:

[0383] Identify key users included in disaster recovery activities

[0384] Develop and maintain a call tree and list of personnel authorized to declare a disaster

[0385] Develop and keep up-to-date emergency response procedures

[0386] Set up and maintain the disaster recovery site in a state of readiness

[0387] Application changes and upgrades must take into account disaster recovery plans

[0388] Infrastructure changes and upgrades must take into account disaster recovery plans

[0389] Make operating system, database, and third application software and licenses available for restore

[0390] Store vital system software and data (including the EEM application database and file systems) backups offsite in a timely manner and make them readily accessible from (remote) secured facilities

[0391] Perform disaster recovery testing using the disaster recovery site, procedures and personnel.

[0392] Backup and Recovery procedures and Offsite Date Storage Processes

[0393] MAINTENANCE AND SUPPORT FOR EEMS DEPLOYED HARDWARE AND SYSTEMS

[0394] General Maintenance including Software Enhancement and User Guide Updates

[0395] The software life cycle development and maintenance methodology includes:

[0396] Smooth Operations: The system has processed and capabilities to develop, test and implement enhancements without disrupting ongoing operations

[0397] Data: There are numerous interconnections and data dependencies across the EEMS. System enhancements require full regression testing to reduce risk of data corruption or incorrect data processing

[0398] Staff: The operations staff supporting the EEMS system hold specialized functional and technical skill sets. Enabling the team to execute enhancements while understanding maintenance requirements maximizes staff skills, business and technical knowledge. It also encourages knowledge transfer, cross training, and provides growth opportunities

[0399] Technical Environment: Tightly integrating enhancement and maintenance efforts facilitates close coordination of development and testing environments and

data needs and maximizes configuration management of source code and migration control

[0400] Training and User Guide Updates: The system will update training and user guides to reflect enhancements.

[0401] Question b – Process and Methods for Identifying Software Deficiencies

[0402] On an as-needed basis, system application maintenance personnel will work with users to understand, research, and resolve problems with the EEMS. The system will work with the company to determine if a reported problem is a deficiency. The system will track deficiencies via a deficiency report management tool and record enhancements for possible consideration by application owners.

[0403] The system will base service levels for deficiency correction on deficiency severity. The system will base severity definitions on several factors including the criticality of the application. The system will resolve high-severity deficiencies as emergency corrections for immediate release upon correction, whereas non-emergency deficiencies will not be treated as an emergency and would typically not be released until the next scheduled maintenance release.

[0404] For software or data deficiencies, the system will assign to all deficiencies a severity code and will correct the deficiencies in accordance with the company governance processes. The system will work with the company to define the characteristics of severity levels that drive the release path of a fix. Equally important to application deficiency management is data correction management. Upon completion of an impact analysis, the system will address data fixes appropriately.

[0405] Maintenance Cost

[0406] The cost to fix deficiencies (i.e., application not working as documented) may be included in the maintenance costs.

[0407] Response Time and Process for Help Desk

[0408] The Help Desk approach provides the EEMS users with a central contact point to provide rapid issue resolution and customer support. Support starts when an end user contacts the Help Desk with a request. The Help Desk uses industry-standard tools to record contacts as trouble tickets with information regarding both issue and resolution. The system may use Standard Operating Procedures

(SOP) such as those used on Federal government projects. The Help Desk performs data extraction at regular intervals for analysis to determine trends and develop approaches to resolve common issues. The help desk is available 7 days a week, 24 hours a day, 365 days per year. The average response time for help desk calls is driven by the service level agreements (SLAs) in place with a given customer, but average at around 45 seconds.

[0409] EDI Exchange Service Business Partner Communication Options

[0410] The system EEMS supports standard EDI protocols including EDIINT AS2, FTP w/PGP, and connect:direct.

[0411] The system may employ Internet Protocol (IP) infrastructure that facilitates the effective integration of disparate building systems. The system may integrate third-party building systems that used protocols such as Modbus, Lonworks®, BACnet and numerous other current, legacy and proprietary protocols. system's ability to seamlessly connect to existing and often proprietary protocols of Trane, Barber Coleman, Invensys, Johnson, Staefa, and more is a critical capability to help the company receive a truly open architecture. The system may also incorporate diagnostic tools that facilitate persistent and interactive commissioning. The system may combine utility bill, Time of Use (TOU), metering, and Building Automation Systems (BAS) data into the process of energy reduction. The system may further employ advanced Automated Fault Detection and Diagnosis (AFDD) analysis for HVAC and refrigeration equipment delivered as a browser-based Software as a Service (SaaS). This provides intelligent remote applications that continuously analyze sensor, machine, and building system data create prioritized, actionable information are hosted on a scalable M2M (Machine to Machine) platform providing data and FDDI analysis results via IT open-standard Web services. The system may also combine both national and Web-based electrical and controls product distribution with service, support and project management capabilities. The system may include the following solutions: Intelligence and tools to help customers make informed decisions and manage electricity purchasing risks, thorough energy analysis and strategic pricing options to meet customers needs, online reporting tools with access to energy usage and billing information, renewable energy, load response

programs and wholesale origination power purchases with generators. Expense-management solutions, e.g., from Cadence, may be implemented to allow multiple site enterprises to more effectively manage and reduce electric, gas, water, sewer, lease and waste expenses.

[0412] Figure 16 shows a program management methodology 1600 for the system 100, which may be driven from a strong Program Management Office (PMO). Figure 16 shows an example of a PMO structure to provide the company with an established and mature set of program management services, reducing startup time and accelerating savings realization.

[0413] Figure 17 shows a scalability scenario 1700. The scenario 1700 connects buildings 1702 to the external world 1704 through the mediator 1102. The scenario 1700 leverages Internet Protocol or other protocols, Web Services, Web Interfaces, or other interfaces to the Network operations center 1106.

[0414] The scenario 1700 may employ a Site Level Infrastructure (SLI), such as a Web-facilitated SLI, as the backbone of the solution. The mediator 1102 comprises hardware that resides inside the four walls of the company facilities. It is an IP-based device that serves as the conduit to the EEMS. The system 100 supports local Web-based real time views of meter and machine data, but the company will also be able to control the building at a site level, regional level and national level. Demand response (DR) may also be implemented across multiple sites as the solution would provide all functionality in a scalable fashion to the size the company will ultimately require.

[0415] The system may support reporting on not only what the consumption curves look like, but also support altering control strategies, schedules, sequences, and set points, etc. The system 100 infrastructure discussed above, provides supervisory control over existing systems (no up front need to start replacing equipment). The system provides real time reporting and M&V dashboards supplied by the score boarding and score carding approach. This visibility the system provides facilitates the company to make far better decisions going forward.

[0416] The company EEMS backbone would promote increased data analytics, pulling meter data as requested, but also a host of additional parameters:

[0417] 60 second machine interval data via sensors or existing BMS (facilitates superior fault detection)

[0418] Real time machine efficiency (energy, carbon and cost drivers)

[0419] Sub meter and meter data

[0420] Lighting where available

[0421] Set points

[0422] The infrastructure facilitates: identification of problems, control HVAC systems, and commission continuously to improve performance. The infrastructure also would facilitate load management, sub-metering of major systems, identification and prioritization of preventative maintenance opportunities, and verification that buildings continue to perform within pre-defined energy-performance parameters.

[0423] The system may analyze available utility bills and time of use (TOU) data. The system may also compare the design intent of the facility to what it actually is doing and advise and work with the company on suspected causes and remedies of sub par performance. The system may make a large portion of the "fixes" remotely with the company concurrence and send them back through the backbone's bi-directional data architecture.

[0424] Table 1-5 below show scenario examples for the system 100.

Scenario 1: Facility Manager - Managing signals, alerts, & alarms	
Current Capability	System 100 Advantage
Occasionally views BMS data to adjust setpoints in the control system in a reactionary mode to system alarms, events, hot/cold calls, or negative changes in the performance of the building. Spends hours attempting to diagnosis a "high pressure" alarm on a chiller and later calls a	Logs into the SMART Buildings platform and reviews (in real time) the top energy and performance issues occurring in their facility. Actionable items are sorted by user-defined priorities, ranking, dollar cost impact, number of faults, etc. Facility Manager sorts the dashboard by chiller type and views the dynamic "dirty coil alert" generated at 20%, weeks and

technician to determine days or potentially weeks later the chiller actually has a dirty coil .vs. the generic "high pressure" alarm issued by the BMS.	potentially months before the BMS has generated the static alarm at 60%.

Scenario 2: Enterprise Energy Manager - Tracking energy across a real estate portfolio	
Current Capability	System 100 Advantage
The Enterprise Manager needs to track the progress of the company's energy & carbon reduction programs across a portfolio of 20 buildings (lighting retros, BMS recommissioning, new equipment performance, etc). Limited to no connected real estate infrastructure, manual utility bill analysis in arrears monthly using excel, and manual report generation.	Continuous real time performance reporting at one minute intervals across the energy manager's real estate portfolio. Energy and carbon analytics highlighting buildings with the highest energy usage, trending, and drill down capabilities from portfolio rollup down to individual buildings and even down to a specific piece of equipment's performance.

Scenario 3: Facility Manager – Continuous commissioning	
Current Capability	System 100 Advantage
N/A – Current BMS does not support	With an ongoing snapshot of one minute interval data 24x7, System's energy models deliver continuous optimization of both schedules and setpoints in a building. Energy models deliver setpoint changes based on seasonal and

	occupancy changes throughout the day (e.g. 20 degree drop in temperature as a cold front moves into the area or the automated setpoint / schedule changes required from a cloudy morning to a sunny afternoon).

Scenario 4: Utility Company / ISO – Interfacing with the SMART City / SMART Grid	
Current Capability	System 100 Advantage
N/A – Current BMS does not support	Predictive capabilities in Systems and established energy models allow building owners to interface with Demand Response programs and structure their energy procurement to the best of their advantage, avoiding higher peak KWH costs. Advanced load shed strategies are implemented to take advantage of ongoing DR programs and incentives.

Scenario 5: Chief Engineer – Advanced building performance strategy	
Current Capability	System 100 Advantage
Chief engineer attempts to establish a building performance strategy to prioritize his workload based on the issues with the highest energy impacts. Realizes he has no way to conduct this analysis.	Delivers a real time dashboard sorted by the most URGENT faults in each building across the entire portfolio with their exact economic impact. Cost is derived from the specifications of each machine, combined with System's analytic models and data.

[0425] As noted above, the system 100 may include a mediator 1102, such as a Richards-Zeta Mediator 2500. The mediator 1102 may implement a middleware system including hardware (e.g., a Richards-Zeta mediator 1102 Multi-Protocol Exchange device) and software (e.g., a Richards-Zeta mediator 1102 system software). Thus, the mediator logic 1102 may be implemented as an embedded device with no moving parts, including a journaling file system that stores data on a Flash memory device for robustness against random power failure events that typically causes file system corruption. In addition, the mediator 1102 may include battery management circuits that allow it to perform its own uninterruptible power supply functionality.

[0426] The mediator 1102 may include multiple 10/100 Base T Ethernet ports for network connections, an RJ-11 port for connecting to an internal modem, a console port, RS-232 serial port, four RS-485 serial ports (configurable as terminated/non-terminated), an IrDA infrared data link port to allow communications with a PDA, pulse counter/frequency counter/digital inputs, Dallas 1-Wire ports, universal serial bus ports, solid-state single pole normally open relay outputs, with 0-60V, 1.0A AC/2.0A DC outputs, opto-isolated, or other interfaces.

[0427] The mediator 1102 may include 512 MB or more of compact flash memory, expandable to up to 2GB externally, which acts as a solid-state hard drive, and 512 MB or more of SDRAM. After power-up, the mediator 1102 Framework Software application loads from Flash into RAM and executes from RAM. The main board has a special header which provides some in-circuit emulation capability and the ability to program its own boot load flash without removing the EEPROM chip.

[0428] The mediator 1102 may operate on 24VAC power provided by a customer-supplied 24 VAC class 2 transformer (typically 40 VA), and may include defenses against power disruptions and failures. For example, the mediator 1102 may include a large capacitor with enough capacity to withstand two or three missing 60-cycle power cycles. In addition, the mediator 1102 may include provisions for an optional external gel cell or lead-acid battery. The battery may be trickle-

charged continually and used as an onboard UPS, so that the system can continue to operate in the event of brownouts or power loss.

[0429] The mediator 1102 Software includes:

[0430] The mediator 1102 Framework Software application

[0431] The mediator 1102 Operating Environment (MOE)

[0432] The mediator 1102 Framework Software

[0433] The mediator 1102 Framework Software provides the core functionality of the mediator 1102 system. This includes:

[0434] Assembling a running system from configuration data

[0435] Getting and setting values

[0436] Processing raw data

[0437] Presenting data from disparate stheces in a uniform format

[0438] Making data easily available to end users

[0439] Providing services such as data logging and HTTP services

[0440] Providing an environment for custom system configuration

[0441] Providing an environment for developing custom solutions

[0442] Providing both REST and XML-RPC based Web-services for external value add applications.

[0443] The mediator 1102 Framework Software is written in Python, an open-source programming language that supports robust, object-oriented applications. One feature of the mediator 1102 Framework architecture is dynamic system configuration. Conventional programs are monolithic in design, which means they would contain all of the code required for any possible site configuration. Much of the program may not be applicable to a particular site, but it would be loaded and run nonetheless. Dynamic system configuration facilitates the Framework to assemble a system that includes only the program code that a particular site configuration actually requires.

[0444] The mediator 1102 Framework provides the structure on which it builds the system that represents a site. It also provides the functionality to assemble the system from configuration data. It then provides the operating environment in which that system runs. As a result, the mediator 1102 facilitates any site

configuration to be represented in software. In addition, it facilitates an existing system to be modified or extended easily and quickly, without shutting it down.

[0445] The mediator 1102 Operating Environment (MOE) system software is based on a Red Hat 2.4 series Linux kernel and a Red Hat-derived user-space, thereby providing true multi-tasking, multi-threads, virtual memory, shared libraries, demand loading, shared copy-on-write executables, sophisticated memory management, loadable device driver modules, and robust TCP/IP networking. The MOE facilitates the mediator 1102 to run multiple services and protocols simultaneously and still respond to events, such as energy usage curtailment signals, generated in the network environment. In the event of a system failure, the Mediator may use its full journaling file system restores the data on the disk to its pre-failure configuration. It also recovers unsaved data and stores it in the location where it would have gone if the system had not failed, making it an important feature for mission-critical applications.

[0446] The mediator 1102 provides firewall capability by means of the Netfilter packet-filtering subsystem built into the Linux operating system. The Secure Shell (SSH) protocol defines programs that allow users to securely log onto another computer over a network, execute commands remotely, and move files between machines. It provides strong authentication and secure communications over insecure networks such as the Internet. The mediator 1102 uses the OpenSSH implementation of the SSH protocol specification. SSL (Secure Socket Layer): the Operating System running on the mediator 1102 is configured to implement Secure Socket Layer (SSL). SSL is an open protocol to allow encrypted transmission of data between Web browsers and Web servers. SSL is based on public key encryption technology and provides data encryption, server authentication, message integrity, and client authentication for TCP/IP connections. IPSec: The mediator 1102 may use FreeS/WAN, an implementation of the IPSec protocol suite. The IPSec protocols provide security in network-to-network connections. It provides access control, data integrity, authentication, and confidentiality, allowing secure private communication across insecure public networks such as the Internet.

[0447] The mediator 1102 may keep logs of the following:

[0448] All system and kernel messages.

[0449] Each network connection, its originating IP address, length, and other data about attempts to enter the system.

[0450] Remote users file requests.

[0451] Repeated authentication failures.

[0452] In addition, the mediator 1102 may be configured with intrusion detection tools that take user-specified actions such as setting off an alarm when unauthorized entry is attempted.

[0453] The Mediator™'s MOE supports a broad range of networking capabilities, including:

[0454] Integrated Web server with HTTP, CGI, SSI, Secure Socket Layer (SSL) and HTTPS protocol support

[0455] Secure Shell (SSH) and Secure Copy (SCP)

[0456] Integrated IPSec (Virtual Private Networking) functionality

[0457] Routing

[0458] Packet filter firewall

[0459] Packet logging

[0460] Intrusion Detection

[0461] Quality of Service (QoS)

[0462] Network Address Translation (NAT)

[0463] Dynamic Host Configuration Protocol (DHCP)

[0464] Simple Network Management Protocol (SNMP)

[0465] The mediator 1102 provides a flexible array of IP-based services that can be used to integrate the various automation systems deployed within an Enterprise. These services include (but are not limited to) the following:

[0466] HTTP (AJAX): On-board tools allow the user to generate custom Web-pages that dynamically update and may be used to represent various equipment. This includes the ability to embed a Flash-based widget that can chart local log data.

[0467] XML-RPC: Large Enterprises typically have requirements for custom applications. The mediator 1102 provides an open XML-RPC based API that facilitates interaction with third-party applications.

[0468] MeterMail Exporter: The mediator 1102 supports the PML EEM log transport protocol, MeterMail. This facilitates information from a variety of meters to be incorporated into this application.

[0469] SNMP: Simple Network Management Protocol used in IT and Telephony communications.

[0470] RSS: Alarm\Event information may be subscribed to via RSS syndication.

[0471] FTP: Log information may be periodically sent to FTP servers.

[0472] SMTP: Alarm information may also be communicated via SMTP.

[0473] The system may store and generate 3-D renderings of buildings or building floor plans, e.g., modeled in Google SketchUp, imported into Google Warehouse, and accessed via Google Earth (GE). A geospatially accurate representation of a real estate portfolio coupled with customizable information overlays could potentially be implemented in the system as part of a building Management Intranet.

[0474] The system solution may facilitate Automatic Demand Response (ADR) offered by many utility providers. For example, Mediator™® listens 24/7 on the PGE DRAS server for pending ADR events. The mediator 1102 consumes the utilities ADR Web service, integrating this DR signal into mediator 1102 resident application logic and policies then driving building systems at the facility level like HVAC and lighting into reset, set point changes and dimming and /or turning off selected lighting loads. Mediator™® also provides M&V and ADR results via a PDF log FTP or other wise sent to the utility upon request and /or on board configuration.

[0475] The system's maintenance component may provide an open architecture to other applications and systems via SQL connections, CVS extracts, online viewing, FTP and Web services methods (XML/SOAP). This facilitates integration of prioritized analysis results into the company' business rules, dashboard, work order systems, or even payment system for payment control purposes, e.g., technician payments cannot be released until faults on the equipments they are responsible for are fixed. This platform is also tightly integrated with Mediator™® to utilize its MPX feature, enabling integration with energy, building, facility

service, asset & IT management applications such as CMMS, Archibus, MAXIMO®, SAP, Oracle, etc.

[0476] The mediator 1102 may support the major communications protocols most widely used in the Building Automation industry, but others may be developed and implemented.

[0477] The following is a list of the building management protocols and drivers that the mediator 1102 may implement

Modbus RTU	Carrier Dataport/Datalink
Modbus TCP	CSI MR
BACnet/Ethernet	CSI I-NET
BACnet/IP	Staefa SmartI and SmartII
Trane proprietary BACnet objects	YorkTalk
Barber Colman ASD protocol	McQuay Microtech #1/#2
Trane TRMI Tracer 100 Interface Module (COM3)	Barrington Microstar I and Microstar II
Trane TRMS Tracer Summit Interface Module. (COM4)	HSQ Misenet Field Interface Emulator
Johnson Controls Metasys N1	DNP3
Johnson Controls Metasys N2	Crossbow Wireless Sensor Network and motes
Dallas 1-Wire	Point Six wireless host protocol
PPP (Point-to- Point Protocol)	LonTalk
Andover proprietary	RZ Net
Capstone proprietary	Capstone Micro-turbine protocol
Point Six proprietary	Caterpillar CCM protocol
Siemens proprietary	Generic SOAP Host
Clipsal C-Bus	ASI Controls VAV, Fan Coil, Heat Pump, AHU and ASIC 2 devices

[0478] MEDIATOR™ OMEGA CONNECTION AND ANALYSIS TOOLS

[0479] The system 100 may include an Event Manager that provides a complete Web-based alarm management system that provides the means to manage alarms from cradle to grave. Every mediator 1102 within a configured cloud reports all locally identified alarm related events to each other, which creates a distributed, fault tolerant alarm management system that still has the ability to

present a system wide consistent view. Alarms may be communicated to a number of parties via RSS, e-mail, SMS and similar mechanisms.

[0480] Security Manager facilitates the ability to control user access to the system, including adding/removing users and passwords to the system, configuring and assigning roles and associating policies with those roles.

[0481] Trend Manager facilitates the integrator to add, configure logs in Flash graphics, so that end users can view the data and save it to a spreadsheet.

[0482] Web Scheduler is a complete scheduling engine for editing and maintaining schedules.

[0483] Web Site Builder facilitates the integrator to configure the look and feel of the end-user application. The integrator can use it to link pages together, create buttons, drop-down menus and other graphical elements in the GUI, choose colors, upload graphics, videos, and other elements for home page, etc.

[0484] Web Express facilitates the integrator to create Web pages on the fly. It provides widgets and other tools to graphically display information from the mediator 1102 – point values, logs, etc. In addition, the mediator 1102 has an onboard image library containing thousands of images that can be used in creating Web pages.

[0485] Configuration Tool is the tool the integrator uses to configure the mediator 1102 to communicate with the devices, equipment, and systems in a facility.

[0486] Node Browser provides the integrator with a graphic view of the nodes in an installation.

[0487] Cisco IPT is a tool for configuring the Cisco voice-over-IP telephone. It facilitates authorized users to communicate with the mediator 1102 over the telephone, and to view and change settings, logs, alarms, and other information from the Mediator™. The mediator 1102 may further include an enterprise connectivity system, such as Web Point.

[0488] Figure 18 shows dashboard screenshots 1800 for reporting screens that the system may generate.

[0489] Figure 19 shows a dashboard screenshot for an analytics reporting screen 1900 that the system may generate.

[0490] Figure 20 shows a dashboard screenshot for a trend reporting screen 2000 that the system may generate.

[0491] Figure 21 shows a dashboard screenshot for a monitoring reporting screen 2100 of historical energy comparison that the system may generate.

[0492] Figure 22 shows a dashboard screenshot for a monitoring reporting screen 2200 of actual energy usage versus budged amount that the system may generate.

[0493] Figure 23 shows a dashboard screenshot for a monitoring reporting screen 2300 of Interactive Automated Fault Detection and Diagnosis that the system may generate.

[0494] Figure 24 shows a sample reporting format for measuring and optimizing comfort, efficiency, and operations within each building space, including reporting on operations of building equipment and systems, specifically regarding Analysis Focused on Equipment Performance 2400.

[0495] Figure 25 shows one example of a particular machine 2500 that implements a system for building energy analysis. The machine 2500 may implement all or part of the network operations center 1106, for example. The machine 2500 includes a processor 2502, a memory 2504, and a display 2506. A communication interface 2508 connects the machine 2500 to energy data sources 2510, such as building sensors, utility company meters, weather centers, mediator devices, and other data sources. The display 2506 may present reports 2512, such as those described above or below, either locally or remotely to an operator interacting with the machine 2500.

[0496] The machine 2500 also includes an energy database 2514. The energy database 2514 may store any data that the machine 2500 processes. As examples, the energy database 2514 may store sensor samples 2516 (e.g., samples of energy consumption or performance of building energy consuming devices), energy metrics 2518 (e.g., measured or computed metrics, optionally based on energy KPIs), utility bill data 2520 (e.g., cost per unit energy, energy consumed, total cost, and date), weather data 2522 (e.g., temperature ranges, dates, expected temperature or temperature variations at any desired interval), or

other data that helps the machine 2500 analyze energy consumption, cost, or history.

[0497] The memory 2504 may store program instructions or other logic for execution by the processor 2502. For example, the memory 2504 may store energy analysis programs 2524 and energy reporting programs 2526. The energy analysis programs 2524 may gather, analyze, and otherwise process the sensor samples 2516 or other energy data (e.g., to produce control recommendations for building systems or identify data points for further study and analysis). The energy reporting programs 2526 may generate user interfaces including dashboards, charts, graphs, text displays, or other reporting information as described above with regard to Figures 18 - 24, or as noted below.

[0498] The machine 2500 may perform an energy analysis (e.g., as part of the network operations center) on the energy data in the energy database 2514 to produce an analysis result. To that end, as one example, the machine 2500 may include in the memory 2504 balance point determination logic 2528 (e.g., as one of the energy analysis programs 2524). The balance point determination logic 2528 may search for one balance point, or a set of multiple balance points (e.g., a pair of balance points) in the energy data. In one implementation, the energy data that is searched are triples of: date, temperature, and measured consumption data 2546, obtained from one or more energy data sources over any desired date range, such as from a building under analysis and a weather information center.

[0499] The balance points may include a Heating Balance Point (HBP) 2530 and a Cooling Balance Point (CBP) 2532 to help identify the number of heating degree days (HDDs) and cooling degree days (CDDs). The HBP 2530 may be interpreted as the temperature above which the building is not heating, while the CBP 2532 may be interpreted as the temperature below which the building is not cooling. In one model, the building is neither heating nor cooling between the HBP 2530 and the CBP 2532. Thus, identifying both the HBP 2530 and CBP 2532 may significantly increase the accuracy of the count of the number of HDDs and CDDs for the building, particularly as compared to finding a single balance point for both heating and cooling, or compared to assuming a standard and

usually inaccurate balance point (e.g., 65 degrees F). The increased accuracy in the determination of HDDs and CDDs has positive effects in downstream technical analyses, such as obtaining a more accurate determination of the weather load on the building, and therefore a more accurate regression model of how the building responds to weather load. The more accurate regression model means more accurate measurement and verification of savings obtained when energy management strategies are implemented based on the downstream analyses.

[0500] In particular, the balance point determination logic 2528 may implement the logic 2600 shown in Figure 26. The logic 2600 may be implemented as executable instructions for the processor 2502, to determine either or both of a HBP 2530 and a CBP 2532 (i.e., as a computer implemented method). The balance point determination logic 2528 may obtain (2602) balance point parameters 2534 including, as examples, those shown below in Table Balance Point Parameters.

[0501] The balance point determination logic 2528 may obtain the balance point parameters 2534 from operator input, from pre-defined parameters stored in the memory 2504, or in other ways. With regard to the search window parameters, alternatively the balance point determination logic 2528 may search for the HBP 2530 and CBP 2532 over the entire temperature range (or some pre-defined portion of the whole range) represented in the energy data obtained for analysis.

Table: Balance Point Parameters

Parameter	Comment
HBPMin	The lower end of the search window for the heating balance point, e.g., in degrees F or C.
HBPMax	The upper end of the search window for the heating balance point, e.g., in degrees F or C.
CBPMin	The lower end of the search window for the cooling balance point, e.g., in degrees F or C.
CBPMax	The upper end of the search window for the cooling balance

	point, e.g., in degrees F or C.
R^2Min	The minimum correlation coefficient value that the balance point determination logic 2528 will consider in its search for a HBP or CBP. Thus, R^2 values below R^2Min may be discarded or not considered in the search for the best fit R^2 in the analysis discussed below. In other implementations, the balance point determination logic 2528 may employ additional or different statistical tests or variables to determine which regression models to consider in its search for the HBP and CBP. Alternatively, all R^2 values may be considered.
Temperature Delta	A temperature increment (for the HBP) or decrement (for the CBP) that defines the number or size of steps through the heating balance point search window or cooling balance point search window. For example: an increment of 2 degrees and a decrement of 3 degrees, or an increment and a decrement of 1 degree.
Data Cleansing Parameters	Parameters used to identify and remove outlier data points in the energy data before searching for the HBP or CBP. For example, a number (e.g., 1.5) of standard deviations from the mean temperature or mean energy consumption that defines outlier data points in temperature or energy consumption to be removed.

[0502] The balance point determination logic 2528 obtains energy data from the building under analysis (2604). As an example, the energy data may include date, temperature, and energy consumption (e.g., kWh) data for each date. The energy data may instead be kBTU consumption, occupancy, wind speed, relative humidity, or other energy data. The energy data may extend over any desired time period, such as one year, one quarter, or one month, and may be collected at any desired interval (e.g., every 15 minutes, 30 minutes, 60 minutes, or other interval), with the data subjected to any desired mathematical treatment (e.g.,

averaging of the data, or discarding outlier data) to obtain the energy data for a given date.

[0503] The balance point determination logic 2528 optionally cleanses the energy data prior to analysis (2606). For example, the balance point determination logic 2528 may remove from consideration from the energy data: weekend data points, outlier data points, data points with errors in date or energy consumption data, or other non-representative data points. The outlier data points may be data points beyond a predefined outlier threshold (e.g., 2 standard deviations away from the mean) input as a balance point parameter. More specifically, the outlier data points may be determined by finding the average and standard deviation of the input data (e.g., the average of weekdays after data with invalid dates and energy data are discarded), then removing data points more than a pre-defined or operator specified multiple of the standard deviation away from the average).

[0504] Given the input energy data, the balance point determination logic 2528 performs an analysis (e.g., a regression analysis) to determine a balance point set. The balance point set may include the HBP 2530 and the CBP 2532, as an example. One exemplary analysis is described below with continued reference to Figure 26. In the example given below, the balance point determination logic 2528 uses regression analysis to determine R^2 values. However, it is noted that the balance point determination logic 2528 may apply additional or different statistical tests or variables in its search of the energy data to find the HBP 2530 and CBP 2532.

[0505] In particular, the balance point determination logic 2528 sorts the energy data according to temperature (e.g., in ascending order) (2608). An analysis bound, for finding the HBP 2530, is initially set to HBPMin (2610). For all the data points starting from the least temperature to the data point corresponding to HBPMin, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for that set of data points (2612). The balance point determination logic 2528 may determine the correlation coefficient by, in general, performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable. The balance point determination logic 2528 then increments

the analysis bound (e.g., by 1 degree, or another pre-defined temperature delta) and if HBPMax has not yet been exceeded, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for all data points from the least temperature to the incremented analysis bound. This way, the balance point determination logic 2528 returns to (2612) repeatedly to determine the next R^2 over the new set of data points extending to the incremented analysis bound until the incremented analysis bound reaches HBPMax. The balance point determination logic 2528 may save, display, analyze, plot or otherwise manipulate any or all of the R^2 values determined during the analysis. Once the balance point determination logic 2528 has determined the R^2 values at each increment delta over the window between HBPMin to HBPMax, the balance point determination logic 2528 determines the temperature at which the best R^2 fit is achieved (2616), e.g., as determined by the greatest R^2 value. That temperature is designated the HBP 2530.

[0506] With regard to the CBP 2532, the balance point determination logic sorts the energy data according to decreasing temperature (2617) and sets a new analysis bound equal to CBPMax (2618). For the data points starting from the highest temperature to the data point corresponding to CBPMax, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption, for that set of data points (2620). The balance point determination logic 2528 then decrements the analysis bound (e.g., by 1 degree, or another pre-defined temperature delta) and if CBPMin has not yet been reached, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for all data points from the highest temperature to the decremented analysis bound. This way, the balance point determination logic 2528 returns to (2620) repeatedly to determine the next R^2 over the new set of data points extending to the decremented analysis bound until the decremented analysis bound reaches CBPMin. The balance point determination logic 2528 may save, display, analyze, plot or otherwise manipulate any or all of the R^2 values determined during the analysis. Once the

balance point determination logic 2528 has determined the R^2 values at each decrement delta over the window between CBPMmax to CBPMin, the balance point determination logic 2528 determines the temperature at which the best R^2 fit is achieved (2624), e.g., as determined by the greatest R^2 value. That temperature is designated the CBP 2530. The HBP and CBP may be displayed, saved, or otherwise manipulated (2626).

[0507] Obtaining the balance point parameters noted above helps to focus the search for the balance points in specific windows. The results are faster and more efficient searches for the balance points. An exhaustive search of all the data points may still be performed, however, and in that regard, the balance point determination logic 2528 need not obtain specific balance point search window parameters before performing its analysis

[0508] [Once the balance point determination logic 2528 has obtained the HBP 2530 and CBP 2532, the machine 2500 may apply the HBP 2530 and CBP 2532 in many different types of analyses and reporting. For example, the measurement and verification (M&V) logic 2548 (or the balance point determination logic 2528) may calculate the number of HDD and CDD, present analysis plots on the display 2506, or take other actions. For example, the M&V logic 2548 may: plot the CBPMin to CBPMax with corresponding R^2; plot the HBPMin to HBPMax with corresponding R^2; determine whether any day was a CDD according to the CDD test: Min(Temperature recorded that day - CBP, 0) that returns non-zero for a CDD; determine whether any day was a HDD according to the HDD test: Min(HBP - Temperature recorded that day, 0) that returns non-zero for a HDD; extract the month from the date field for each data point (row) and sum the kWh consumption, kBTU consumption, CDD, HDD and the number of days in the data set belonging to each month and store or display the monthly figures; for monthly CDD and HDD, calculate Log CDD, Log HDD, CDD^2, HDD^2 and store or display the values for each month; for each month, calculate average Occupancy, Relative Humidity, Wind Speed, Global Solar Radiation and store or display these for each month; or output other analysis result.

[0509], The M&V logic 2548 may define, execute, and display the results of regression analyses, given, as examples, the number of CDD or HDD, the HBP 2530 or CBP 2532, or other parameters. To that end, the M&V logic 2548 may obtain (e.g., from operator input or from pre-defined parameters in the memory 2504) M&V parameters 2550. The M&V parameters 2550 may include, as examples, company name, building name, an (optionally) unique building identifier, analysis start date, analysis end date, or other parameters. Additional M&V parameters 2550 may include: user-specified independent variables for use in regression analyses, such as CDD, HDD, number of days, CDD^2, HDD^2, Log CDD, Log HDD, occupancy, relative humidity, wind speed, and global solar radiation; and user-specified dependent variables for use in the regression analyses, such as kWh consumption, kBTU (i.e., natural gas) consumption.. Using the M&V parameters 2550, the M&V logic 2548 may calculate, store, display or otherwise perform a user-specified regression analysis. In particular, the M&V logic 2548 may determine the 'n' independent variables specified in the M&V parameters 2550, and from 'i'=1 to n, take 'i' of the variables at a time and create a regression model with the 'i' variables as independent variables and kWh (or kBTU, or other energy measurement chosen) as the dependent variable. Each of the regression models created may use a combination (subset) of the overall 'n' independent variables chosen. The M&V logic 2548 runs the regression based on the data (e.g., monthly, weekly, or daily data) for the dependent and independent variables, and may determine and store the R^2 value, significance F (e.g., from an F-test), or any other variables or test results, and the corresponding intercept and coefficient values for each of the 'i' independent variables.

[0510] The M&V logic 2548 may, if desired, for each independent variable chosen, disallow the certain pairs of variables in the regression analysis (e.g., transformations of the same variable may not be chosen together in the same regression model). As examples:

[0511] CDD and CDD^2 together may be disallowed;

[0512] CDD and Log CDD together may be disallowed;

[0513] Log CDD and CDD^2 together may be disallowed;

[0514] HDD and HDD^2 together may be disallowed;

[0515] HDD and Log HDD together may be disallowed;

[0516] Log HDD and HDD^2 together may be disallowed.

[0517] Once the combinations of regression outputs for 'i'=1 to n have been generated and stored, the M&V logic 2548 may sort the R^2 values for the regressions (e.g., by decreasing R^2) and output on the display 2506 the top results (e.g., the top 1, 2, or 3 results). Each result may, for example, report the R^2, Significance F, intercept and coefficients for each independent variable in the top regression results. Additionally, the M&V logic 2548, may use the intercept and the coefficients for each independent variable to create the regression equation for each of the top regression outputs.

[0518] In addition to those noted above, the M&V logic 2548 may generate a wide variety of analysis results as outputs on the display 2506. Examples are given below. With regard to the first two examples, the M&V logic 2548 may generate the displays using information obtained from the balance point determination logic 2528. Alternatively or additionally, the balance point determination logic 2528 may display the charts described using the information that it obtains in its analysis to find the balance points.

[0519] 1) a line chart showing temperature varying from HBPMin to HBPMax on the X axis and R^2 (the square of correlation for temperature and kWh) corresponding to each temperature on the Y axis;

[0520] 2) a line chart showing temperature varying from CBPMin to CBPMax on the X axis and R^2 (the square of correlation for temperature and kWh) corresponding to each temperature on the Y axis;

[0521] 3) tables containing the underlying data used to generate above two charts;

[0522] 4) a table showing monthly date in any desired (e.g., mm/yyyy) format, kWh consumption, kBTU consumption, monthly CDD, monthly HDD, monthly CDD^2, Log CDD, Log HDD, HDD^2, monthly average Occupancy, monthly average Relative Humidity, monthly average Wind Speed, monthly average Global Solar Radiation, or other variables; and

[0523] 5) a table which shows a summary of the top regression outputs, including R^2, Significance F, Regression Equation, Intercept and coefficients for each independent variable for each regression output.

[0524] The machine 2500 may additionally or alternatively include comparison logic 2544 (e.g., as one of the energy analysis programs 2524). The comparison logic 2544 may include instructions that when executed by the processor 2502 cause the processor 2502 to perform a kilowatt hour consumption and exception rank analysis, for example. One example of a comparison analysis 2700 that results from the comparison logic 2544 is shown in Figure 27. The comparison analysis 2700 extends in 30 minute intervals over an entire day for a particular building under analysis, but the comparison logic 2544 may perform analyses over shorter or longer time periods at different intervals. Furthermore, the comparison may be done with respect to a single building (e.g., to compare energy consumption data historically for the building), or with respect to multiple buildings (e.g., to compare a building under analysis to a different control building). In addition, there may be multiple buildings in a control building group that each contribute energy data for defining (e.g., by averaging or according to another statistical treatment) the control building data described below.

[0525] The comparison logic 2544 may compare control building data 2702 to a user-defined standard 2704. In the example shown in Figure 27, the control building data 2702 is daily average kWh consumption measured at 30 minute intervals over 15 different days in July, and the user-defined data is 2704 is daily average kWh consumption at 30 minute intervals over the month of January 2009 for a particular building under analysis. The control building data 2702 and user-defined data 2704 may be data points over any other time intervals, time spans, or obtained from any number of different buildings, or from the same building. Further, either the control building data 2702, the user-defined data 2704, or both, may capture desired or expected levels of building performance, may represent actually measured and optionally statistically treated (e.g., averaged) consumption data from one or more buildings, or may represent other data automatically obtained or input by an operator. Thus, as another example, the control building data 2702 may be individual operator specified data points at 30

minute intervals that provide a baseline for comparison. The constitution of the control building data 2702 and the user-defined data 2704 may vary widely, as examples: average consumption at any desired interval on weekdays over a pre-defined time period (e.g., one week, three months, or one year), optionally excluding holidays, and/or outlier data points; average consumption at any desired interval on weekends over a predefined time period; average consumption at any desired interval on holidays over a predefined time period; or other consumption data.

[0526] For the example shown in Figure 27, the comparison logic 2544 performs a comparison respect to energy consumption measured in kWh. However, other energy measurements may be used, such as cubic feet of natural gas consumption, gallons of water used, or measurements of other types of energy or resources.

[0527] The comparison logic 2544 may determine and display exceptions 2706. The exceptions 2706 may identify noteworthy variations in consumption data for further review or analysis. Figure 27 illustrates an example in which 16 exception ranks 2708 are defined. As specific examples, the exception 2710 indicates a rank 3 exception and the exception 2712 indicates a rank 4 exception. The comparison logic 2544 may analyze the building control data 2702, the user-defined data 2704, or both to determine exceptions at any desired time interval, such as every second, every minute, every 15 minutes or every 30 minutes.

[0528] The comparison logic 2544 may determine an exception rank for any interval in many different ways. For example, the exception rank may apply to the user-defined data 2704, with exception rank assigned based on the standard deviation of the user defined data 2704 (e.g., determined at each interval). Table Exception Ranks, below, shows one example definition of the exception ranks according to windows of standard deviations of the user-defined data 2704. The comparison logic 2544 may determine additional, fewer, or different exception ranks according to additional, fewer, or different standard deviation windows, or using any other statistical criteria of interest that map the statistical criteria to one or more exception ranks.

Table: Exception Ranks					
Rank	1	2	3	4	5
Standard Deviations from the mean	-1 to +1	from: -1 to -1.5 and from: 1 to 1.5	from: -1.5 to -2 and from: 1.5 to 2	from: -2 to -2.5 and from: 2 to 2.5	from: -2.5 to -3 and from: 2.5 to 3

[0529] More specifically, the comparison logic 2544 may determine the average (the control average) and standard deviation (the control standard deviation) of the energy data for each interval (e.g., the interval between 3 am and 3:30 am on a given day) in the building control data 2702. The comparison logic 2544 further determines the average (the user-defined average) of the data for each similar interval in the user-defined data 2704. The comparison logic 2544 then assigns an exception rank to the user-defined average for each interval in the user-defined data 2704 according to where the user-defined average falls within the control standard deviation determined from the building control data 2702 for the same interval. For example, in Figure 27, at 3:30 am the comparison logic 2544 determines an exception rank of 4 because the average consumption (7082.58 kWh) is between -2 and -2.5 standard deviations of the average consumption (7267.40) in the building control data 2702 in the same interval. At 3:30 pm, an exception rank of 3 applies because the average consumption (7526.81 kWh) of the user-defined data 2704 is between -1.5 and -2 standard deviations of the average consumption (8064.87) in the building control data 2702 in the same interval.

[0530] The Table Comparison Data, below, shows for the comparison analysis 2700 the analysis data at 30 minute intervals for the control building data 2702 and the user-specified data 2704, including the determined exception rank determined according to Table Exception Ranks.

Table: Comparison Data

	Control Range average by time slot	User Defined Range average by time slot	Exception Rank by time slot	Difference
12:30 AM	7348.93	7213.00	2.00	135.93
1:00 AM	7331.47	7218.42	1.00	113.05
1:30 AM	7310.67	7210.65	1.00	100.02
2:00 AM	7281.27	7204.10	0.00	77.17
2:30 AM	7285.67	7202.52	1.00	83.15
3:00 AM	7275.53	7194.45	1.00	81.08
3:30 AM	7267.40	7082.58	4.00	184.82
4:00 AM	7250.07	7086.48	4.00	163.58
4:30 AM	7248.60	7198.90	0.00	49.70
5:00 AM	7245.80	7206.10	0.00	39.70
5:30 AM	7323.53	7169.90	2.00	153.63
6:00 AM	7265.13	7259.00	0.00	6.13
6:30 AM	7285.67	7291.13	0.00	-5.46
7:00 AM	7413.67	7419.35	0.00	-5.69
7:30 AM	7448.87	7453.87	0.00	-5.00
8:00 AM	7526.47	7419.16	0.00	107.31
8:30 AM	7583.80	7443.19	0.00	140.61
9:00 AM	7673.47	7465.71	1.00	207.76
9:30 AM	7751.73	7499.58	1.00	252.15
10:00 AM	7835.53	7522.03	1.00	313.50
10:30 AM	7923.40	7550.65	2.00	372.75
11:00 AM	7952.73	7556.00	2.00	396.73
11:30 AM	7975.87	7537.77	2.00	438.09
12:00 PM	7994.87	7545.10	3.00	449.77
12:30 PM	8015.13	7557.58	2.00	457.55
1:00 PM	8016.80	7550.87	3.00	465.93
1:30 PM	8041.73	7556.03	3.00	485.70
2:00 PM	8057.87	7556.29	3.00	501.58
2:30 PM	8052.53	7600.32	2.00	452.21
3:00 PM	8043.93	7568.87	3.00	475.06
3:30 PM	8064.87	7526.81	3.00	538.06
4:00 PM	8050.93	7492.26	3.00	558.68
4:30 PM	8041.73	7506.42	4.00	535.31
5:00 PM	8010.40	7509.71	4.00	500.69
5:30 PM	7971.53	7496.00	3.00	475.53
6:00 PM	7935.40	7487.13	3.00	448.27

6:30 PM	7891.13	7462.32	3.00	428.81
7:00 PM	7859.20	7441.35	3.00	417.85
7:30 PM	7815.40	7436.06	3.00	379.34
8:00 PM	7783.07	7426.45	3.00	356.62
8:30 PM	7720.87	7415.61	2.00	305.25
9:00 PM	7703.20	7405.29	2.00	297.91
9:30 PM	7628.07	7392.23	1.00	235.84
10:00 PM	7492.53	7280.90	3.00	211.63
10:30 PM	7442.33	7267.32	2.00	175.01
11:00 PM	7423.47	7257.65	2.00	165.82
11:30 PM	7371.53	7224.42	2.00	147.11
12:00 AM	7349.53	7219.74	2.00	129.79
Total KWH	367583.33	354587.29	3.00	12996.04

[0531] Figure 28 shows the logic that the comparison logic 2544 may implement, e.g., as processor executable instructions (i.e., as a computer implemented method). The comparison logic 2544 obtains background information, such as company name, building and company location, an (optionally) unique building identifier, or other data (2802). The comparison logic 2544 gathers overall time of use consumption data at any desired interval (e.g., every 30 minutes) (2804). The operator may specify a date range for exception rank analysis (2806) and for the control range (2808). For example, the operator may specify a particular month in 2006 as the control range, and a particular month in 2010 as the date range for exception rank analysis. Optionally, the operator may directly specify the consumption data for either the control range or exception rank analysis range.

[0532] The comparison logic 2544 obtains or establishes exception rank definitions (2810). Examples of exception rank definitions are shown in Table: Exception Ranks, but the definitions may vary widely in implementation to take into consideration any statistical parameter desired. The comparison logic 2544 optionally cleanses any of the input consumption data (2812). To that end, the comparison logic 2544 may remove data rows for which no consumption data is available, for which erroneous data is present, or for which the consumption data

is anomalous (e.g., exceeding the mean consumption data by more than a pre-defined threshold).

[0533] The exception analysis may be run against all the data, weekdays, weekends, holidays, or any other subset of the overall data. Thus, the comparison logic 2544 identifies and determines the number of weekdays, weekends, holidays, or other particular days in the overall data (2814). Similarly, the comparison logic 2544 determines overall and monthly average consumption data at each interval for weekdays, weekends, holiday, and all days in each month (2816).

[0534] For each interval in the control range (e.g., daily, every 30 minutes), the comparison logic 2544 determines the average and standard deviation of the data for that interval (2818). Similarly, the comparison logic 2544 determines the average consumption in each interval in the user-defined date range for the exception rank analysis (2820). The comparison logic 2544, with reference to the exception rank definitions, assigns an exception rank for each interval, using the average consumption from the user-defined date range with reference to the average and standard deviation determined form the corresponding interval in the control range (2822). The comparison logic 2544 may generate and display the resulting comparison analysis 2700 (2824). While Figure 27 shows an analysis of daily consumption at 30 minute intervals, the comparison logic 2544 may analyze other time windows at other intervals (e.g., one day intervals over one month, or one day intervals over one year).

[0535] Exception ranks may be determined in ways other than that described above, however. As another example, the comparison logic 2544 may determine the exception rank according to the magnitude of the difference in consumption between the control building data 2702 and the user-defined data 2704, with individual thresholds or ranges defined to determine which difference magnitude maps to which exception rank. Furthermore, the difference may be shaded or otherwise highlighted in the comparison analysis 2700 to help visualize the difference.

[0536] The machine 2500 may employ the comparison analysis 2700 to rank or gauge how well a building is performing. The ranking may be output on the

display 2506 as an analysis result. For example, a building with more than a threshold number of exceptions of greater than a pre-defined exception rank (or some other function of the exception ranks) may be flagged and displayed as a building that needs special attention with regard to its energy consumption. To that end, the comparison logic 2544 may implement any desired ranking rules based on the comparison analysis 2700 to determine how well a building is performing, and responsively take action, e.g., by notifying a building supervisor, outputting notification or warning messages on the display 2506, or taking other action when the rule fires.

[0537] In addition, the machine 2500 may implement building level alerts. The alerts may be defined in the memory 2504 using alert rules 2536. Alert logic 2538, shown in Figure 29, may run at any desired interval. The alert logic 2538 may include instructions that when executed by the processor 2502, read the alert rules 2536 (2902) and energy data from the energy database 2514 (2904). The instructions may further processes the alert rules 2536 to determine based on any of the energy data whether any of the alert rules 2536 should fire (2906). If so, the alert logic 2538 determines the analysis result (2908) based on the alert rule and displays the analysis result (2910). In that regard, the machine 2500 may output a message, display any desired indicia, or take any other pre-defined action when the alert rule fires, as defined in each alert rule 2536. Further, the alert rules 2536 may specify the analysis result (e.g., display a warning message), the analysis results may be pre-determined (e.g., for any rule that fires, send a message to an operator), or the analysis results may be determined in other ways. The alert rules 2536 may vary widely in implementation, and may take into consideration any of the variables obtained from the building or any other source, such as kWh consumption, temperature, time, date, balance points, or other variables. Examples of alert rules 2536 are shown below in Table: Alerts.

Table: Alerts

Alert Category	Alert Name	Alert Rule	Notes

Demand kilowatts(kw)	1. Demand Exceeded Peak Threshold	Building kw demand compared at any desired interval against a user defined kw threshold.	Example: If kw demand reaches over 500kw, then issue alert.
	2. Demand Exceeded Historic Threshold (not normalized)	Building kw demand continuously or at any desired interval (e.g., daily, monthly) compared against historical demand for the building. Analysis Result: Send warning message to building operator.	Example: Daily kw demand is compared to the same day in previous years. Issue alert if demand is greater or less than historical demand by a pre-selected threshold.
	3. Demand Exceeded Baseline Threshold (normalized)	Building kw demand is continuously or at any desired interval (e.g., daily, monthly) compared against historical baseline regression model	Example: Daily kw demand is compared to the same or a similar day (as defined by any desired regression on variables such as HDD, CDD, Humidity, Occupancy, or other variables).
	4. Significant Change (Increase or Decrease) in Demand	Building kw demand is monitored continuously or at any desired interval for changes up or	Example: Demand goes from 700kw at 10am to 500kw 10:15 (the next interval). This could either be a result of a demand / response event or some problem with

		down that exceed a pre-defined threshold.	equipment or behavior changes.
	5. Demand Exceeded Comparable Building Threshold	Building kw demand is continuously or at any desired interval compared against a user-defined comparable/similar building.	Example: Building 1 demand exceeds Building 7 kw demand (Building 7 is the baseline or control building against which other buildings are compared).
Consumption (kwh)	1. Consumption Exceeded Historic Threshold (not normalized)	Building kwh consumption at any desired interval (e.g., hourly, daily, monthly) compared against historical consumption for the building.	Example: Daily kwh consumption is compared to the same day in previous years. Issue alert if consumption is greater or less than historical consumption by a pre-selected threshold.
	2. Consumption Exceeded Baseline Threshold (normalized)	Building kwh consumption is compared at any desired interval (e.g., daily, monthly) against historical baseline regression model	Example: Daily kwh consumption is compared to the same or a similar day (as defined by regression variables such as HDD, CDD, Humidity, Occupancy, or other variables).
	3. Significant Change (Increase or Decrease) in Consumption	Building kwh consumption is monitored at any desired interval for changes up or down that exceed	Example: Consumption goes from 900kwh between 10 am and 11 am to 500kwh between 11 am and 12 noon. This could either be a

		a pre-defined threshold.	result of a demand / response event or some problem with equipment or behavior changes.
	4. Consumption Exceeded Comparable Building Threshold	Building kwh consumption is compared at any desired interval against a user-defined comparable/similar building.	Example: Building 1 consumption exceeds Building 7 kwh consumption (Building 7 is the baseline or control building against which other buildings are compared).

[0538] The alerts discussed above are building level alerts with regard to consumption and demand. However, the alert rules may define alerts based on any energy consumption parameters that are directly measured, statistically derived, or otherwise obtained. The machine 2500 may also implement more complex analyses. As one example, the machine 2500 may include event logic 2542 that analyzes equipment data to detect or infer events of interest based on event rules 2540. Such event rules 2540 may help define when demand / response events occur, when equipment has failed or has been fixed, or other events. When the event logic 2542 identifies an event, the event logic 2542 may responsively execute a pre-defined action, for example as specified in the event rules 2540.

[0539] The machine 2500 or any of the systems described above may be implemented with additional, different, or fewer components. As one example, a processor may be implemented as a microprocessor, a microcontroller, a DSP, an application specific integrated circuit (ASIC), discrete logic, or a combination of other types of circuits or logic. As another example, memories may be DRAM, SRAM, Flash or any other type of memory. The processing capability of the system may be distributed among multiple components, such as among multiple processors and memories, optionally including multiple distributed processing systems. Parameters, databases, and other data structures may be separately

stored and managed, may be incorporated into a single memory or database, may be logically and physically organized in many different ways, and may implemented with different types of data structures such as linked lists, hash tables, or implicit storage mechanisms.

[0540] Logic, such as programs or circuitry, may be combined or split among multiple programs, distributed across several memories and processors, and may be implemented in a library, such as a shared library (e.g., a dynamic link library (DLL)). The DLL, for example, may store code that analyzes energy expenditure or that prepares energy reports. As another example, the DLL may itself provide all or some of the functionality of the machine 2500. The programs may be stored on a computer readable medium, such as a CDROM, hard drive, floppy disk, flash memory, or other computer readable medium. Thus, a computer program product may include computer readable instructions, which when loaded and run in a computer and/or computer network system, cause the computer system and/or the computer network system to perform operations according to any of the claims below, and in particular to perform any of the logic and methods illustrated in Figures 26, 28, and 29, as examples.

[0541] While various embodiments of the invention have been described, it will be apparent to those of ordinary skill in the art that many more embodiments and implementations are possible within the scope of the invention. Accordingly, the invention is not to be restricted except in light of the attached claims and their equivalents.

CLAIMS

What is claimed is:

1. A method for energy analysis comprising:
establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;
obtaining energy data at the network operations center through the data connection to the energy data source;
performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:
determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and
generating and displaying a user interface on a display, the user interface including the analysis result.

2. The method of claim 1, where determining a balance point set comprises:
determining either or both of a heating balance point search window into the energy data and a cooling balance point search window into the energy data.

3. The method of claim 2, where determining a balance point set comprises:
executing either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

4. The method of claim 3, where executing the correlation analysis comprises:
executing a correlation analysis between temperature and energy consumption to find a best fit correlation.

5. The method of claim 3, where executing the correlation analysis comprises:
executing the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window.

6. An energy analysis system comprising:
a processor; and
a memory coupled to the processor, the memory comprising:
energy analysis logic that, when executed by the processor, causes an energy analysis system to:
establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;
obtain energy data at the network operations center through the data connection to the energy data source;
perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:
determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and
generate and display a user interface on a display, the user interface including the analysis result.

7. The system of claim 6, where the energy analysis logic further causes the energy analysis system to obtain either or both of a heating balance point search window and a cooling balance point search window.

8. The system of claim 7, where the energy analysis logic further causes the energy analysis system to:
execute either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

9. The system of claim 8, where the energy analysis logic further causes the energy analysis system to:
execute a correlation analysis between temperature and energy consumption to find a best fit correlation.

10. The system of claim 8, where the energy analysis logic further causes the energy analysis system to:
execute the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window.

11. A method for energy analysis comprising:
establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;
obtaining energy data at the network operations center through the data connection to the energy data source;
performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:
determining control building data within the energy data;
determining user-defined data within the energy data;
determining, as the analysis result, an exception rank by comparing the control building data and the user-defined data, the exception rank identifying specific data in the user defined data for further review; and
generating and displaying a user interface on a display, the user interface including the analysis result.

12. The method of claim 11, where determining an exception rank comprises:
determining a control average and a control standard deviation of the energy data within a time interval in the control building data.

13. The method of claim 12, where determining an exception rank further comprises:
determining a user-defined average of the energy data within the time interval in the user-defined data.

14. The method of claim 13, where determining an exception rank further comprises:
accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and
assigning the exception rank to the time interval according to the mapping.

15. The method of claim 14, where the statistical parameter comprises a standard deviation window with respect to the control average.

16. An energy analysis system comprising:
a processor; and
a memory coupled to the processor, the memory comprising:
energy analysis logic that, when executed by the processor, causes an energy analysis system to:
establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;
obtain energy data at the network operations center through the data connection to the energy data source;
perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:
determining control building data within the energy data;
determining user-defined data within the energy data;
determining, as the analysis result, an exception rank by comparing the control building data and the user-defined data, the exception rank identifying specific data in the user defined data for further review; and
generate and display a user interface on a display, the user interface including the analysis result.

17. The system of claim 16, where the energy analysis logic further causes the energy analysis system to:
determine a control average and a control standard deviation of the energy data within a time interval in the control building data.

18. The system of claim 17, where the energy analysis logic further causes the energy analysis system to:
determine a user-defined average of the energy data within the time interval in the user-defined data.

19. The system of claim 18, where the energy analysis logic further causes the energy analysis system to:
access an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and
assign an exception rank to the time interval according to the mapping.

20. The method of claim 19, where the statistical parameter comprises a standard deviation window with respect to the control average.

ABSTRACT

An energy analysis system provides valuable input into building energy expenditures. The system assists with obtaining a detailed view of how energy consumption occurs in a building, what steps may be taken to lower the energy footprint, and executing detailed energy consumption analyses. The analyses may include, as examples, a balance point pair analysis to determine either or both of a heating balance point and a cooling balance point, an exception rank analysis to identify specific data (e.g., energy consumption data) in specific time intervals for further review, or other analysis. The system may display the analysis results on a user interface.

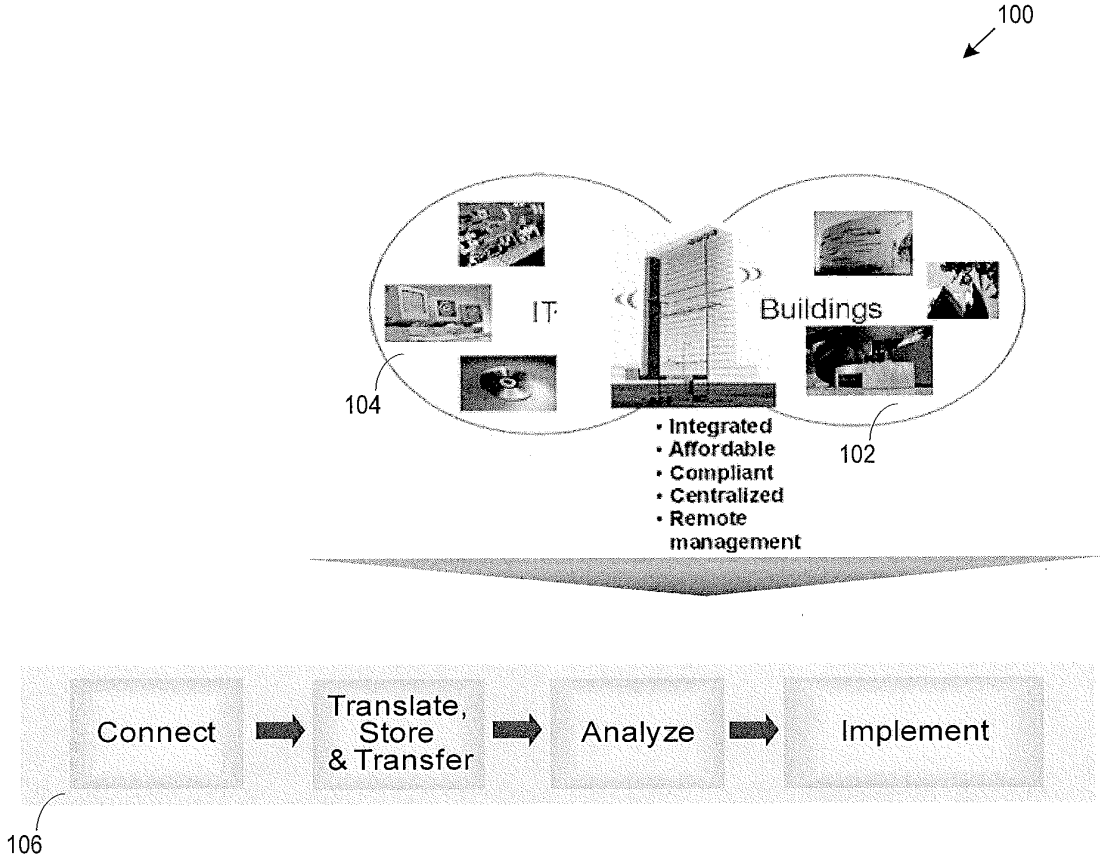

100
IT
Buildings
104
102
• Integrated
• Affordable
• Compliant
• Centralized
• Remote management
Connect
Translate, Store & Transfer
Analyze
Implement
106

Figure 1

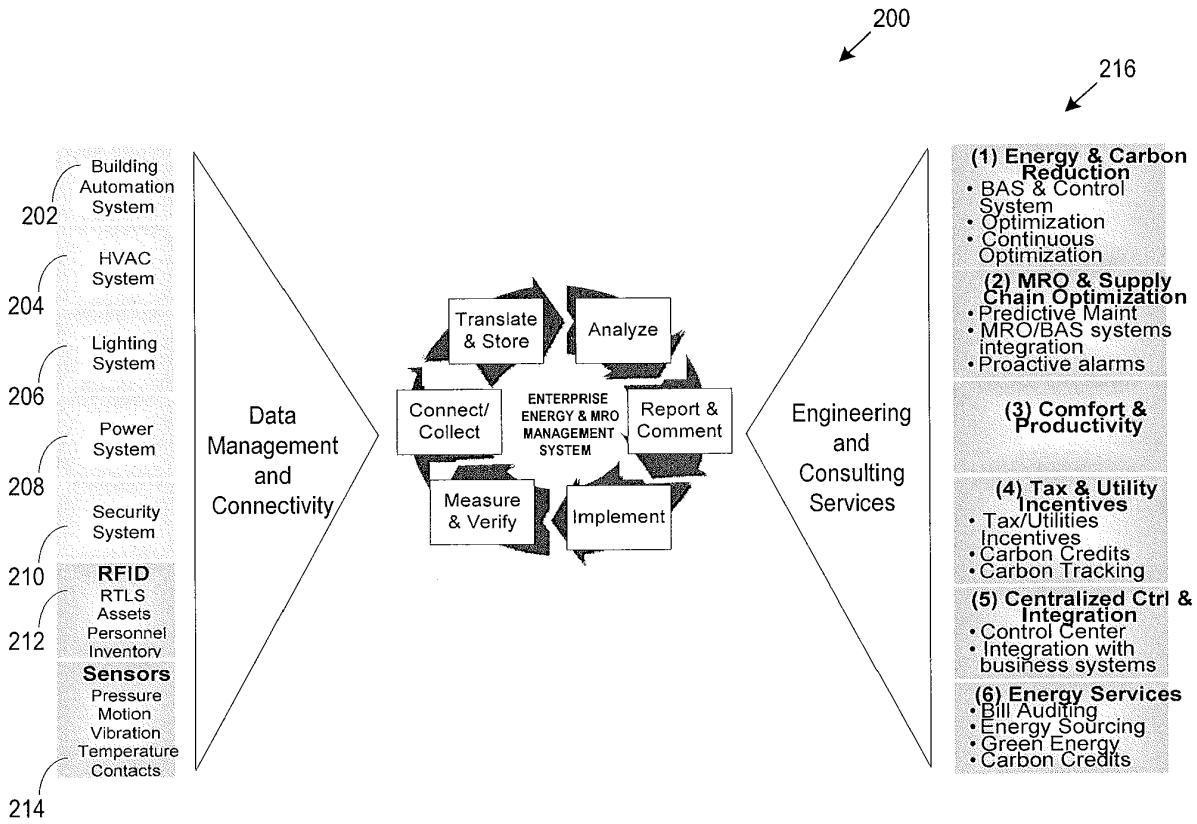

200
216
Building Automation System
202
HVAC System
204
Lighting System
206
Power System
208
Security System
210
RFID
RTLS
Assets
Personnel
Inventory
212
Sensors
Pressure
Motion
Vibration
Temperature
Contacts
214
Data Management and Connectivity
Translate & Store
Analyze
Connect/ Collect
ENTERPRISE ENERGY & MRO MANAGEMENT SYSTEM
Report & Comment
Measure & Verify
Implement
Engineering and Consulting Services
(1) Energy & Carbon Reduction
• BAS & Control System
• Optimization
• Continuous Optimization
(2) MRO & Supply Chain Optimization
• Predictive Maint
• MRO/BAS systems integration
• Proactive alarms
(3) Comfort & Productivity
(4) Tax & Utility Incentives
• Tax/Utilities Incentives
• Carbon Credits
• Carbon Tracking
(5) Centralized Ctrl & Integration
• Control Center
• Integration with business systems
(6) Energy Services
• Bill Auditing
• Energy Sourcing
• Green Energy
• Carbon Credits

Figure 2

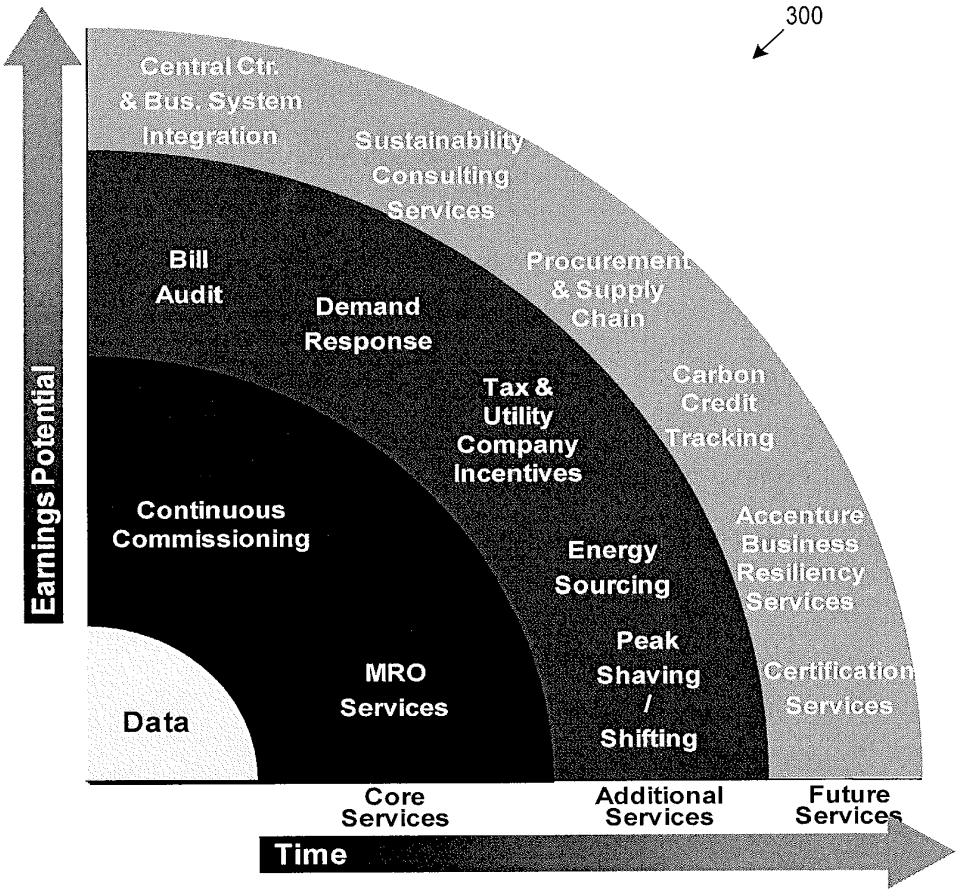

300
Central Ctr. & Bus. System Integration
Sustainability Consulting Services
Procurement & Supply Chain
Carbon Credit Tracking
Accenture Business Resiliency Services
Certification Services
Bill Audit
Demand Response
Tax & Utility Company Incentives
Energy Sourcing
Peak Shaving / Shifting
Continuous Commissioning
MRO Services
Data
Earnings Potential
Core Services
Additional Services
Future Services
Time

Figure 3

400

Benefits

Quantitative Benefits: $0.62 - $1.55/SqFt-year

- $0.35 - $0.70 Energy Reduction
- $0.20 - $0.70 Maintenance & Operations
- $0.07 - $0.15 Energy Services
- Highly Variable Tax Benefits/ Incentives

Additional Qualitative Benefits

- Corporate responsibility & carbon reduction
- Tenant comfort, productivity, & satisfaction
- Integration with business systems
- Crisis management
- Avoided unplanned system downtown

Main benefits drivers

1. Energy intensity of facility (kWh/SqM)
2. Energy price
3. Systems complexity
   - ↑ complexity = ↑ benefits
4. Energy usage by system (Lighting, HVAC-R, Plug Load, etc.)

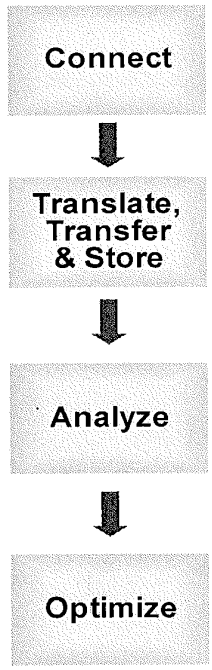


Figure 4

500

Energy & Maintenance Savings Impact Analysis	
Annual Revenue	$1,000,000,000
Annual Net Income (8%)	$80,000,000
Shares Outstanding	100,000,000
Annual Earnings Per Share	$0.80
End of Year Share Price	$16.00
Price Earning Ratio (P/E)	20.00
Market Capitalization	$1,600,000,000
Annual Energy Spend	$30,000,000
Annual Maintenance Spend	$30,000,000
Percent of Revenue Represented by Energy & Maintenance Spend	6.0%
Expected % Savings from Annual Energy & Maintenance Spend	20.0%
Expected Annual NI Increase @ 40% tax rate	$7,200,000
Energy & Maintenance Savings Contribution to Shareholder Value	$144,000,000
Addition to Share Price	**$1.44**
Share Price After Institution of Total Energy & Maintenance Management	**$17.44**
Percentage Increase in Share Price and EPS	**9.0%**

Figure 5

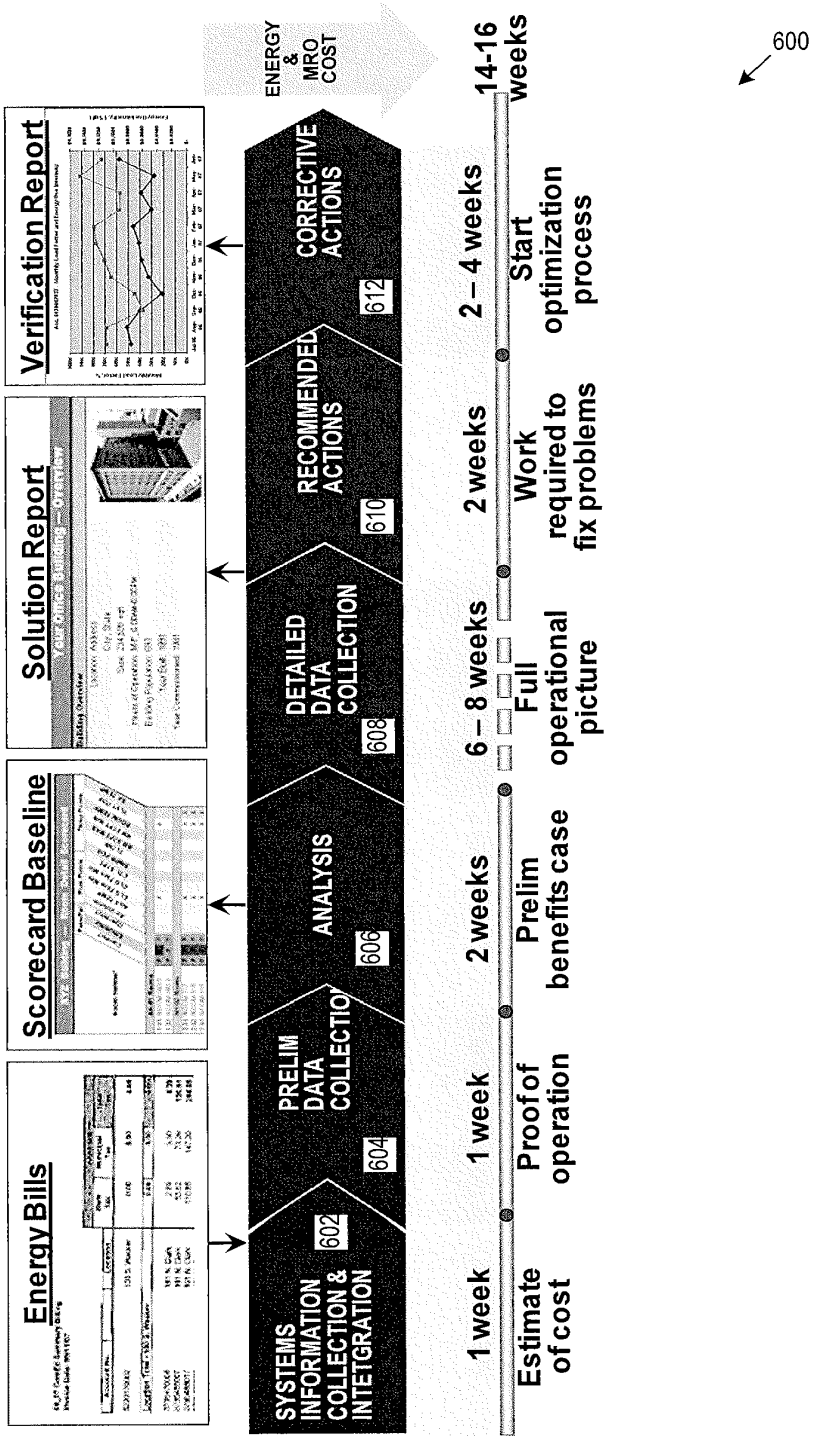
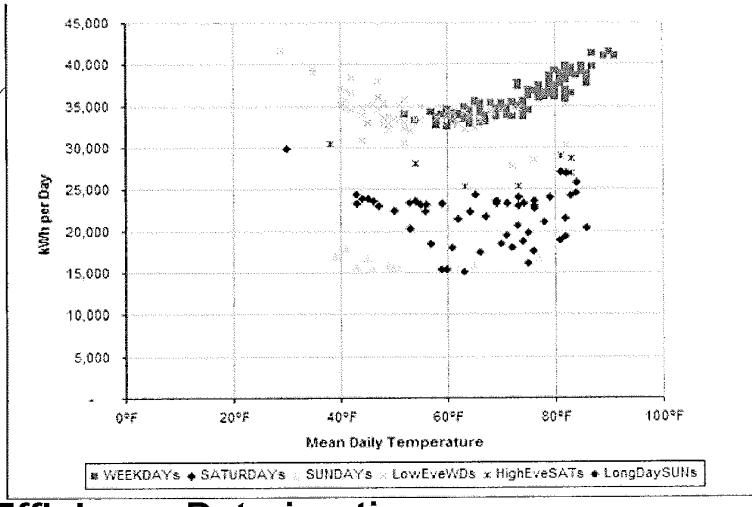

600
ENERGY & MRO COST
Energy Bills
Scorecard Baseline
Solution Report
Verification Report
SYSTEMS INFORMATION COLLECTION & INTETGRATION
602
PRELIM DATA COLLECTIO
604
ANALYSIS
606
DETAILED DATA COLLECTION
608
RECOMMENDED ACTIONS
610
CORRECTIVE ACTIONS
612
1 week
Estimate of cost
1 week
Proof of operation
2 weeks
Prelim benefits case
6 – 8 weeks
Full operational picture
2 weeks
Work required to fix problems
2 – 4 weeks
Start optimization process
14-16 weeks

Figure 6

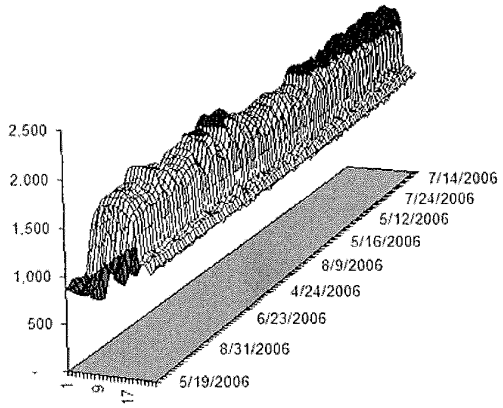
700

Temperature Correlation



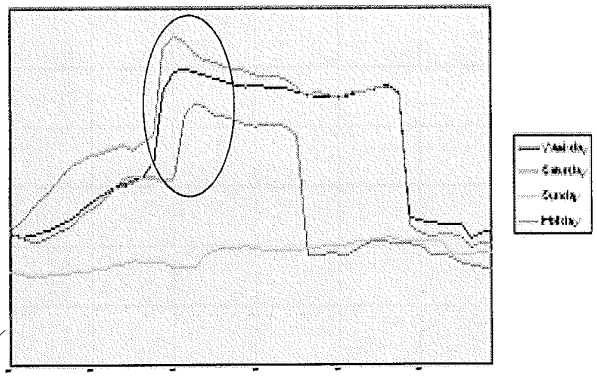
708

Building Efficiency Deterioration



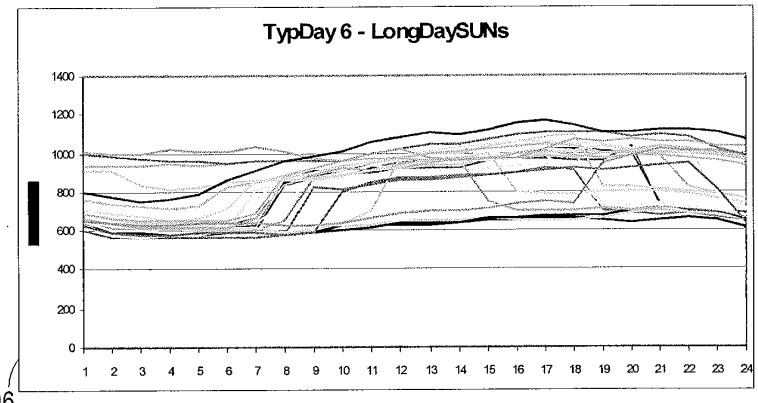
702

Unnecessary Peaking



704

Sub-Optimal Occupancy Schedules



706

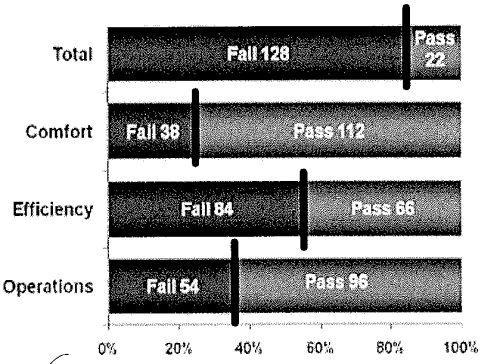
Figure 7

800

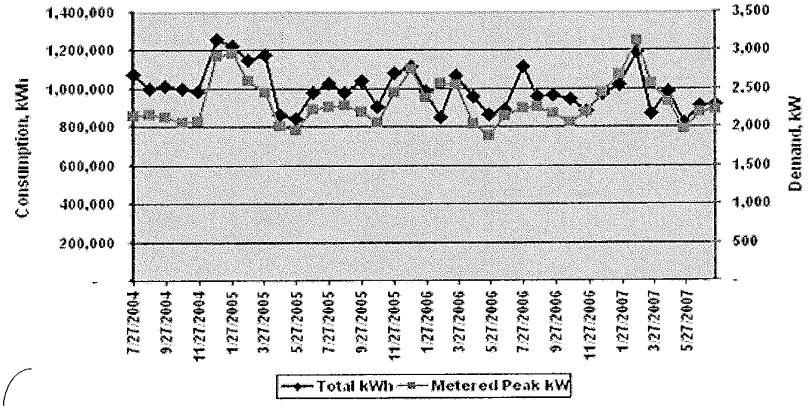
802

XYZ Building — Room Detail Scorecard

Room Number	Pass/Fail	Flow Points							Temp Points				
	Comfort	Efficiency	Operation	Air Volume	AUX TEMP	CLG Flow Max	CLG Flow Min	CTL STPT	DMPR POS	FLOW	RM STPT MAX	RM STPT MIN	ROOM TEMP	VLV1 POS	SA TEMP
AH-01 Rooms															
1.01 ROOM 003-1	P	F	P			X							X		
1.02 ROOM 003-2	P	P	P												
AH-02 Rooms															
2.01 ROOM 117	P	F	P			X							X	X	
2.02 ROOM 118	P	F	P			X							X	X	
2.03 ROOM 119	P	F	P			X							X	X	
2.04 ROOM 120	P	F	P			X							X	X	
2.05 ROOM 121	F	F	P	X		X			X			X	X	X	
2.06 ROOM 122	P	F	P			X							X	X	
2.07 ROOM 124	P	F	P			X							X	X	
2.08 ROOM 126B	P	F	P			X	X						X	X	
2.09 ROOM 126E	P	F	P			X							X	X	
2.10 ROOM 126W	P	F	P			X							X	X	
2.11 ROOM 127	P	F	P			X							X	X	
2.12 ROOM 127A	P	F	P			X							X	X	
2.13 ROOM 127B	P	F	F		X	X							X	X	
2.14 ROOM 127C	P	F	P			X	X						X	X	
2.15 ROOM 127D	P	F	P											X	
2.16 ROOM 127E	P	F	P			X	X						X	X	
2.17 ROOM 127F	P	F	F		X	X							X	X	
2.18 ROOM 199G	P	F	P	X					X					X	
AH-03 Rooms															
3.01 ROOM 210	P	P	P												
3.02 ROOM 214	P	F	P			X							X		
3.03 ROOM 215	P	F	P			X	X						X		
3.04 ROOM 216	P	F	P			X							X		
3.05 ROOM 217	P	F	P			X							X		
3.06 ROOM 218	P	P	P												
3.07 ROOM 219	P	P	P				X								
3.08 ROOM 221	P	F	P			X							X		
3.09 ROOM 222	P	F	P			X							X		
3.10 ROOM 223	F	P	P			X	X						X		



806



804

Figure 8

900

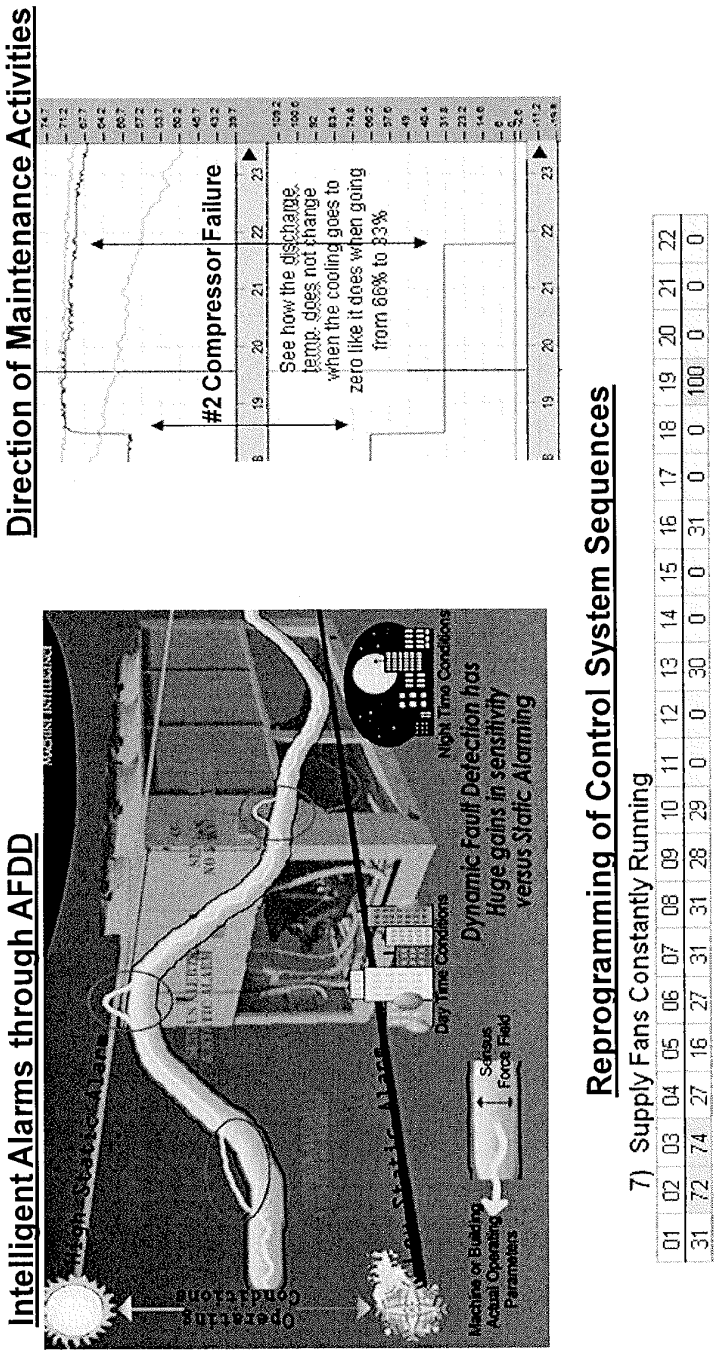

Direction of Maintenance Activities
#2 Compressor Failure
See how the discharge temp. does not change when the cooling goes to zero like it does when going from 86% to 33%
Intelligent Alarms through AFDD
Operations conditions
Night Time Conditions
Day Time Conditions
Dynamic Fault Detection has Huge gains in sensitivity versus Static Alarming
Machine or Building Actual Operating Parameters
Reprogramming of Control System Sequences
7) Supply Fans Constantly Running
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22
31 72 74 27 16 27 31 31 28 29 0 0 30 0 0 31 0 0 100 0 0 0
The value represents the percentage of the time the supply fan is turned OFF from the period Nov. 23 to Nov. 28
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Figure 9

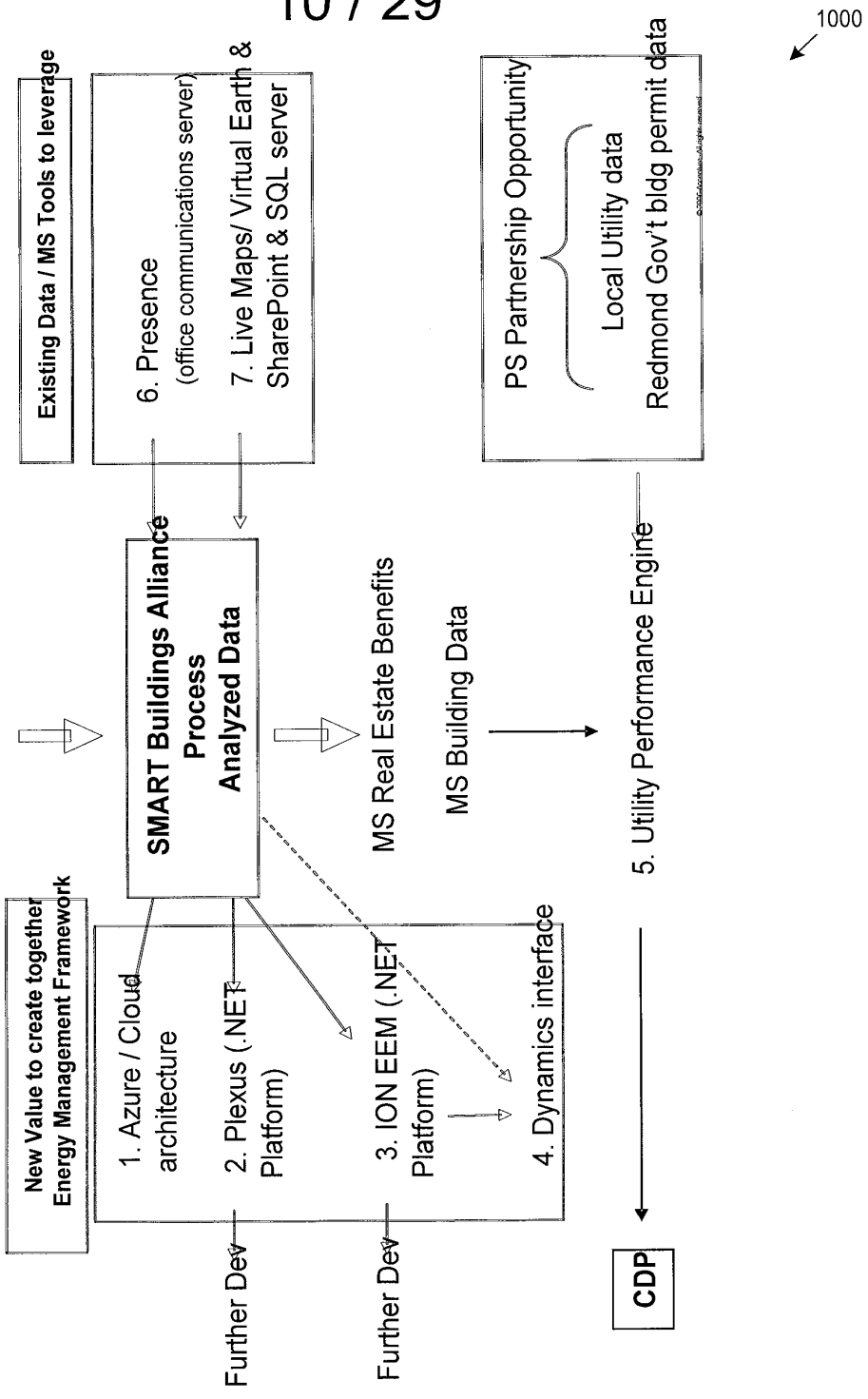

1000
Existing Data / MS Tools to leverage
6. Presence
(office communications server)
7. Live Maps/ Virtual Earth &
SharePoint & SQL server
PS Partnership Opportunity
Local Utility data
Redmond Gov't bldg permit data
SMART Buildings Alliance
Process
Analyzed Data
MS Real Estate Benefits
MS Building Data
5. Utility Performance Engine
New Value to create together
Energy Management Framework
1. Azure / Cloud
architecture
2. Plexus (.NET
Platform)
3. ION EEM (.NET
Platform)
4. Dynamics interface
Further Dev
Further Dev
CDP

Figure 10

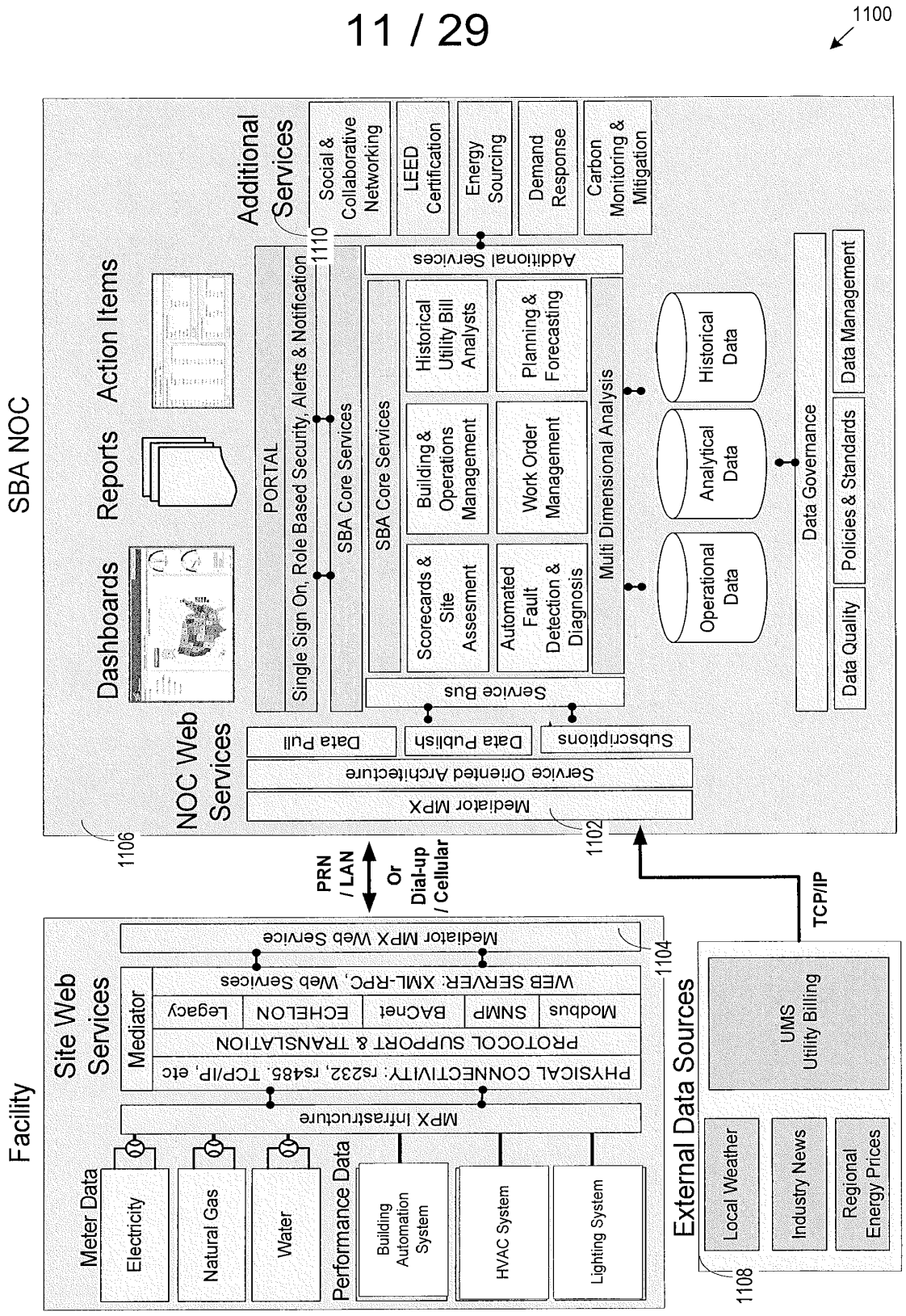

1100
SBA NOC
Dashboards
Reports
Action Items
Additional Services
Social & Collaborative Networking
LEED Certification
Energy Sourcing
Demand Response
Carbon Monitoring & Mitigation
1110
PORTAL
Single Sign On, Role Based Security, Alerts & Notification
SBA Core Services
Additional Services
SBA Core Services
Scorecards & Site Assesment
Automated Fault Detection & Diagnosis
Building & Operations Management
Work Order Management
Historical Utility Bill Analysts
Planning & Forecasting
Multi Dimensional Analysis
Service Bus
Operational Data
Analytical Data
Historical Data
Data Governance
Data Quality
Policies & Standards
Data Management
NOC Web Services
Data Pull
Data Publish
Subscriptions
Service Oriented Architecture
Mediator MPX
1106
1102
PRN / LAN Or Dial-up / Cellular
TCP/IP
Facility
Site Web Services
Mediator MPX Web Service
1104
Mediator
WEB SERVER: XML-RPC, Web Services
PROTOCOL SUPPORT & TRANSLATION
PHYSICAL CONNECTIVITY: rs232, rs485, TCP/IP, etc
Modbus
SNMP
BACnet
ECHELON
Legacy
MPX Infrastructure
Meter Data
Electricity
Natural Gas
Water
Performance Data
Building Automation System
HVAC System
Lighting System
External Data Sources
UMS Utility Billing
Local Weather
Industry News
Regional Energy Prices
1108

Figure 11

1200

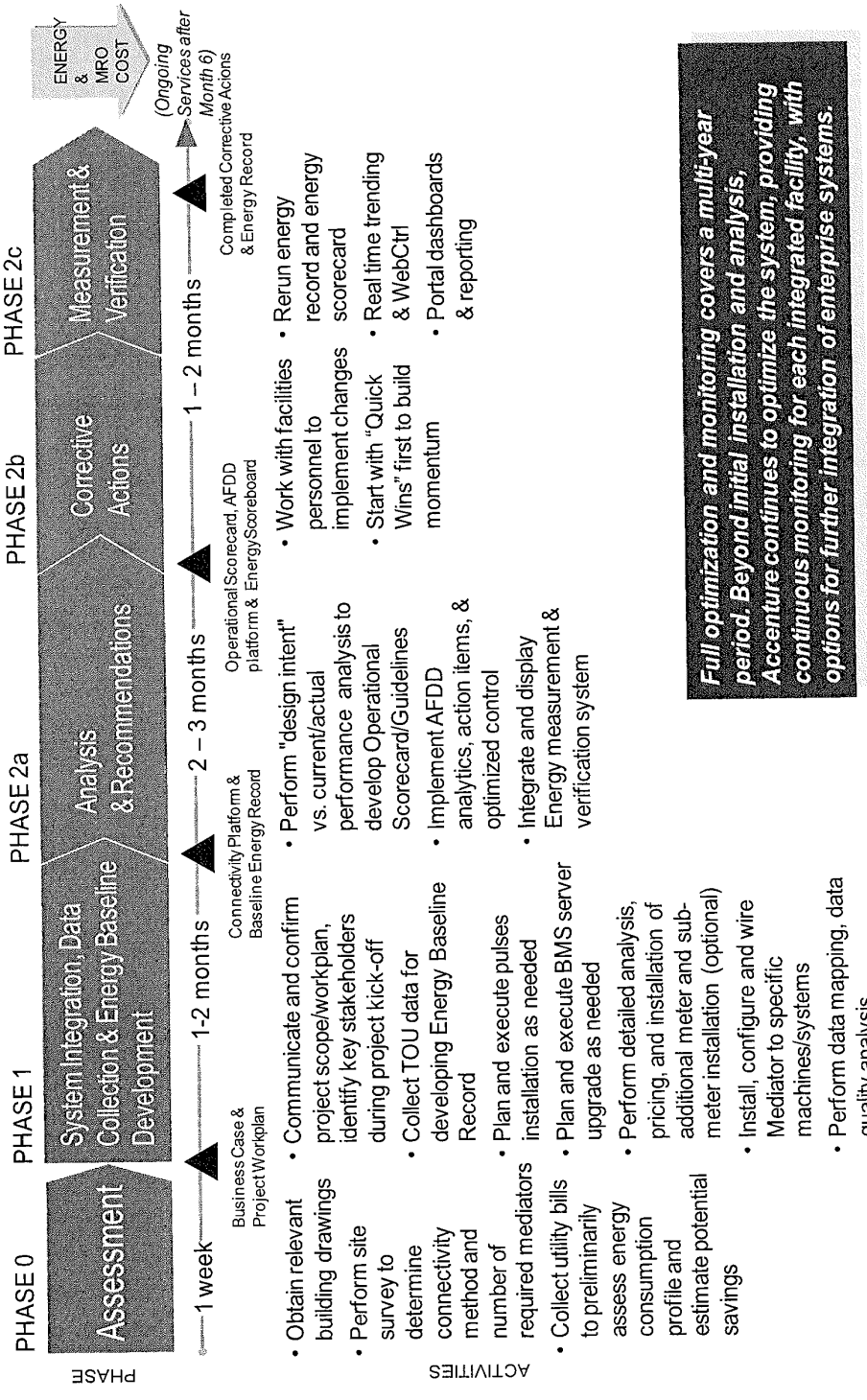


Figure 12

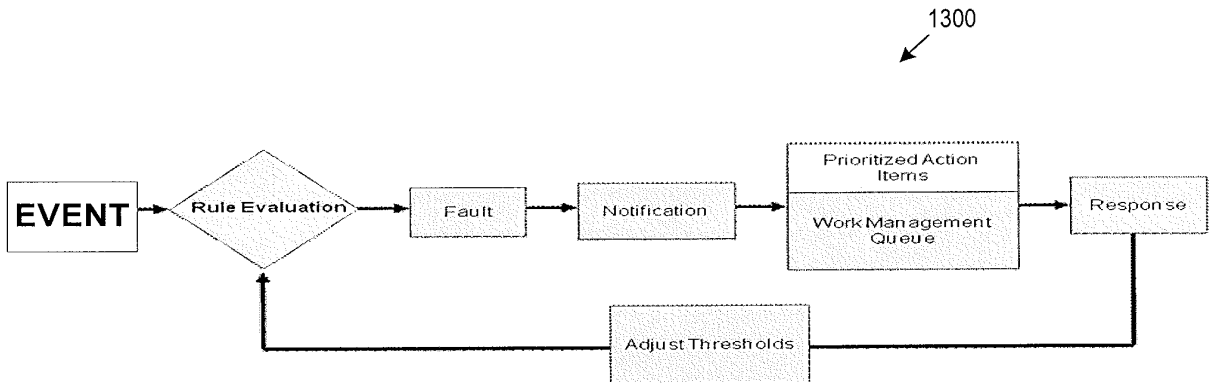

1300
EVENT
Rule Evaluation
Fault
Notification
Prioritized Action Items
Work Management Queue
Response
Adjust Thresholds

Figure 13

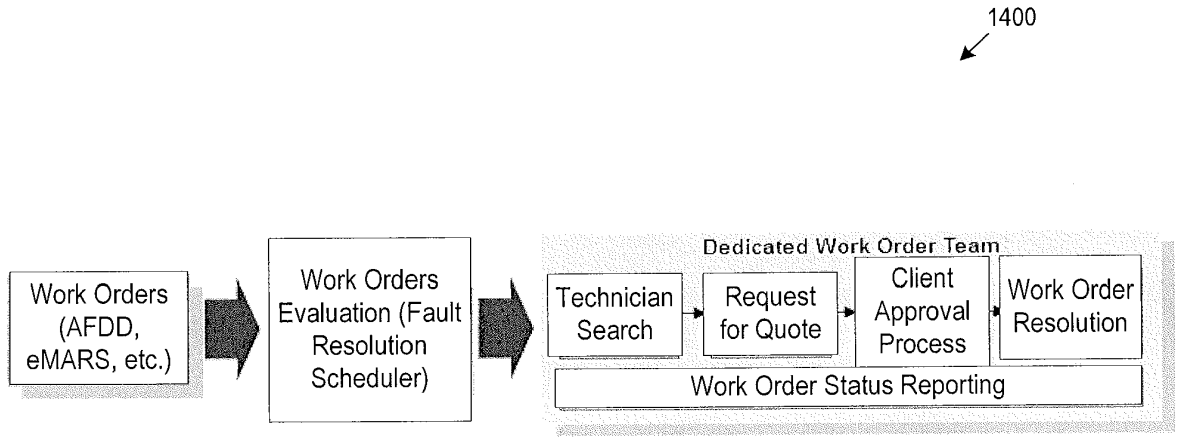

1400
Work Orders (AFDD, eMARS, etc.)
Work Orders Evaluation (Fault Resolution Scheduler)
Dedicated Work Order Team
Technician Search
Request for Quote
Client Approval Process
Work Order Resolution
Work Order Status Reporting

Figure 14

1500

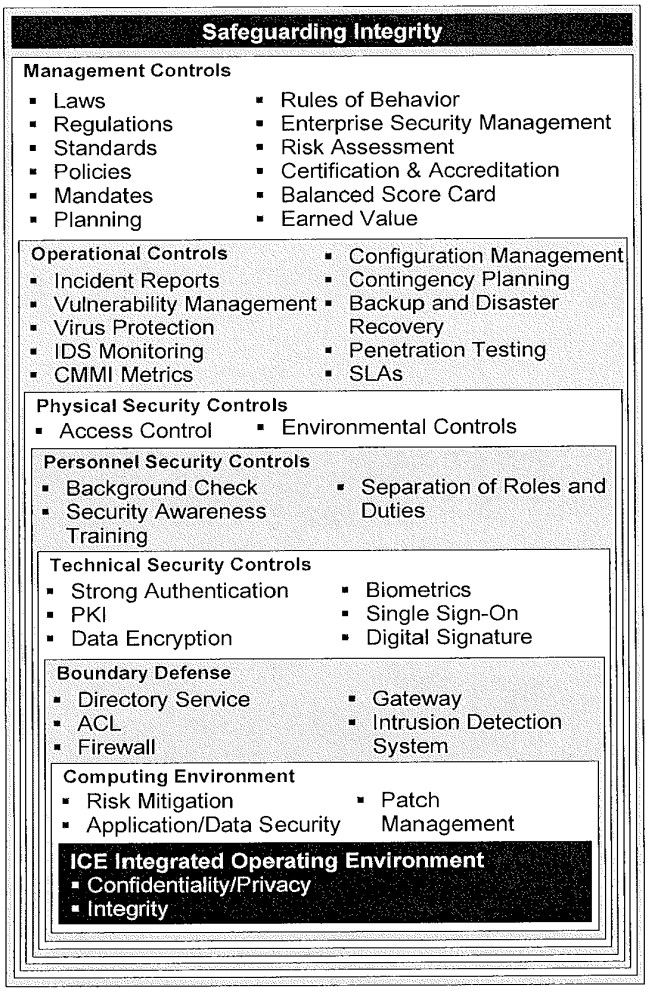


Figure 15

1600

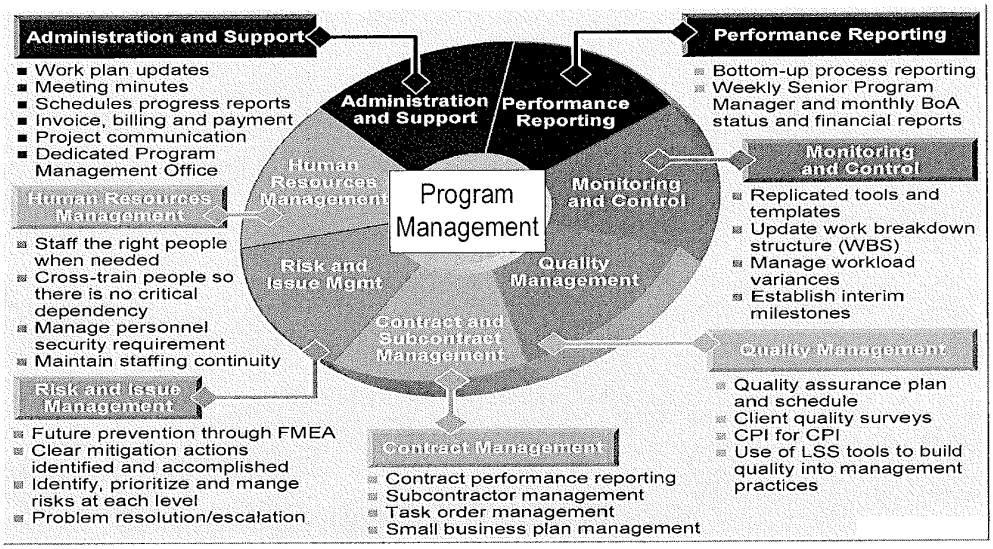


Figure 16

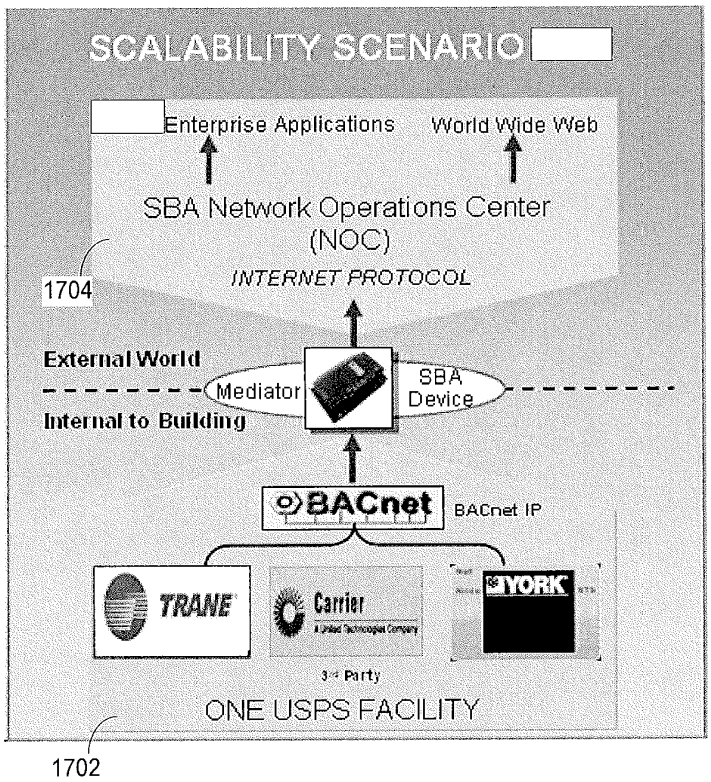

1700
SCALABILITY SCENARIO
Enterprise Applications
World Wide Web
SBA Network Operations Center
(NOC)
INTERNET PROTOCOL
1704
External World
Mediator
SBA
Device
Internal to Building
BACnet
BACnet IP
TRANE
Carrier
YORK
3rd Party
ONE USPS FACILITY
1702

Figure 17

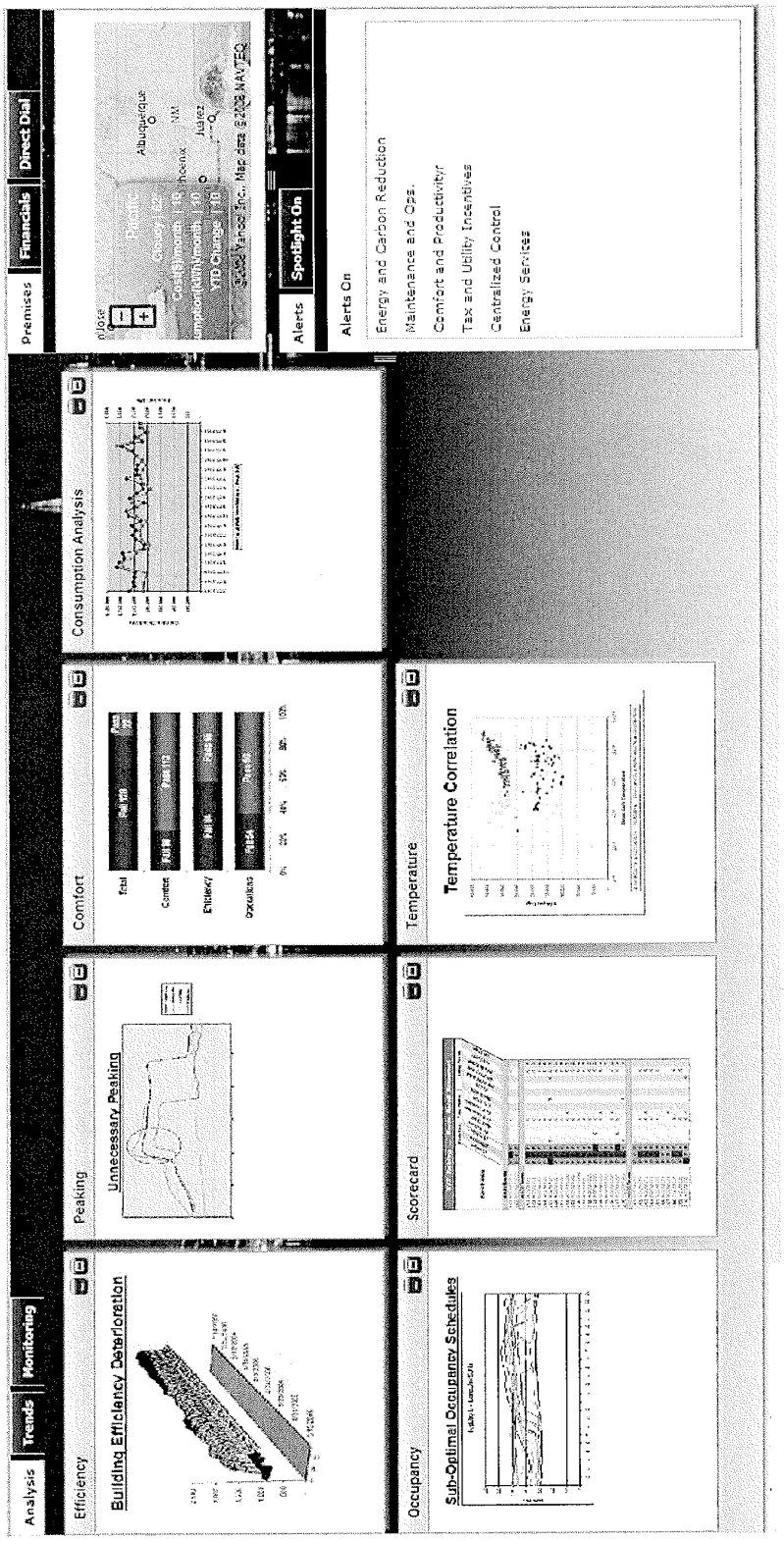

1800
Analysis
Trends
Monitoring
Premises
Financials
Direct Dial
Efficiency
Building Efficiency Deterioration
Peaking
Unnecessary Peaking
Comfort
Consumption Analysis
Temperature
Temperature Correlation
Occupancy
Sub-Optimal Occupancy Schedules
Scorecard
Alerts
Spotlight On
Alerts On
Energy and Carbon Reduction
Maintenance and Ops.
Comfort and Productivity
Tax and Utility Incentives
Centralized Control
Energy Services

Figure 18

1900

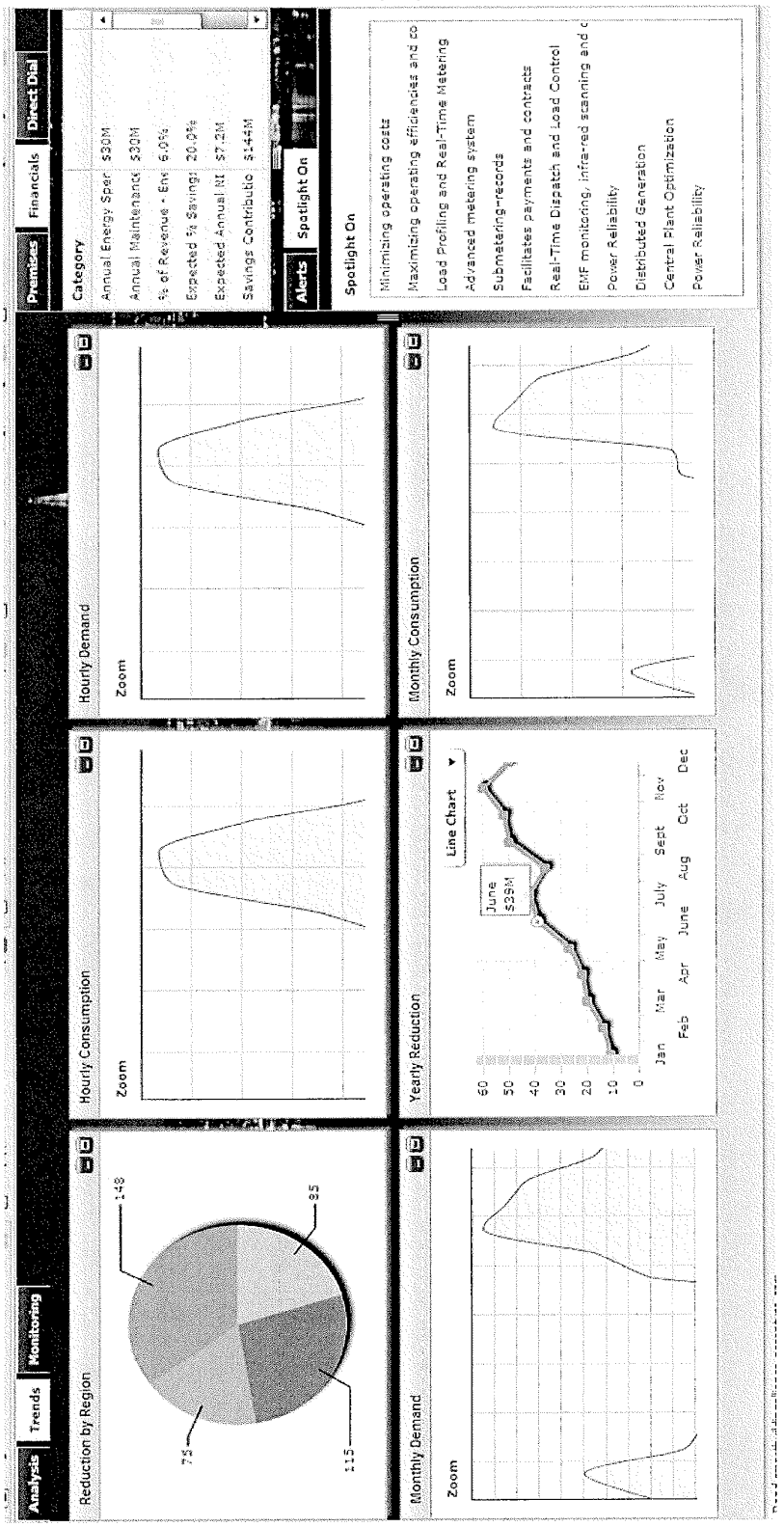


Figure 19

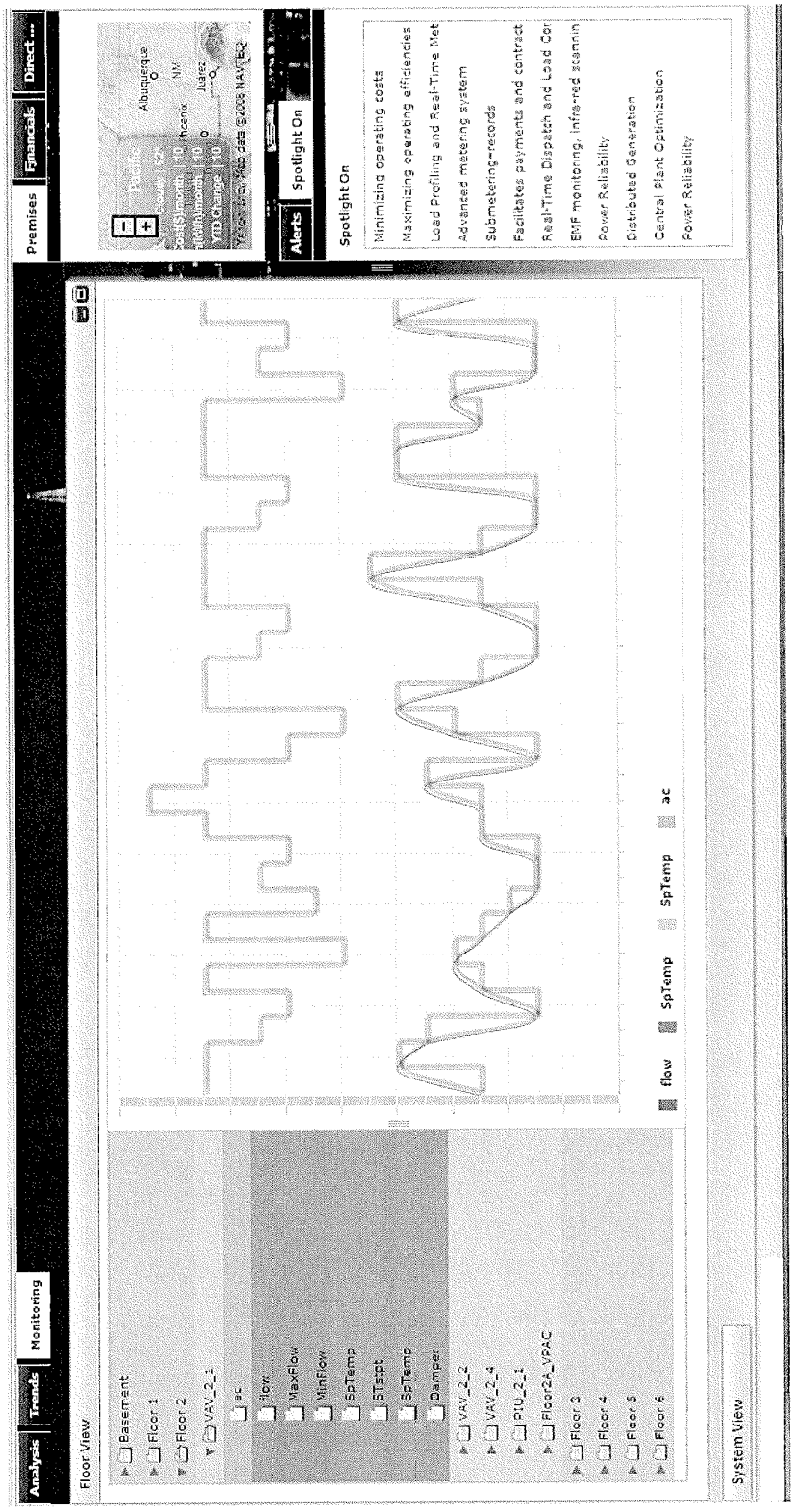

2000
Analysis
Trends
Monitoring
Premises
Financials
Direct
Alerts
Spotlight On
Floor View
System View
Basement
Floor 1
Floor 2
VAV_2_3
ac
flow
MaxFlow
MinFlow
SpTemp
STstpt
SpTemp
Damper
VAV_2_2
VAV_2_4
PIU_2_1
Floor2A_VPAC
Floor 3
Floor 4
Floor 5
Floor 6
flow
SpTemp
SpTemp
ac

Figure 20

2100

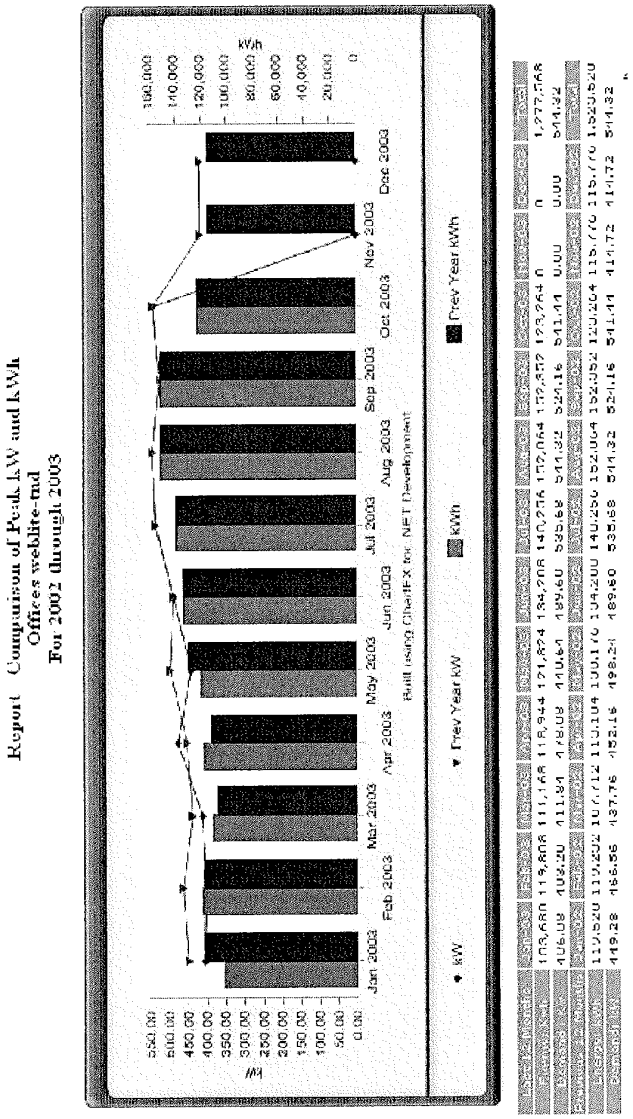


Figure 21

2200

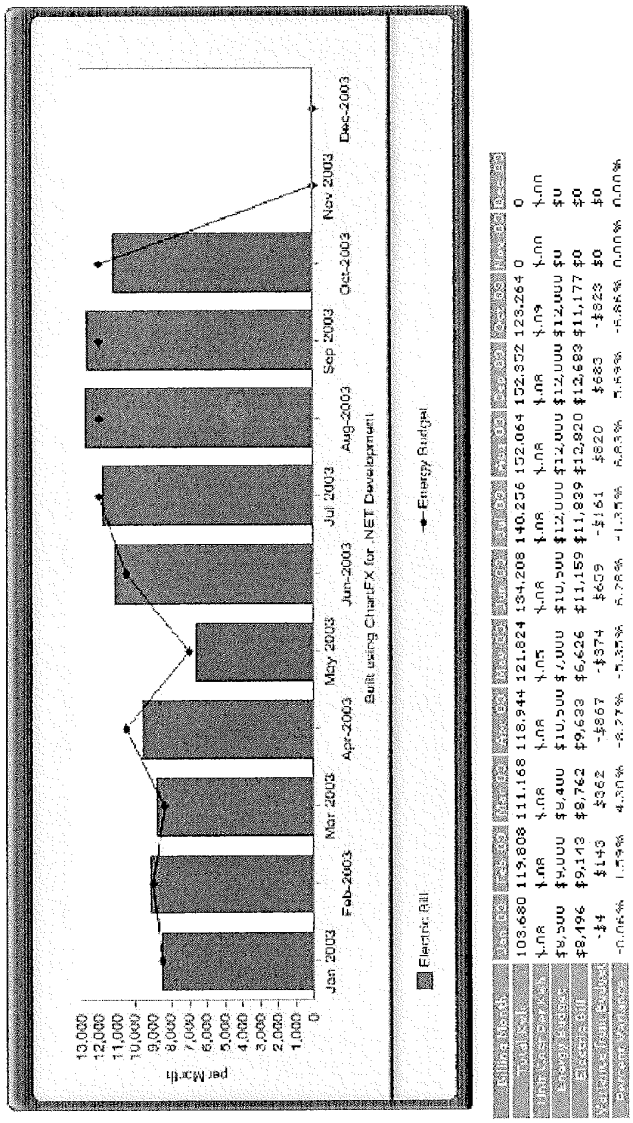


Figure 22

2300

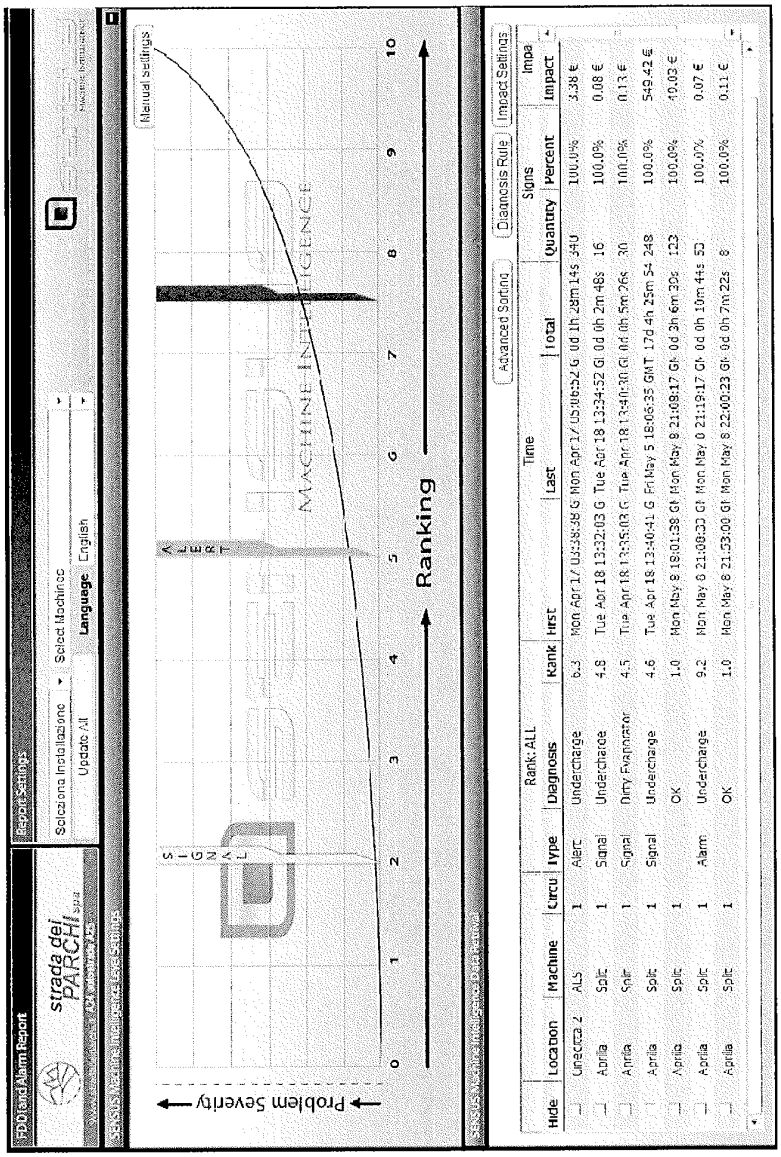


Figure 23

2400

AH-01	AH-02	AH-03	AH-04	AH-05	Air Handler	Pass/Fail
F	P	P	F	P	Comfort	
P	P	P	F	P	Efficiency	
F	F	F	F	F	Operation	

					CCO	CC-HC
					CLG VALVE	
			X	X	PCO	
			X		PRE-HEAT DAMPER	
X					PRE-HEAT VALVE	
					EXH DAMPER STAT	Exhaust Air
					EXHAUST FAN	
X	X	X	X	X	EXH FAN SPEED	
					MIXED AIR DAMPER	MAD, MACO2
					MIN OA SETPT	
					MAD OUTPUT	
X					CO2 SENSOR	
	X		X	X	STATIC PRESSURE	Static Pressure
	X		X	X	SA STATIC SETPT	
					SA FAN SPD OUTPUT	
					AVG SPACE TEMP	Temperatures
X					MIXED AIR TEMP	
X	X	X	X	X	AVG SPACE TEMP	
					MAX SPACE TEMP	
		X			MIN SPACE TEMP	
					NGT CLG SETPT	
					NGT HTG SETPT	
					WRT OATEMP	
X					RETURN AIR TEMP	
		X	X		SA TEMP	
		X			SA TEMP SETPT	
					WARMUP SETPT	
X					RA HUMIDITY	

Figure 24

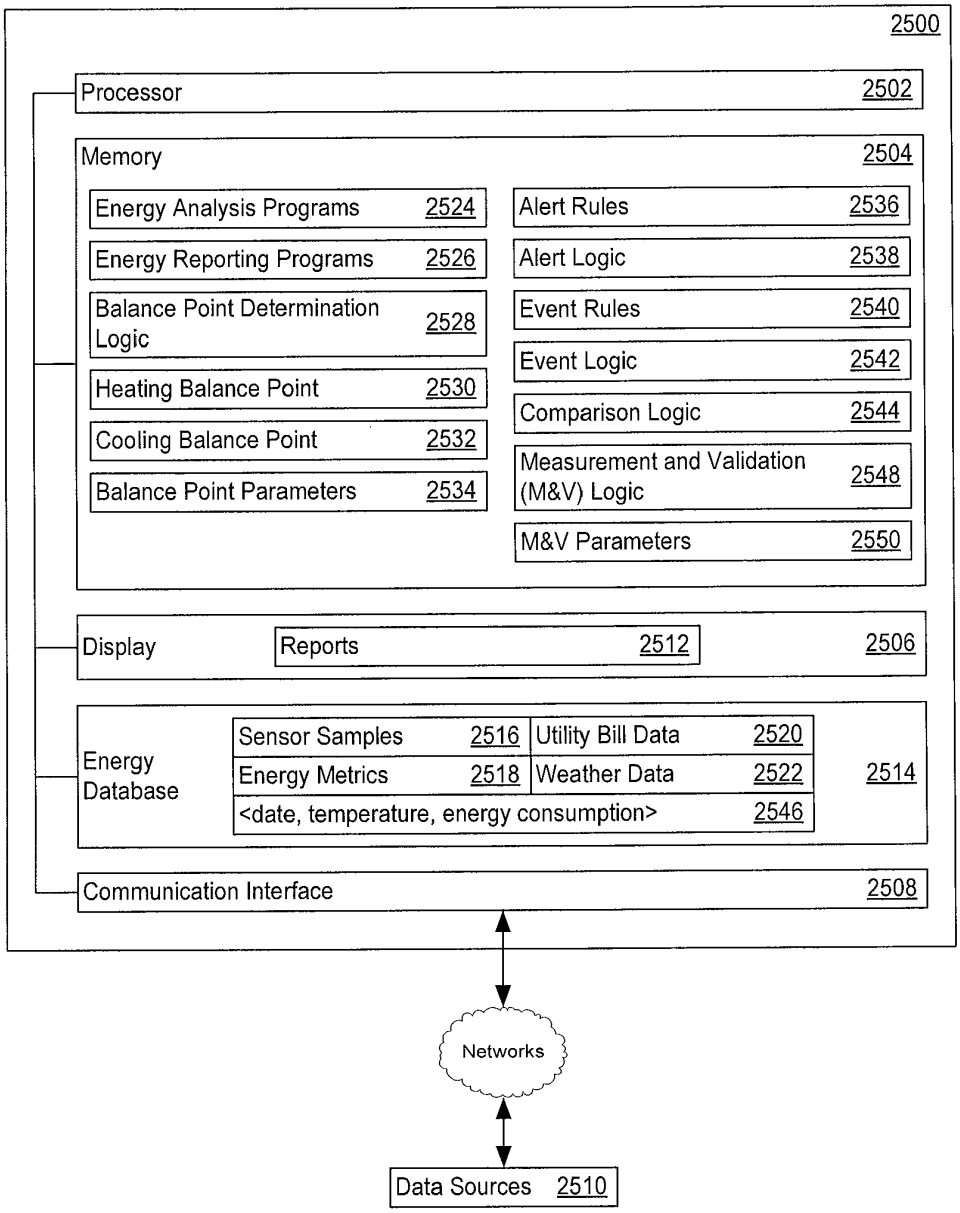

2500
Processor 2502
Memory 2504
Energy Analysis Programs 2524
Energy Reporting Programs 2526
Balance Point Determination Logic 2528
Heating Balance Point 2530
Cooling Balance Point 2532
Balance Point Parameters 2534
Alert Rules 2536
Alert Logic 2538
Event Rules 2540
Event Logic 2542
Comparison Logic 2544
Measurement and Validation (M&V) Logic 2548
M&V Parameters 2550
Display
Reports 2512
2506
Energy Database
Sensor Samples 2516
Utility Bill Data 2520
Energy Metrics 2518
Weather Data 2522
<date, temperature, energy consumption> 2546
2514
Communication Interface 2508
Networks
Data Sources 2510

Figure 25

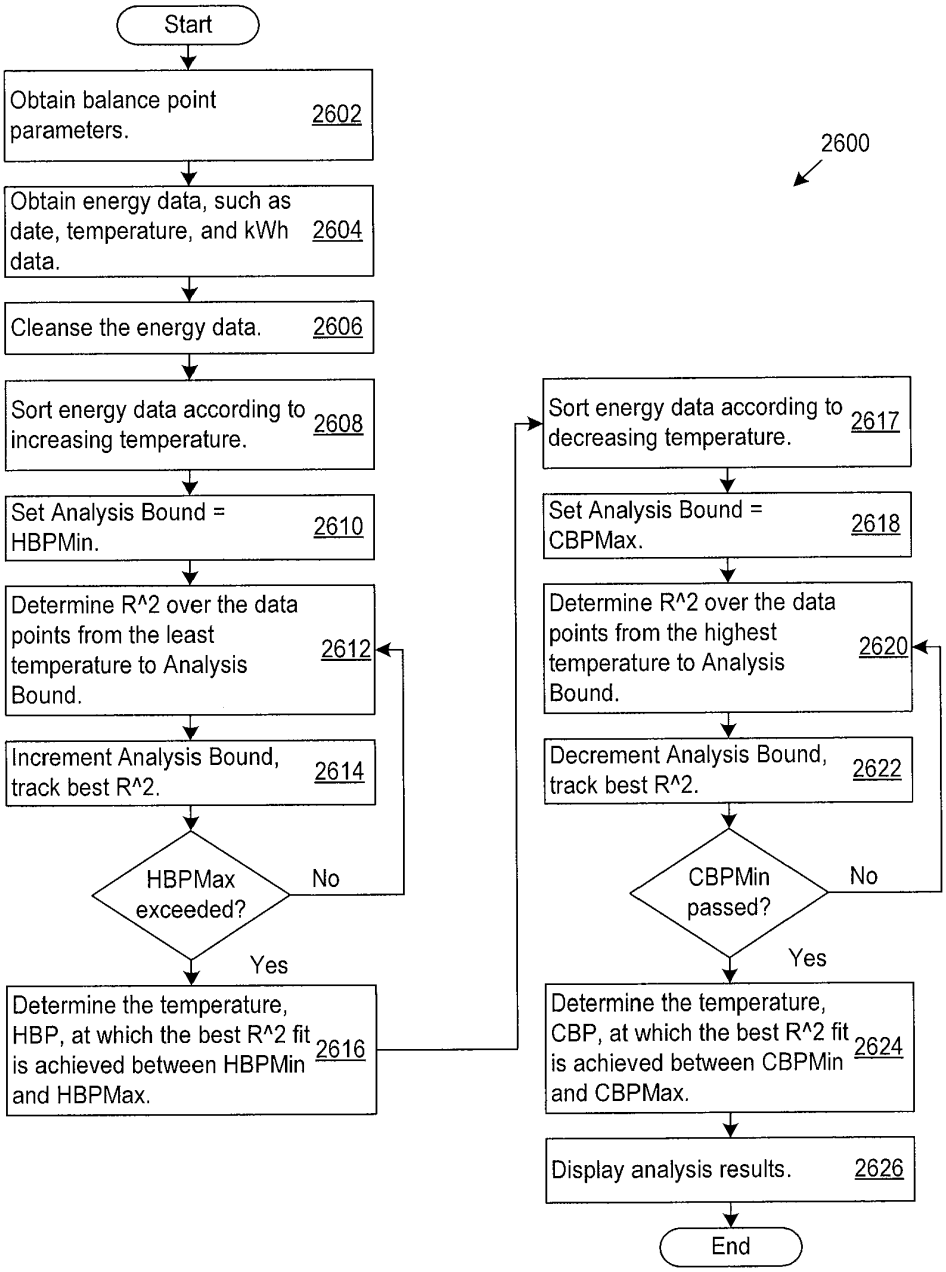

Start
Obtain balance point parameters. 2602
Obtain energy data, such as date, temperature, and kWh data. 2604
Cleanse the energy data. 2606
Sort energy data according to increasing temperature. 2608
Set Analysis Bound = HBPMin. 2610
Determine R^2 over the data points from the least temperature to Analysis Bound. 2612
Increment Analysis Bound, track best R^2. 2614
HBPMax exceeded?
No
Yes
Determine the temperature, HBP, at which the best R^2 fit is achieved between HBPMin and HBPMax. 2616
2600
Sort energy data according to decreasing temperature. 2617
Set Analysis Bound = CBPMax. 2618
Determine R^2 over the data points from the highest temperature to Analysis Bound. 2620
Decrement Analysis Bound, track best R^2. 2622
CBPMin passed?
No
Yes
Determine the temperature, CBP, at which the best R^2 fit is achieved between CBPMin and CBPMax. 2624
Display analysis results. 2626
End

Figure 26

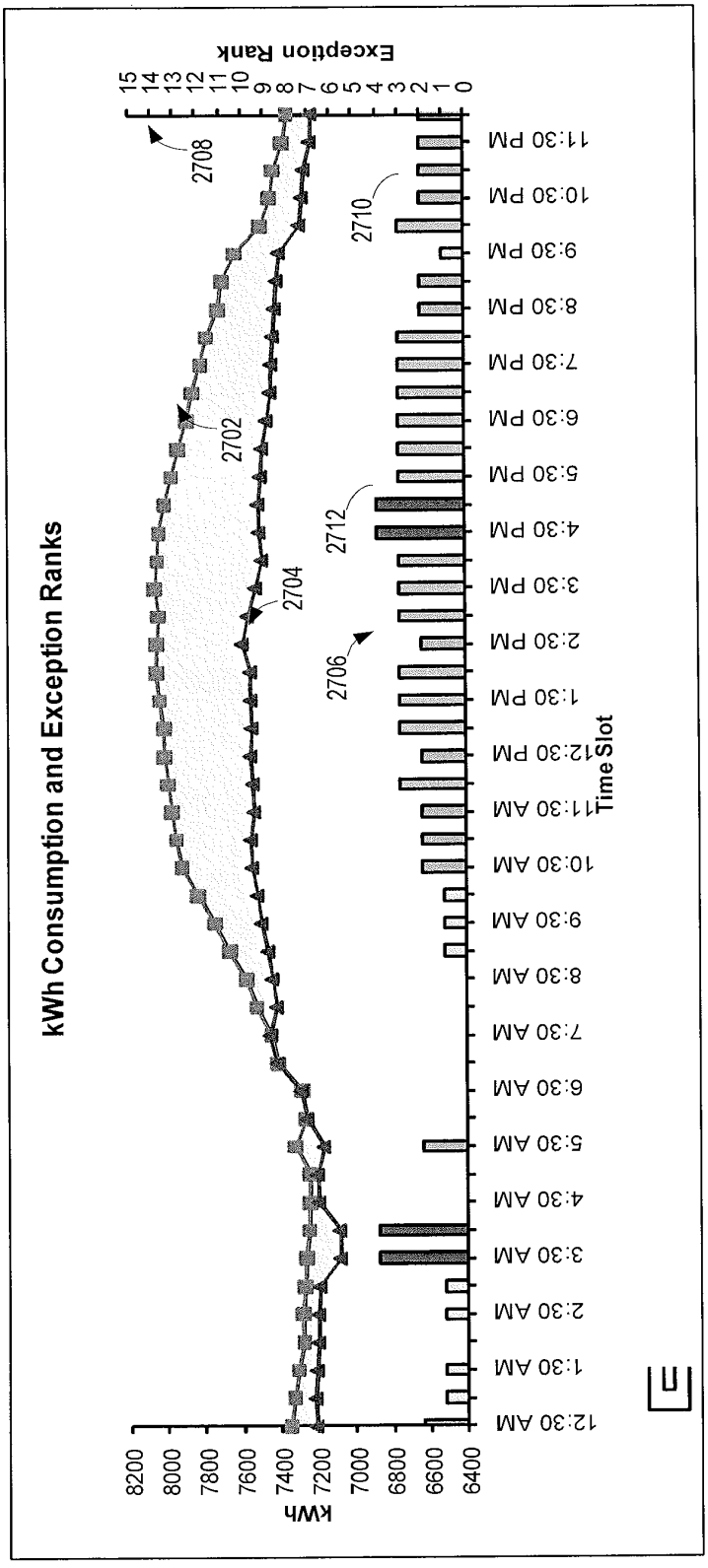

2700
kWh Consumption and Exception Ranks
Exception Rank
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
2708
2710
2702
2712
2704
2706
11:30 PM
10:30 PM
9:30 PM
8:30 PM
7:30 PM
6:30 PM
5:30 PM
4:30 PM
3:30 PM
2:30 PM
1:30 PM
12:30 PM
11:30 AM
10:30 AM
9:30 AM
8:30 AM
7:30 AM
6:30 AM
5:30 AM
4:30 AM
3:30 AM
2:30 AM
1:30 AM
12:30 AM
Time Slot
kWh
8200
8000
7800
7600
7400
7200
7000
6800
6600
6400

Figure 27

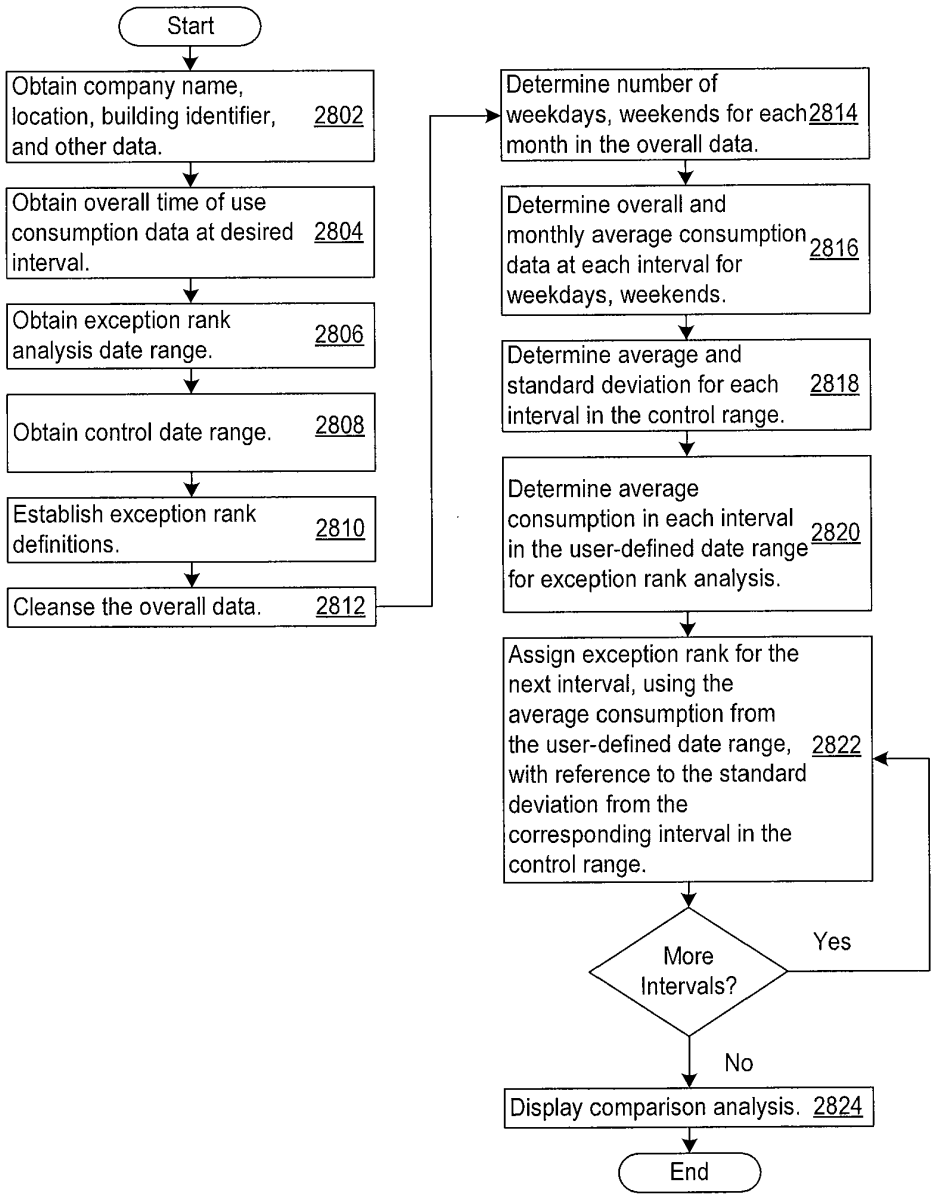

Start
Obtain company name, location, building identifier, and other data. 2802
Obtain overall time of use consumption data at desired interval. 2804
Obtain exception rank analysis date range. 2806
Obtain control date range. 2808
Establish exception rank definitions. 2810
Cleanse the overall data. 2812
Determine number of weekdays, weekends for each month in the overall data. 2814
Determine overall and monthly average consumption data at each interval for weekdays, weekends. 2816
Determine average and standard deviation for each interval in the control range. 2818
Determine average consumption in each interval in the user-defined date range for exception rank analysis. 2820
Assign exception rank for the next interval, using the average consumption from the user-defined date range, with reference to the standard deviation from the corresponding interval in the control range. 2822
More Intervals?
Yes
No
Display comparison analysis. 2824
End

Figure 28

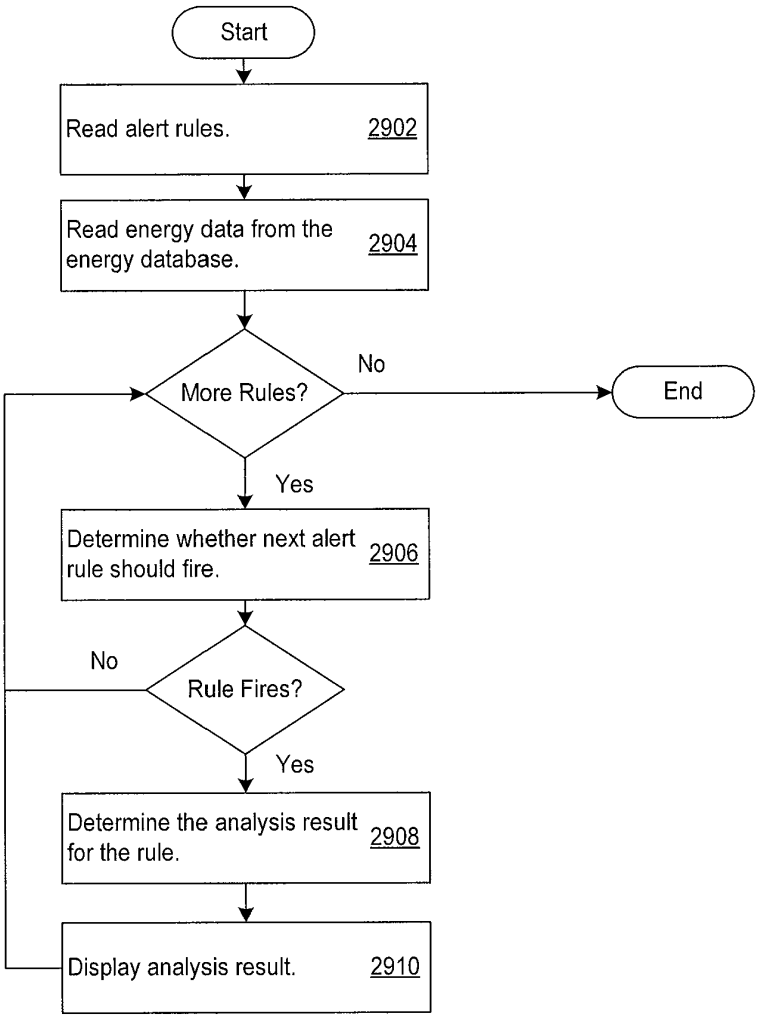

Start
Read alert rules. 2902
Read energy data from the energy database. 2904
More Rules?
No
End
Yes
Determine whether next alert rule should fire. 2906
Rule Fires?
No
Yes
Determine the analysis result for the rule. 2908
Display analysis result. 2910

Figure 29

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 C.F.R. §1.63)

As a below named inventor, I hereby declare:

My residence, mailing address, and citizenship are as stated below next to my name;

I believe I am an original, first and joint inventor of the subject matter that is claimed and for which a patent is sought on the invention entitled:

BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

the specification of which (check one)

☒ is attached hereto.

☐ was filed on _____ as United States Application No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge my duty to disclose to the United States Patent and Trademark Office all information that I know to be material to patentability as defined in 37 C.F.R. §1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or (f), or §365(b) of any foreign application(s) for patent or inventor's or plant breeder's rights certificate(s), or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's or plant breeder's rights certificate(s) or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s):			Priority Not Claimed
N.A.			☐
(Number)	(Country)	(Filing Date, MM/DD/YYYY)	
			☐
(Number)	(Country)	(Filing Date, MM/DD/YYYY)	

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below:

61/176,790	05/08/2009	Pending
(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: pending, or abandoned)
61/176,855	05/08/2009	Pending
(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: pending, or abandoned)

I hereby claim the benefit under 35 U.S.C. §120 of any United States applications(s), or §365(c) of any PCT International Application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in 37 C.F.R. §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

N.A.		
(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: patented, pending, abandoned)
(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: patented, pending, abandoned)
(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of inventor	Full name of inventor
Jay Hedley	**Boris Tsypin**
Signature Date	Signature Date
Residence (City, State/Foreign Country) Arlington, VA	Residence (City, State/Foreign Country) Chicago, IL
Citizenship US	Citizenship US
Mailing Address 1200 N. Nash Street, Suite 1128 Arlington, VA 22209	Mailing Address 2052 N. Lincoln Park West Chicago, IL 60614

Full name of inventor **Deepak Raghu**
Signature 07/05/2010 Date
Residence (City, State/Foreign Country) Haryana, India
Citizenship IN
Mailing Address B182, Belvedere Park, DLF Phase 3, Gurgaon – 122001, Haryana, India

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 C.F.R. §1.63)

As a below named inventor, I hereby declare:

My residence, mailing address, and citizenship are as stated below next to my name;

I believe I am an original, first and joint inventor of the subject matter that is claimed and for which a patent is sought on the invention entitled:

BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

the specification of which (check one)

☒ is attached hereto.

☐ was filed on _____ as United States Application No. _____ and was amended on _____ (if applicable).

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Prior Foreign Application(s):			Priority Not Claimed
N.A.			☐
(Number)	(Country)	(Filing Date, MM/DD/YYYY)	
			☐
(Number)	(Country)	(Filing Date, MM/DD/YYYY)	

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(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: pending, or abandoned)

I hereby claim the benefit under 35 U.S.C. §1[illegible] of any United States applications(s), or §365(c) of any PCT International Application designating the United States. listed below and, insofar as the subject matter of each of the claims of this applica[illegible] is not disclosed in the prior United States or PCT International application in the manner p[illegible]ded by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose to the Un[illegible] States Patent and Trademark Office all information known to me to be material to patentability as defined in 37 C.F.R. §1.56 which became available between the filing date of the prior applicati[illegible] and the national or PCT International filing date of this application.

N.A. (Application Serial No.)	(Filing Date, MM/[illegible]YYYY)	(Status: patented, pending, abandoned)
(Application Serial No.)	(Filing Date, MM/[illegible]YYYY)	(Status: patented, pending, abandoned)
(Application Serial No.)	(Filing Date, MM/[illegible]YYYY)	(Status: patented, pending, abandoned)

I hereby declare that all statements mad[illegible] herein of my own knowledge are true and that all statements made on information and belief a[illegible] believed to be true; and further that these statements were made with the knowledge that willful f[illegible] statements and the like so made are punishable by fine or imprisonment, or both, under 18 U[illegible] §100[illegible] and that such willful false statements may jeopardize the validity of the application or ar[illegible] patent issued thereon.

Full name of inventor
Jay Hedley

Signature Date

Residence (City, State/Foreign Country)
Arlington, VA

Citizenship
US

Mailing Address
1200 N. Nash Street, Suite 1128
Arlington, VA 22209

Full name of inventor
Deepak Raghu

Signature Date

Residence (City, State/Foreign Country)
Haryana, India

Citizenahip
IN

Mailing Address
B182, Belvedere Park, DLF Phase 3, Gurgac
– 122001, Haryana, India

Full name of inventor
Boris Tsypin

Signature Date 5/06/10

Residence (City, State/Foreign Country)
Chicago, IL

Citizenship
US

Mailing Address
2052 N. Lincoln Park West
Chicago, IL 60614

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BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

the specification of which (check one)

☒ is attached hereto.

☐ was filed on _____ as United States Application No. _____ and was amended on _____ (if applicable).

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			☐
(Number)	(Country)	(Filing Date, MM/DD/YYYY)	

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N.A.		
(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: patented, pending, abandoned)
(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: patented, pending, abandoned)
(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of inventor **Jay Hedley**	Full name of inventor **Boris Tsypin**
Signature Date	Signature Date
Residence (City, State/Foreign Country) Arlington, VA	Residence (City, State/Foreign Country) Chicago, IL
Citizenship US	Citizenship US
Mailing Address 1200 N. Nash Street, Suite 1128 Arlington, VA 22209	Mailing Address 2052 N. Lincoln Park West Chicago, IL 60614
Full name of inventor **Deepak Raghu**	
Signature Date	
Residence (City, State/Foreign Country) Haryana, India	
Citizenship IN	
Mailing Address B182, Belvedere Park, DLF Phase 3, Gurgaon – 122001, Haryana, India	

CERTIFICATE OF EFS FILING

This correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS on the below date:

Date: May 7, 2010 Name: John F. Nethery Signature: _____

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley et al.	
Appln. No.:	Not yet assigned	Examiner: Not yet assigned
Filed:	Herewith	Art Unit: Not yet assigned
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Confirmation No.: Not yet assigned
Attorney Docket No:	10022/1726	

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

In accordance with the duty of disclosure under 37 CFR §1.56 and §§1.97-1.98, and more particularly in accordance with 37 CFR §1.97(b), Applicant hereby cites the following reference(s):

OTHER ART – NON PATENT LITERATURE DOCUMENTS
David Clayton et al., Building Automation Systems Worldwide Outlook, Market Analysis and Forecast Through 2006, ARC Advisory Group, 145pgs. (Printed 2pgs. Per Sheet - 73 sheets).
International Performance Measurement & Verification Protocol, Concepts and Options for Determining Energy and Water Savings, Vol. 1, 93 pgs., March 2002.

Applicant is enclosing Form PTO-1449 (one sheet), along with a copy of each listed reference for which a copy is required under 37 CFR §1.98(a)(2). As each of the listed references is in English, no further commentary is believed to be necessary, 37 C.F.R §1.98(a)(3). Applicant respectfully requests the Examiner's consideration of the above reference(s) and entry thereof into the record of this application.

By submitting this Statement, Applicant is attempting to fully comply with the duty of candor and good faith mandated by 37 CFR §1.56. As such, this Statement is not

intended to constitute an admission that any of the enclosed references, or other information referred to therein, constitutes "prior art" or is otherwise "material to patentability," as that phrase is defined in 37 CFR §1.56(a).

The Applicant or Applicants have calculated no fee to be due in connection with the filing of this Information Disclosure Statement. However, the Director is authorized to charge any fee deficiency associated with the filing of this Information Disclosure Statement to a deposit account, as authorized in the Transmittal accompanying this Information Disclosure Statement.

Respectfully submitted,

May 7, 2010
Date

John F. Nethery
(Reg. No. 42,928)

FORM PTO-1449		SERIAL NO. Not yet assigned	CASE NO. 10022/1726
LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT		FILING DATE Herewith	GROUP ART UNIT Not yet assigned
(use several sheets if necessary)	APPLICANT(S): Jay Hedley et al.		CONFIRMATION NO. Not yet assigned

REFERENCE DESIGNATION **U.S. PATENT DOCUMENTS**

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	NAME	CLASS/ SUBCLASS	FILING DATE

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	COUNTRY	CLASS/ SUBCLASS	TRANSLATION YES OR NO

EXAMINER INITIAL		OTHER ART – NON PATENT LITERATURE DOCUMENTS (Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date page(s), volume-issue number(s), publisher, city and/or country where published.
	A1	David Clayton et al., Building Automation Systems Worldwide Outlook, Market Analysis and Forecast Through 2006, ARC Advisory Group, 145pgs. (Printed 2pgs. Per Sheet - 73 sheets).
	A2	International Performance Measurement & Verification Protocol, Concepts and Options for Determining Energy and Water Savings, Vol. 1, 93 pgs., March 2002.

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Electronic Acknowledgement Receipt

EFS ID:	7573388
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	John F. Nethery/Edward Popoca
Filer Authorized By:	John F. Nethery
Attorney Docket Number:	10022/1726
Receipt Date:	07-MAY-2010
Filing Date:	
Time Stamp:	17:43:18
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	10022_1726_Trans.PDF	60591 a55be1a7672b51e81757b19665b46ad9b0f03389	no	1

Warnings:	
Information:	

2	Application Data Sheet	10022_1726_ADS.PDF	209405 9ed853df079cf7623e98d47420cceda5ff883e58	no	4
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
3		10022-1726_App.pdf	330398 ef38e5a2a7821708048d2b46bfc0e3bff99684ac	yes	86
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Specification		1	80	
	Claims		81	85	
	Abstract		86	86	
Warnings:					
Information:					
4	Drawings-only black and white line drawings	10022_1726_AppFigs.PDF	4280786 24f0de11a34f1435d7db4ab95bf2e5af677a2ff4	no	29
Warnings:					
Information:					
5	Oath or Declaration filed	10022_1726_Raghu-Dec.PDF	91637 9e493b3b3fece89f31740bc11cb2ad833c64317b	no	2
Warnings:					
Information:					
6	Oath or Declaration filed	10022_1726_Tsypin-Dec.PDF	95861 248ad7d0e649148ac9ccc908f4d9e78a424c94c7	no	2
Warnings:					
Information:					
7	Oath or Declaration filed	10022_1726_Hedley-Dec.PDF	100702 f74f10425dc4661b2b30945fbf7e1819a6535c27	no	2
Warnings:					
Information:					
8		10022_1726_IDS.PDF	106827 e5ca7b8267ba2778dc128894bb16834ec1b6d74f	yes	3

	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Transmittal Letter		1	2	
	Information Disclosure Statement (IDS) Filed (SB/08)		3	3	
Warnings:					
Information:					
9	NPL Documents	BuildingAutomationSystems.PDF	4218663 dbecf2d4f8cd22a70112fbaa80497ef9139d51f8	no	73
Warnings:					
Information:					
10	NPL Documents	Intl_Per_Mea_Veri_Protocol.pdf	2593329 d7cf14832afc51743185ceb0abf85d39fc834688	no	93
Warnings:					
Information:					
		Total Files Size (in bytes):	12088199		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (12-04)

Date: **05/07/10**

Approved for use through 7/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

12/776,159

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	**330**
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	**540**
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	**220**
TOTAL CLAIMS (37 CFR 1.16(i))	**20** 3		x$26		OR	x$52	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	**4** minus 3 =	* **1**	x$110			x$220	**220**
APPLICATION SIZE FEE (37 CFR 1.16(s))							
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			195			390	
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	**1310**

APPLICATION AS AMENDED – PART II

AMENDMENT A		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

AMENDMENT B		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/776,159	05/07/2010	2882	0.00	10022/1726	20	4

CONFIRMATION NO. 1676

28164
ACCENTURE CHICAGO 28164
BRINKS HOFER GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

FILING RECEIPT

OC000000041693886

Date Mailed: 05/20/2010

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Jay Hedley, Arlington, VA;
Boris Tsypin, Chicago, IL;
Deepak Raghu, Gurgaon, INDIA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 61/176,855 05/08/2009
and claims benefit of 61/176,790 05/08/2009

Foreign Applications

If Required, Foreign Filing License Granted: 05/17/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/776,159**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

Title

BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Preliminary Class

378

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/776,159	05/07/2010	Jay Hedley	10022/1726

CONFIRMATION NO. 1676

28164
ACCENTURE CHICAGO 28164
BRINKS HOFER GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

FORMALITIES LETTER

OC000000041693887

Date Mailed: 05/20/2010

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
  *Applicant must submit $**330** to complete the basic filing fee for a non-small entity. If appropriate, applicant may make a written assertion of entitlement to small entity status and pay the small entity filing fee (37 CFR 1.27).*
- The signature of the following inventor(s) is missing from the oath or declaration:
  Jay Hedley

The application is informal since it does not comply with the regulations for the reason(s) indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
  - The drawing sheets do not have the appropriate margin(s) (see 37 CFR 1.84(g)). Each sheet must include a top margin of at least 2.5 cm. (1 inch), a left side margin of at least 2.5 cm. (1 inch), a right side margin of at least 1.5 cm. (5/8 inch), and a bottom margin of at least 1.0 cm. (3/8 inch).See Figures(s) 10.
  - The drawings must be reasonably free from erasures and must be free from alterations, overwriting, interlineations, folds, and copy marks. See Figure(s) 1,6-9,11,17-24.
  - Numbers, letters, and reference characters on the drawings must measure at least 0.32 cm (1/8 inch) in height. See Figure(s) 6,7,11,17-18,19-23.
  - The drawings submitted to the Office are not electronically reproducible because portions of figures 1,2,6-9,11,17-24 are missing and/or blurry.
  - The drawings are not in compliance with 37 CFR 1.84 because figures 6,9-12,18-23,27 contain figure or view numbers that have incorrect orientation. Reference characters, sheet numbers, and view numbers must be oriented in the same direction as the view. See 37 CFR 1.84(p)(1).

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of $**220** as a non-small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of $**130** for a non-small entity, must be submitted with the missing items identified in this notice.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is $**1440** for a non-small entity

- $**330** Statutory basic filing fee.
- $**130** Surcharge.
- The application search fee has not been paid. Applicant must submit $**540** to complete the search fee.
- The application examination fee has not been paid. Applicant must submit $**220** to complete the examination fee for a non-small entity.
- Total additional claim fee(s) for this application is $**220**
  - $**220** for **1** independent claims over 3.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/rgreen/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: June 11, 2010 Name: John F. Nethery, Reg. No. 42,928 Signature: _____

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of: Jay E. Hedley et al.			
Appln. No.:	12/776,159	Examiner:	Not yet assigned
Filed:	May 7, 2010	Art Unit:	Not yet assigned
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.: 10022/1726			

RESPONSE TO NOTICE TO FILE MISSING PARTS

Mail Stop Missing Parts
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In accordance with the Notice to File Missing Parts of Nonprovisional Application Filed Under 37 CFR 1.53(b) Filing Date Granted dated May 20, 2010, a copy of which is attached, enclosed herewith for filing are the following documents for the above-referenced patent application:

- ☐ Fully executed Declaration for Patent Application
- ☐ Fully executed Power of Attorney
- ☐ Fully executed Combined Declaration and Power of Attorney
- ☐ Petition for Ext. of Time (37 CFR § 1.136(a)) to File Missing Parts (if by mail, in dup)
- ☒ Other: Submission of Replacement Drawings and Remarks Accompanying Submission of Filing Fee, 35 Sheets of Replacement Drawings

Applicant is: ☐ small entity (per 37 CFR 1.27) ☒ other than small entity

Fees Associated with Payment:

- ☒ Filing Fee: $330
- ☒ Surcharge: $130
- ☒ Addtl. Claim Fees: $220 for 1 additional claims
- ☒ Search Fee: $540
- ☒ Examination Fee: $220
- ☐ App. Size Fee: $____ (for each additional 50 sheets that exceeds 100 sheets, including specification and drawings)

Payment Method:

- ☐ Check in the amount of $____ is enclosed to cover the fees listed above.
- ☐ Payment by credit card in the amount of $____ to cover the fees listed above.

  Form PTO-2038 is enclosed for this purpose.
- ☒ The Commissioner is hereby authorized to charge $1440 to cover the fees listed above to Deposit Account No. 23-1925.
- ☒ The Commissioner is hereby authorized to charge any deficiencies in fees or credit overpayment to Deposit Account No. 23-1925.

Respectfully submitted,

Dated: June 11, 2010

John F. Nethery, Reg. No. 42,928
Attorney for Applicant(s)

BRINKS HOFER GILSON & LIONE
PO BOX 10395
CHICAGO, IL 60610
(312) 321-4200

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: June 11, 2010 Name: John F. Nethery, Reg. No. 42,928 Signature:

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of: Jay E. Hedley et al.			
Appln. No.:	12/776,159	Examiner:	Not yet assigned
Filed:	May 7, 2010	Art Unit:	Not yet assigned
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.: 10022/1726			

REMARKS ACCOMPANYING SUBMISSION OF FILING FEE AND SUBMISSION OF REPLACEMENT DRAWINGS

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The filing fee and surcharge are paid with this communication in order to support a claim for priority to this application by continuing applications, as required under 37 CFR 1.78(a)(1)(ii). In particular, a Continuation application taking priority to this application is being filed on the same day as the filing fee and surcharge for this application.

In addition, in response to the Notice to File Missing Parts dated May 20, 2010, Assignee encloses 35 sheets of replacement drawings containing Figure(s) 1-29.

Respectfully submitted,

Dated: June 11, 2010

John F. Nethery, Reg. No. 42,928
Attorney for Applicant(s)

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, IL 60610
(312) 321-4200

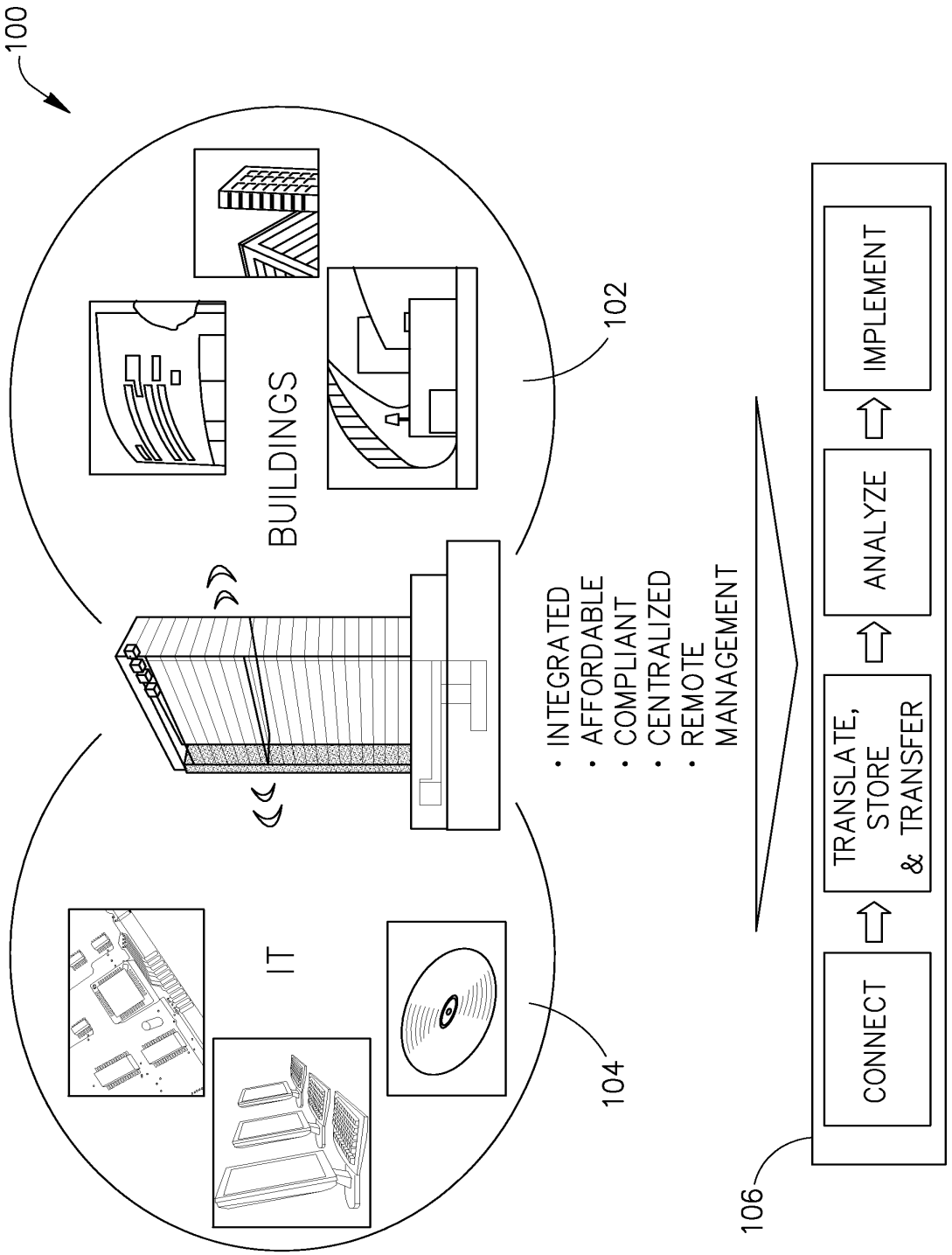

100
BUILDINGS
102
IT
104
• INTEGRATED
• AFFORDABLE
• COMPLIANT
• CENTRALIZED
• REMOTE MANAGEMENT
CONNECT
TRANSLATE, STORE & TRANSFER
ANALYZE
IMPLEMENT
106

Figure 1

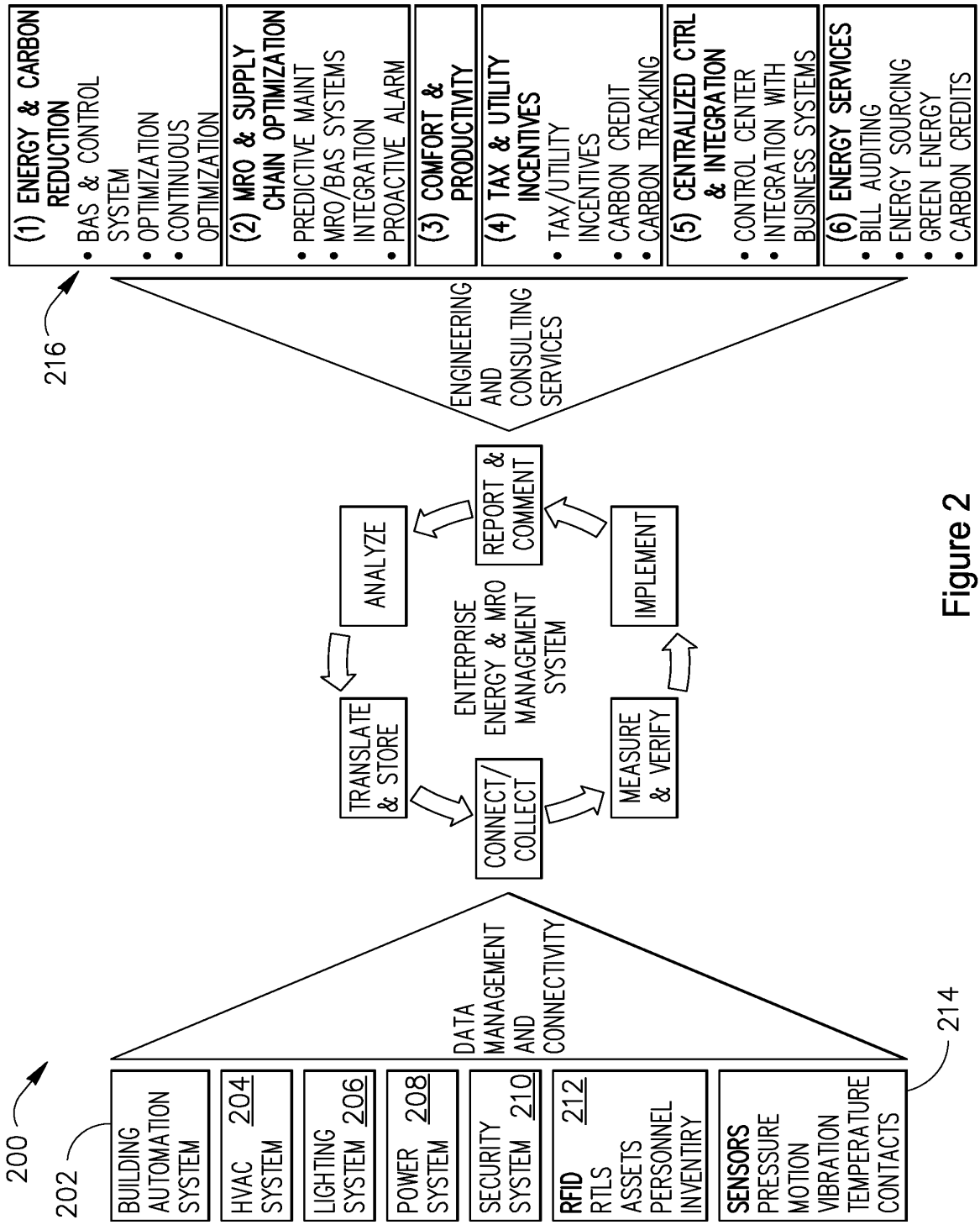

200
202
BUILDING AUTOMATION SYSTEM
HVAC 204 SYSTEM
LIGHTING SYSTEM 206
POWER 208 SYSTEM
SECURITY SYSTEM 210
RFID 212 RTLS ASSETS PERSONNEL INVENTIRY
SENSORS PRESSURE MOTION VIBRATION TEMPERATURE CONTACTS
214
DATA MANAGEMENT AND CONNECTIVITY
CONNECT/ COLLECT
TRANSLATE & STORE
ANALYZE
REPORT & COMMENT
MEASURE & VERIFY
IMPLEMENT
ENTERPRISE ENERGY & MRO MANAGEMENT SYSTEM
216
ENGINEERING AND CONSULTING SERVICES
(1) ENERGY & CARBON REDUCTION
• BAS & CONTROL SYSTEM
• OPTIMIZATION
• CONTINUOUS OPTIMIZATION
(2) MRO & SUPPLY CHAIN OPTIMIZATION
• PREDICTIVE MAINT
• MRO/BAS SYSTEMS INTEGRATION
• PROACTIVE ALARM
(3) COMFORT & PRODUCTIVITY
(4) TAX & UTILITY INCENTIVES
• TAX/UTILITY INCENTIVES
• CARBON CREDIT
• CARBON TRACKING
(5) CENTRALIZED CTRL & INTEGRATION
• CONTROL CENTER
• INTEGRATION WITH BUSINESS SYSTEMS
(6) ENERGY SERVICES
• BILL AUDITING
• ENERGY SOURCING
• GREEN ENERGY
• CARBON CREDITS

Figure 2

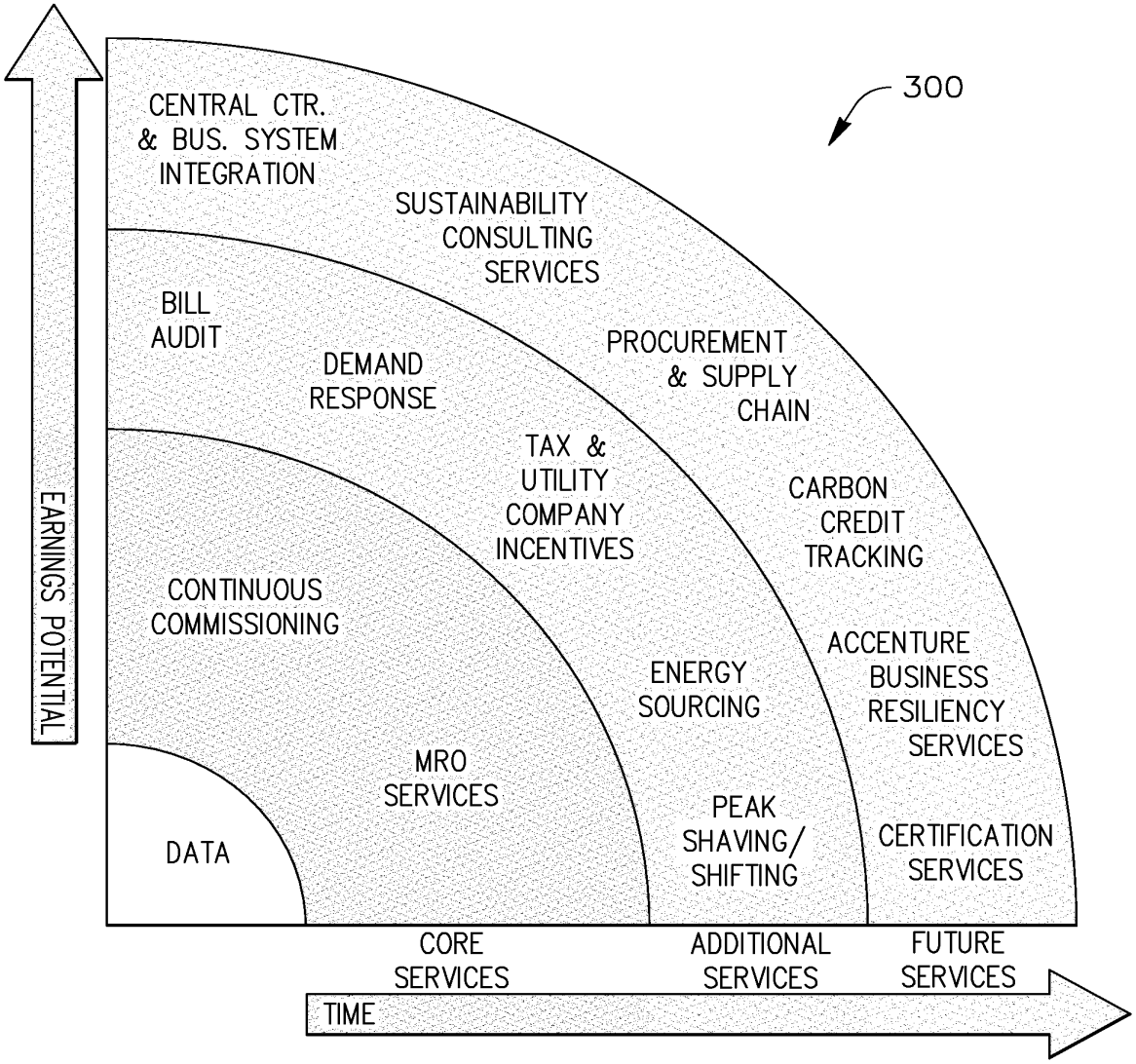

300
CENTRAL CTR. & BUS. SYSTEM INTEGRATION
SUSTAINABILITY CONSULTING SERVICES
BILL AUDIT
DEMAND RESPONSE
PROCUREMENT & SUPPLY CHAIN
TAX & UTILITY COMPANY INCENTIVES
CARBON CREDIT TRACKING
CONTINUOUS COMMISSIONING
ENERGY SOURCING
ACCENTURE BUSINESS RESILIENCY SERVICES
MRO SERVICES
PEAK SHAVING/ SHIFTING
CERTIFICATION SERVICES
DATA
EARNINGS POTENTIAL
CORE SERVICES
ADDITIONAL SERVICES
FUTURE SERVICES
TIME

Figure 3

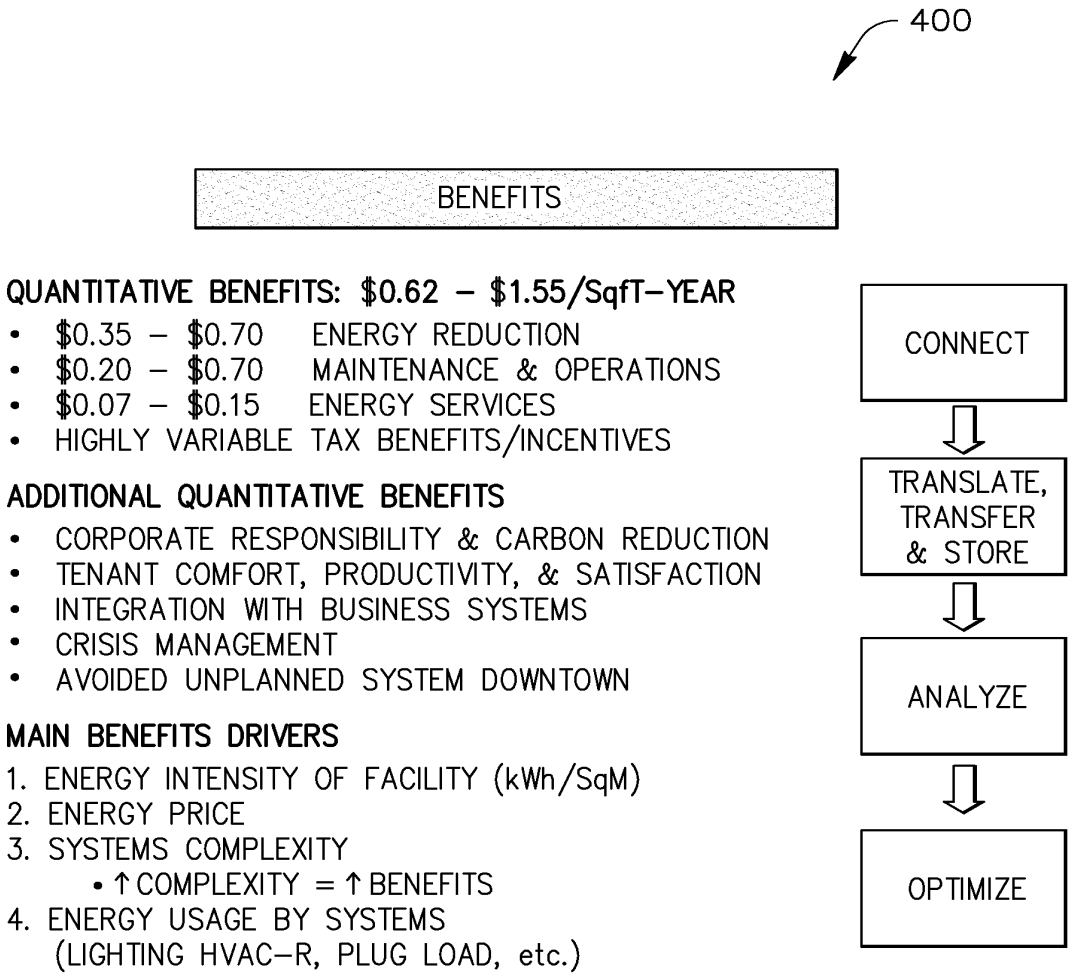

400
BENEFITS
QUANTITATIVE BENEFITS: $0.62 – $1.55/SqfT–YEAR
• $0.35 – $0.70 ENERGY REDUCTION
• $0.20 – $0.70 MAINTENANCE & OPERATIONS
• $0.07 – $0.15 ENERGY SERVICES
• HIGHLY VARIABLE TAX BENEFITS/INCENTIVES
ADDITIONAL QUANTITATIVE BENEFITS
• CORPORATE RESPONSIBILITY & CARBON REDUCTION
• TENANT COMFORT, PRODUCTIVITY, & SATISFACTION
• INTEGRATION WITH BUSINESS SYSTEMS
• CRISIS MANAGEMENT
• AVOIDED UNPLANNED SYSTEM DOWNTOWN
MAIN BENEFITS DRIVERS
1. ENERGY INTENSITY OF FACILITY (kWh/SqM)
2. ENERGY PRICE
3. SYSTEMS COMPLEXITY
• ↑ COMPLEXITY = ↑ BENEFITS
4. ENERGY USAGE BY SYSTEMS
(LIGHTING HVAC–R, PLUG LOAD, etc.)
CONNECT
TRANSLATE, TRANSFER & STORE
ANALYZE
OPTIMIZE

Figure 4

500

ENERGY & MAINTENANCE SERVICES IMPACT ANALYSIS

ANNUAL REVENUE	$1,000,000,000
ANNUAL NET INCOME (8%)	$80,000,000
SHARES OUTSTANDING	100,000,000
ANNUAL EARNINGS PER SHARE	$0.80
END OF YEAR SHARE PRICE	$16.00
PRICE EARNING RATIO (P/E)	20
MARKET CAPITALIZATION	$1,600,000,000
ANNUAL ENERGY SPEND	$30,000,000
ANNUAL MAINTENANCE SPEND	
PERCENT OF REVENUE REPRESENTED ENERGY & MAINTENANCE SPEND	$30,000,000
EXPECTED % SAVINGS FROM ANNUAL ENERGY & MAINTENANCE SPEND	6.0%
EXPECTED ANNUAL NI INCREASE @ 40% TAX RATE	20.0%
ENERGY & MAINTENANCE SAVINGS CONTRIBUTION	$7,200,000
SHAREHOLDER VALUE	$144,000,000
ADDITION TO SHARE PRICE	**$1.44**
SHARE PRICE AFTER INSTITUTION OF TOTAL ENERGY & MAINTENANCE MANAGEMENT	**$17.44**
PERCENTAGE INCREASE IN SHARE PRICE AND EPS	**9.0%**

Figure 5

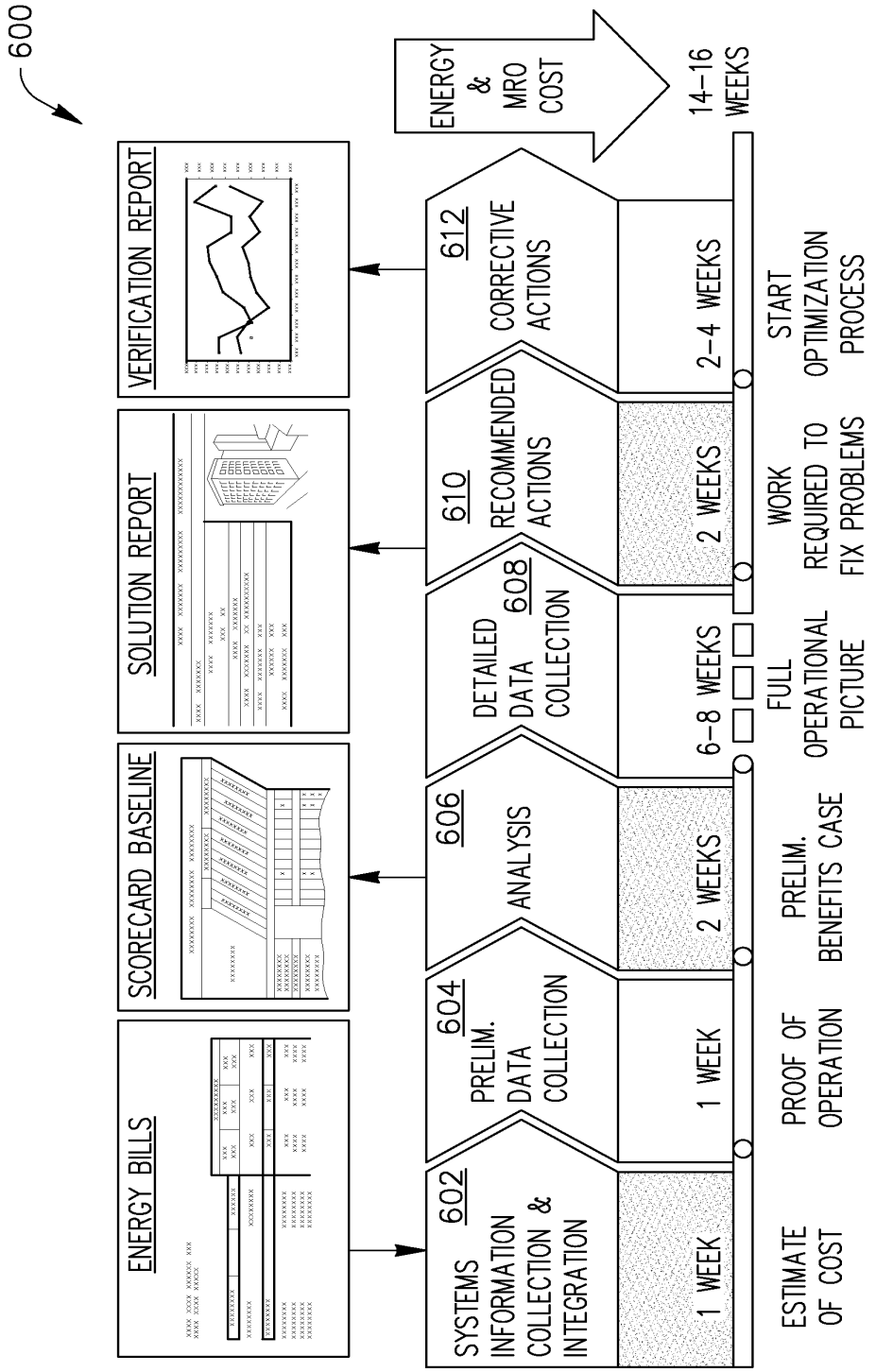

600
ENERGY BILLS
SCORECARD BASELINE
SOLUTION REPORT
VERIFICATION REPORT
SYSTEMS INFORMATION COLLECTION & INTEGRATION 602
PRELIM. DATA COLLECTION 604
ANALYSIS 606
DETAILED DATA COLLECTION 608
RECOMMENDED ACTIONS 610
CORRECTIVE ACTIONS 612
ENERGY & MRO COST
1 WEEK
1 WEEK
2 WEEKS
6–8 WEEKS
2 WEEKS
2–4 WEEKS
14–16 WEEKS
ESTIMATE OF COST
PROOF OF OPERATION
PRELIM. BENEFITS CASE
FULL OPERATIONAL PICTURE
WORK REQUIRED TO FIX PROBLEMS
START OPTIMIZATION PROCESS

Figure 6

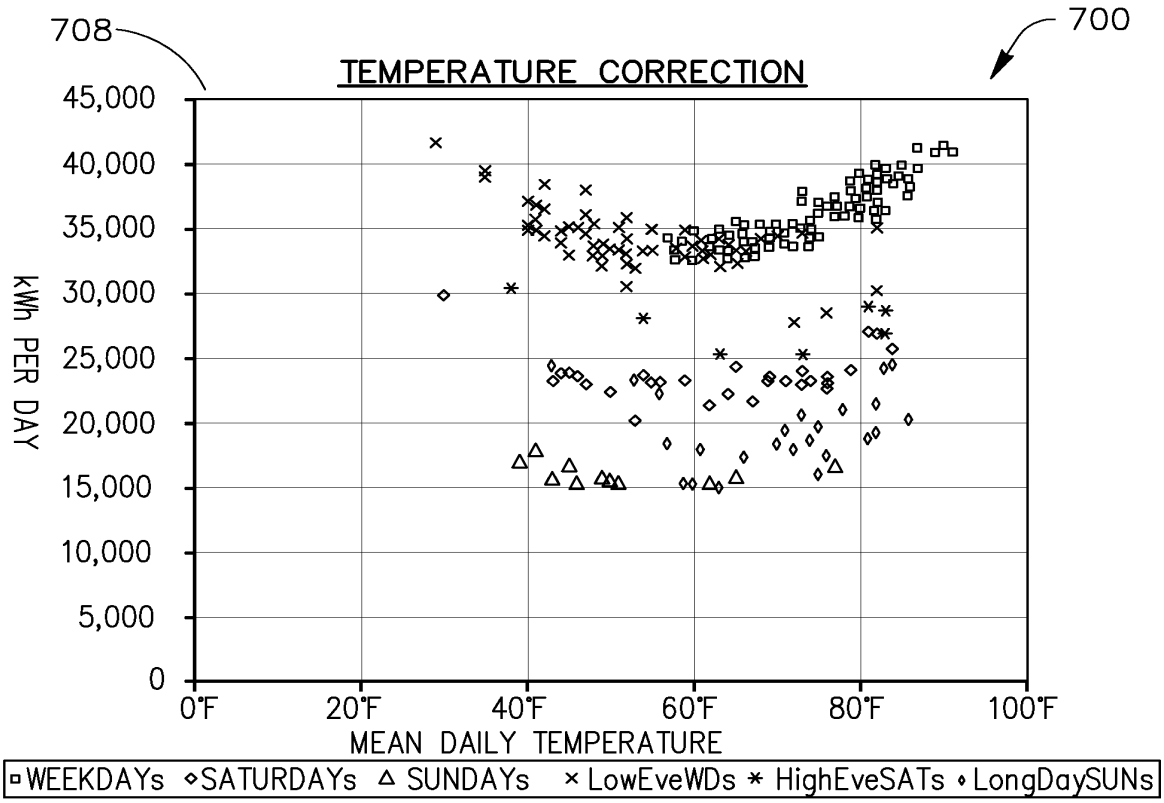


Figure 7A

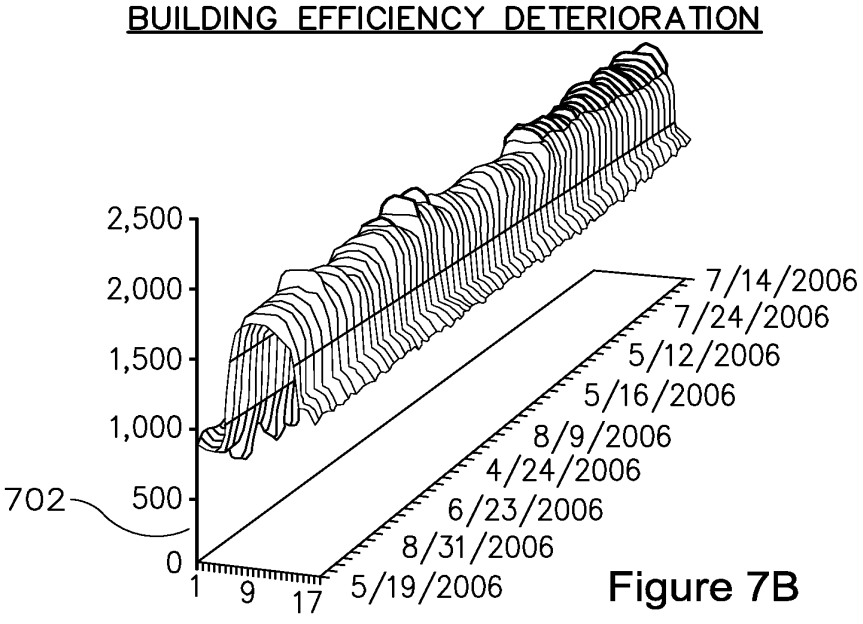


Figure 7B

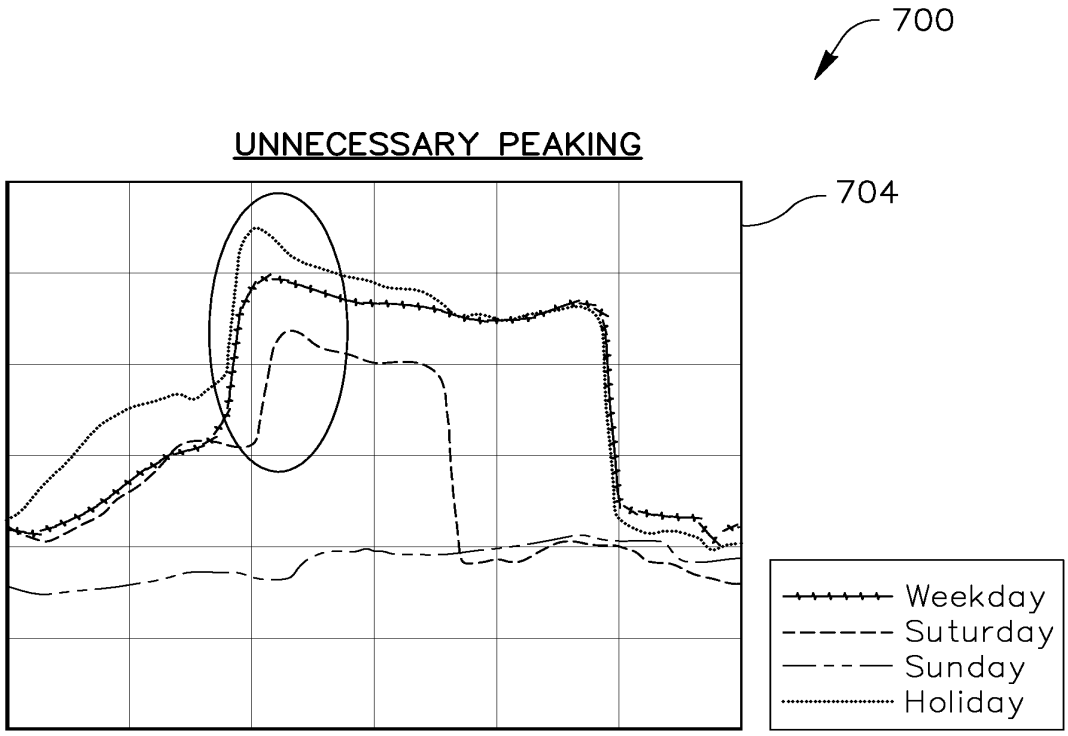


Figure 7C

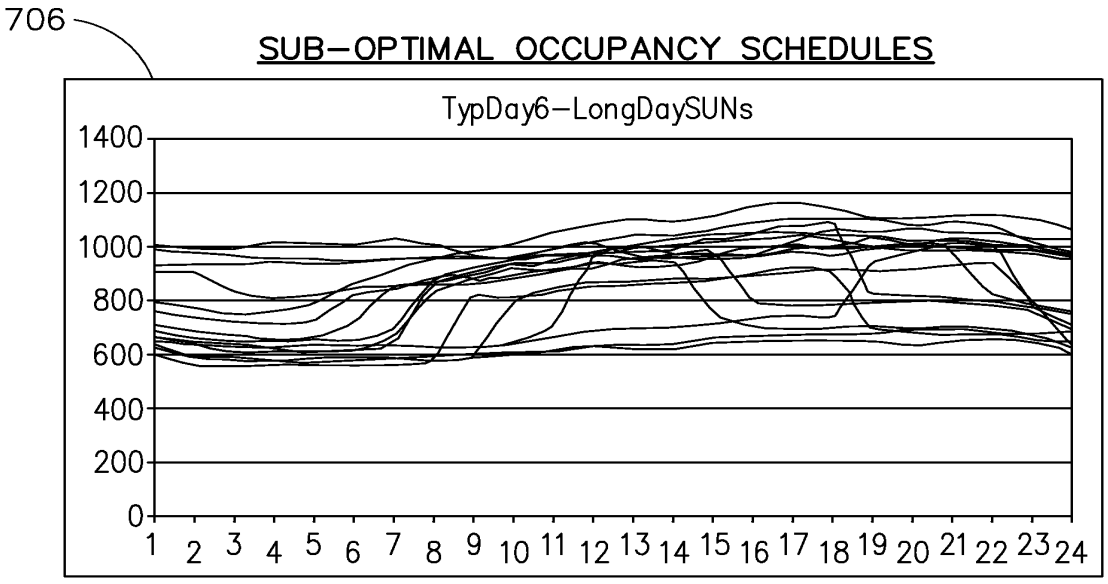
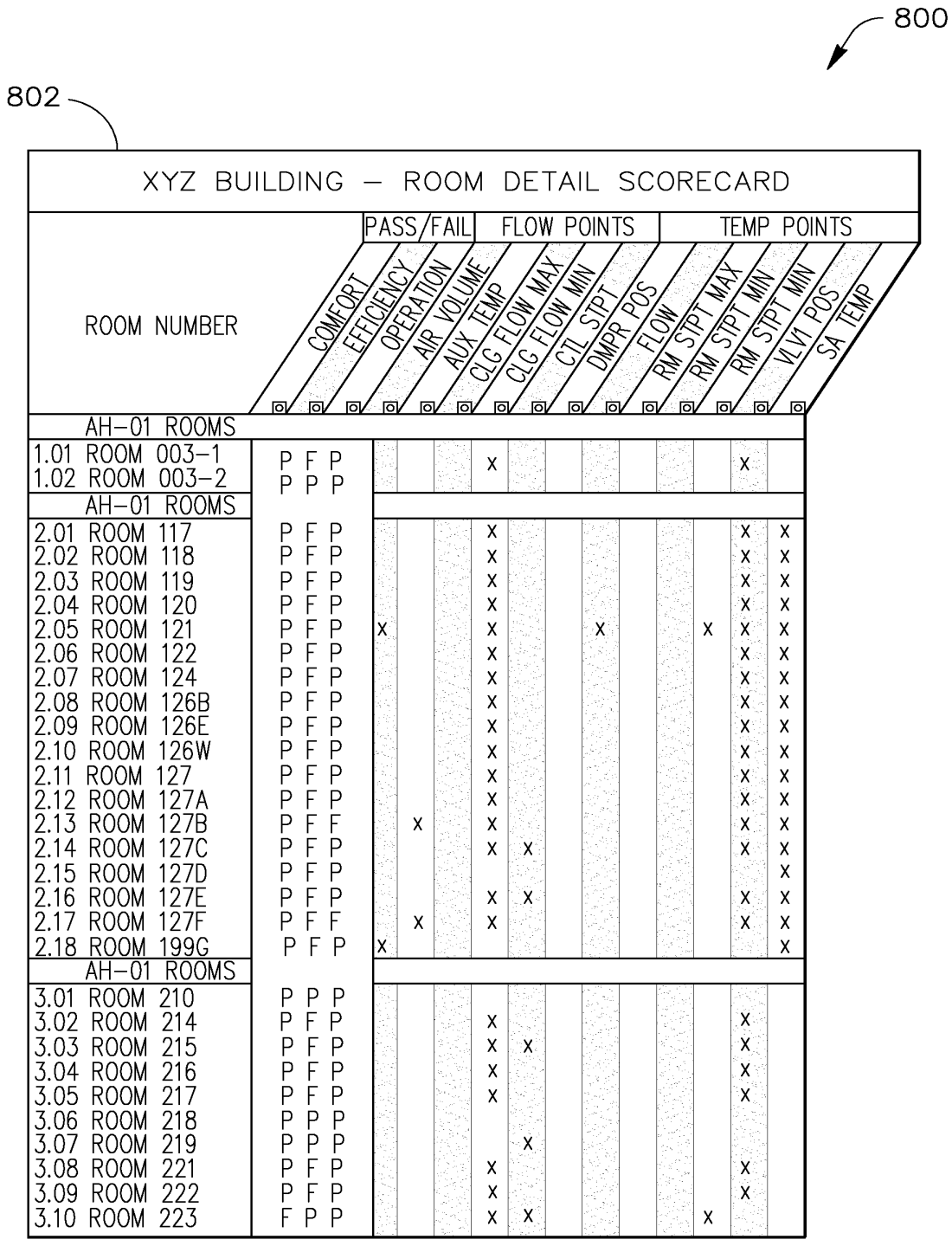


Figure 7D



XYZ BUILDING – ROOM DETAIL SCORECARD

ROOM NUMBER	PASS/FAIL	COMFORT	EFFICIENCY	OPERATION	FLOW POINTS: AIR VOLUME	AUX TEMP	CLG FLOW MAX	CLG FLOW MIN	CTL STPT	DMPR POS	FLOW	TEMP POINTS: RM STPT MAX	RM STPT MIN	RM STPT MIN	VLV1 POS	SA TEMP
AH–01 ROOMS																
1.01 ROOM 003–1	P F P					x								x		
1.02 ROOM 003–2	P P P															
AH–01 ROOMS																
2.01 ROOM 117	P F P					x								x	x	
2.02 ROOM 118	P F P					x								x	x	
2.03 ROOM 119	P F P					x								x	x	
2.04 ROOM 120	P F P					x								x	x	
2.05 ROOM 121	P F P	x				x				x			x	x	x	
2.06 ROOM 122	P F P					x								x	x	
2.07 ROOM 124	P F P					x								x	x	
2.08 ROOM 126B	P F P					x								x	x	
2.09 ROOM 126E	P F P					x								x	x	
2.10 ROOM 126W	P F P					x								x	x	
2.11 ROOM 127	P F P					x								x	x	
2.12 ROOM 127A	P F P					x								x	x	
2.13 ROOM 127B	P F F			x		x								x	x	
2.14 ROOM 127C	P F P					x	x							x	x	
2.15 ROOM 127D	P F P														x	
2.16 ROOM 127E	P F P					x	x							x	x	
2.17 ROOM 127F	P F F			x		x								x	x	
2.18 ROOM 199G	P F P	x													x	
AH–01 ROOMS																
3.01 ROOM 210	P P P															
3.02 ROOM 214	P F P					x								x		
3.03 ROOM 215	P F P					x	x							x		
3.04 ROOM 216	P F P					x								x		
3.05 ROOM 217	P F P					x								x		
3.06 ROOM 218	P P P															
3.07 ROOM 219	P P P						x									
3.08 ROOM 221	P F P					x								x		
3.09 ROOM 222	P F P					x								x		
3.10 ROOM 223	F P P					x	x						x			

Figure 8A

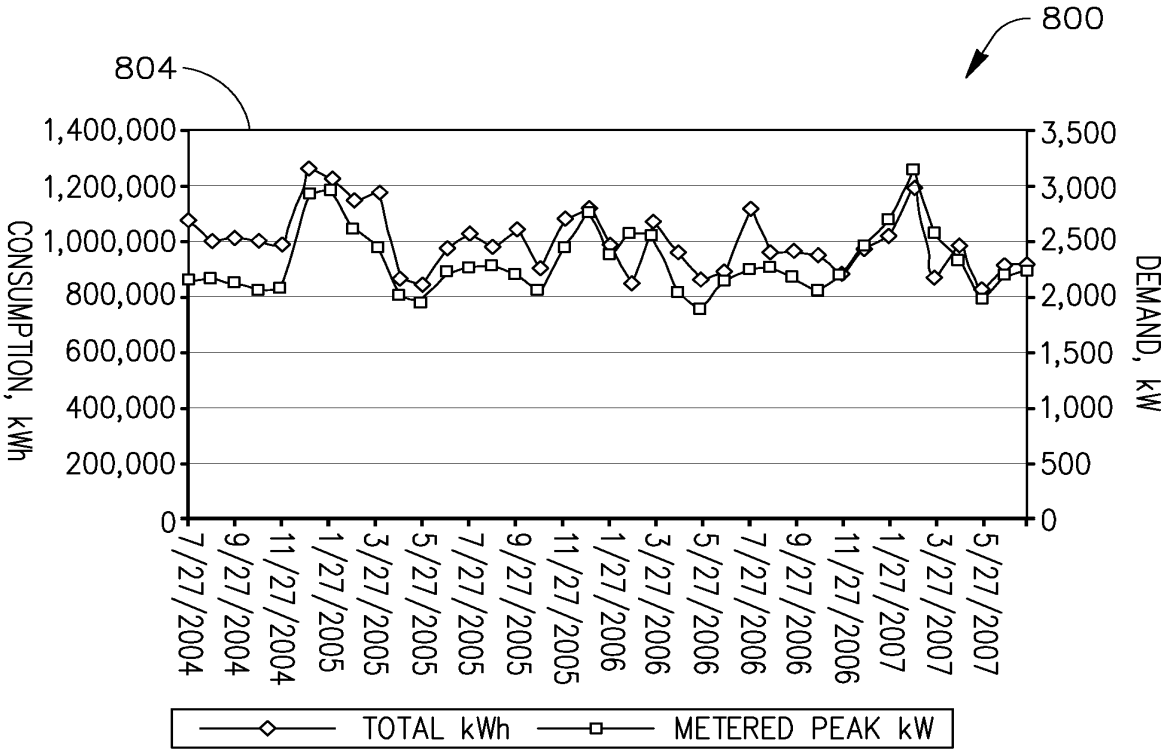


Figure 8B

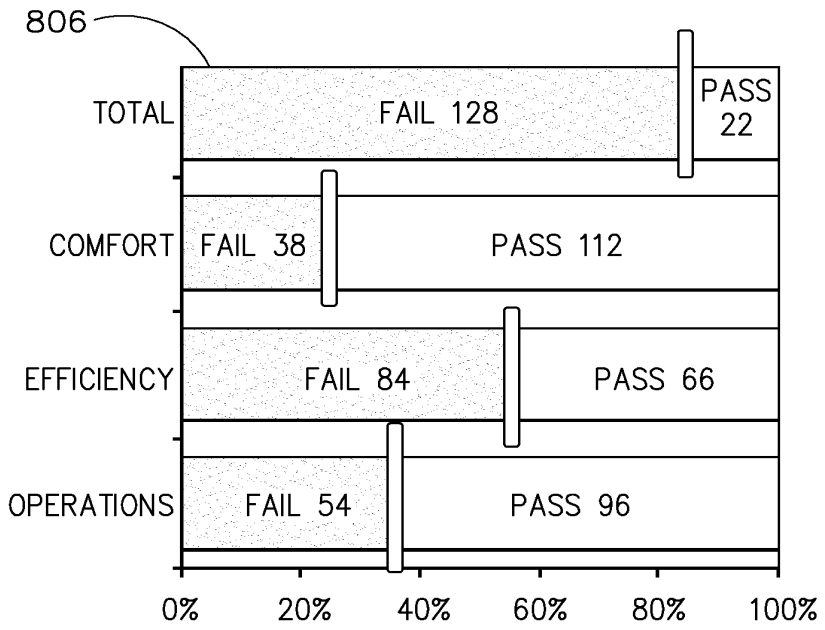
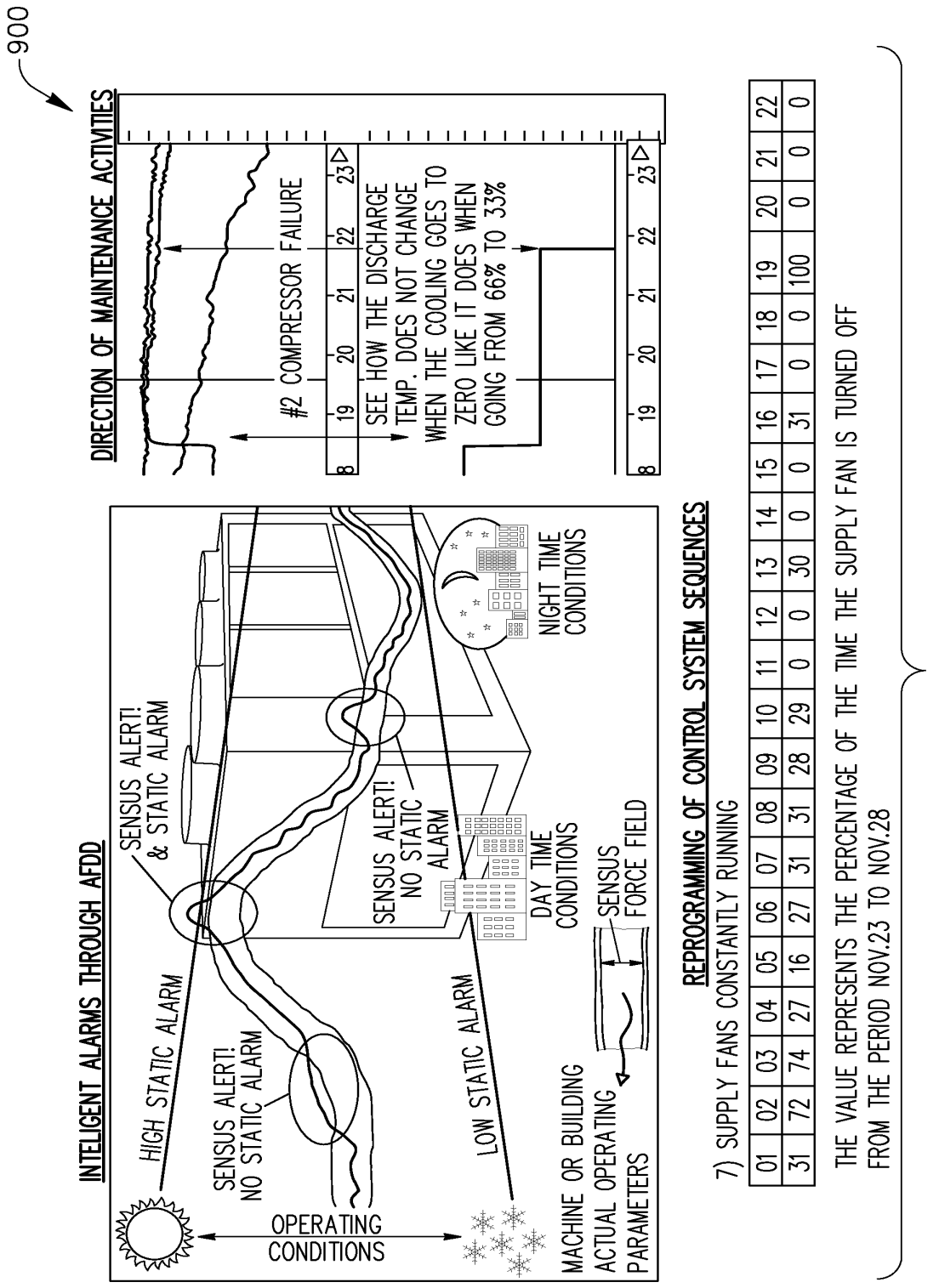


Figure 8C



01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
31	72	74	27	16	27	31	31	28	29	0	0	30	0	0	31	0	0	100	0	0	0

Figure 9

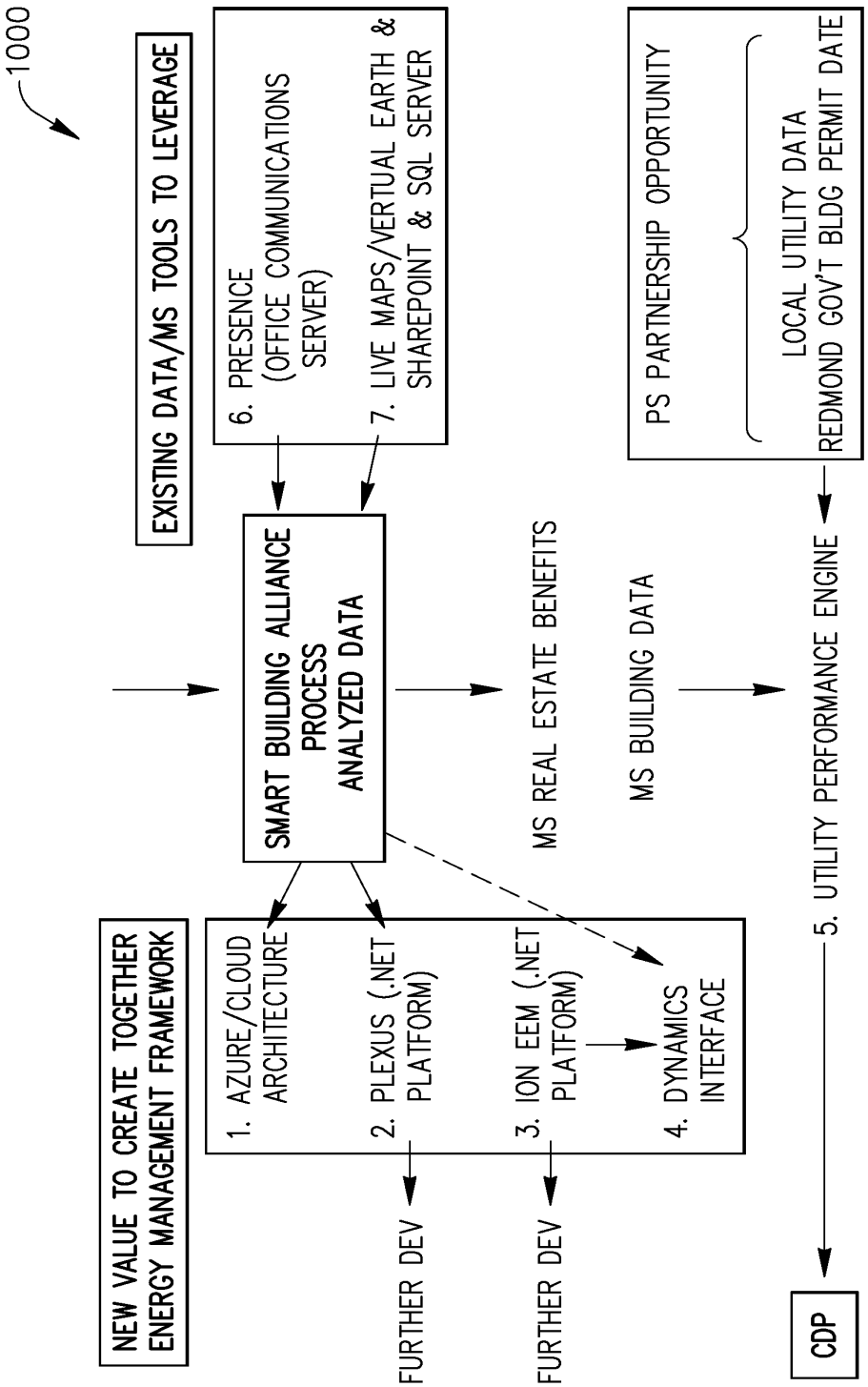

1000
EXISTING DATA/MS TOOLS TO LEVERAGE
6. PRESENCE (OFFICE COMMUNICATIONS SERVER)
7. LIVE MAPS/VERTUAL EARTH & SHAREPOINT & SQL SERVER
PS PARTNERSHIP OPPORTUNITY
LOCAL UTILITY DATA
REDMOND GOV'T BLDG PERMIT DATE
SMART BUILDING ALLIANCE PROCESS ANALYZED DATA
MS REAL ESTATE BENEFITS
MS BUILDING DATA
5. UTILITY PERFORMANCE ENGINE
NEW VALUE TO CREATE TOGETHER ENERGY MANAGEMENT FRAMEWORK
1. AZURE/CLOUD ARCHITECTURE
2. PLEXUS (.NET PLATFORM)
3. ION EEM (.NET PLATFORM)
4. DYNAMICS INTERFACE
FURTHER DEV
FURTHER DEV
CDP

Figure 10

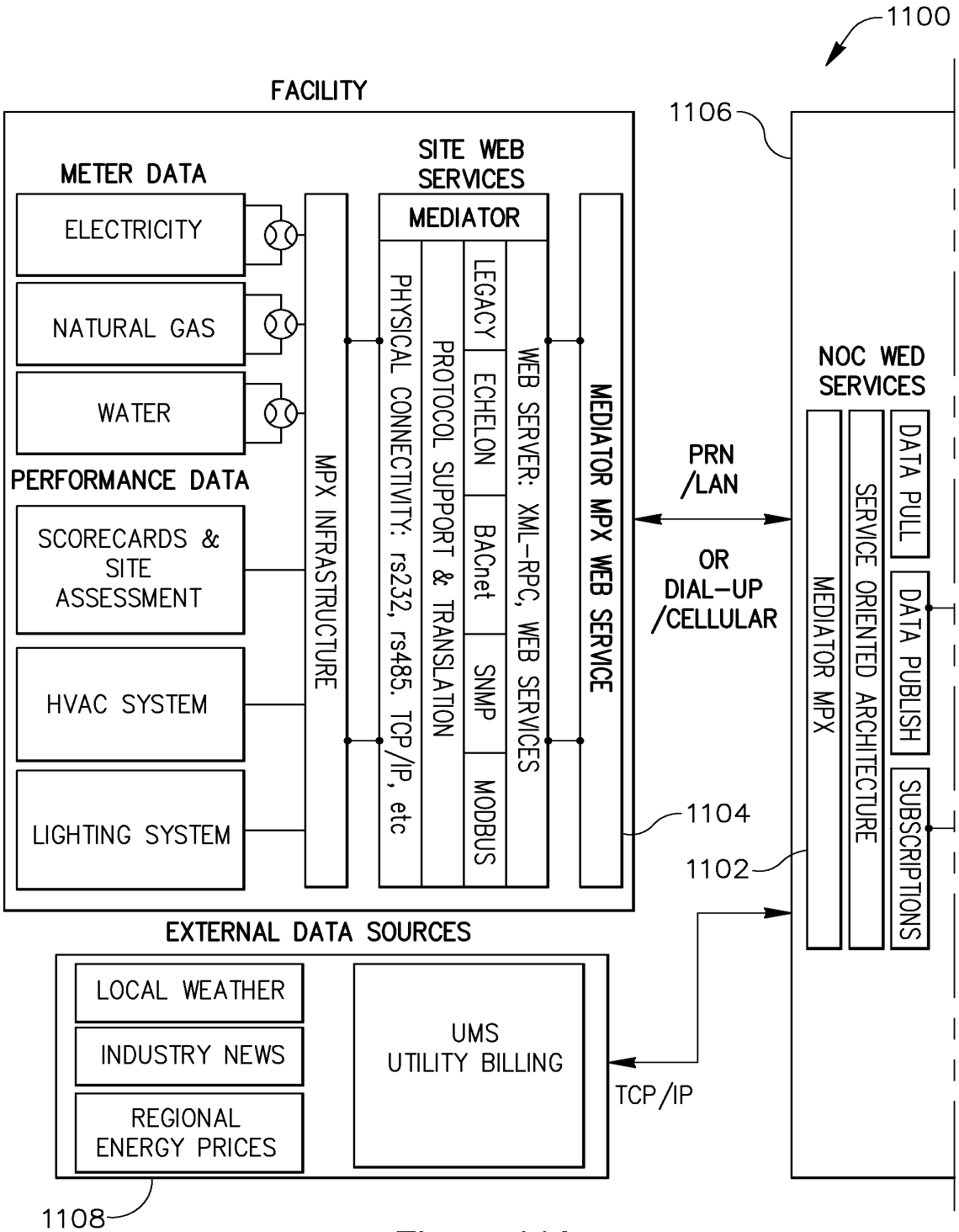

1100
FACILITY
1106
METER DATA
ELECTRICITY
NATURAL GAS
WATER
PERFORMANCE DATA
SCORECARDS & SITE ASSESSMENT
HVAC SYSTEM
LIGHTING SYSTEM
MPX INFRASTRUCTURE
SITE WEB SERVICES
MEDIATOR
PHYSICAL CONNECTIVITY: rs232, rs485. TCP/IP, etc
PROTOCOL SUPPORT & TRANSLATION
LEGACY
ECHELON
BACnet
SNMP
MODBUS
WEB SERVER: XML-RPC, WEB SERVICES
MEDIATOR MPX WEB SERVICE
PRN /LAN
OR DIAL-UP /CELLULAR
NOC WED SERVICES
MEDIATOR MPX
SERVICE ORIENTED ARCHITECTURE
DATA PULL
DATA PUBLISH
SUBSCRIPTIONS
1104
1102
EXTERNAL DATA SOURCES
LOCAL WEATHER
INDUSTRY NEWS
REGIONAL ENERGY PRICES
UMS UTILITY BILLING
TCP/IP
1108

Figure 11A

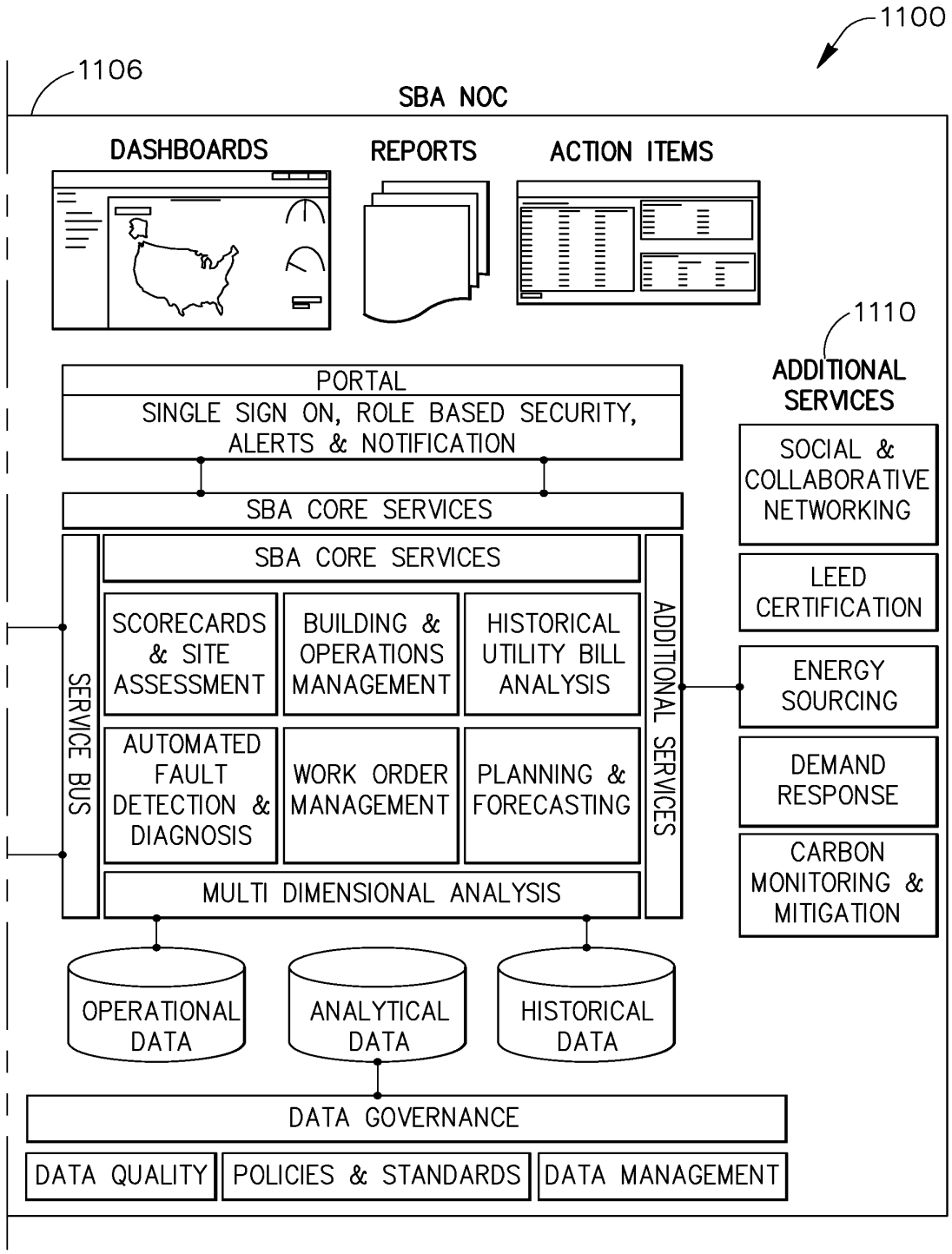

1100
1106
SBA NOC
DASHBOARDS
REPORTS
ACTION ITEMS
1110
ADDITIONAL SERVICES
PORTAL
SINGLE SIGN ON, ROLE BASED SECURITY, ALERTS & NOTIFICATION
SBA CORE SERVICES
SBA CORE SERVICES
SERVICE BUS
SCORECARDS & SITE ASSESSMENT
BUILDING & OPERATIONS MANAGEMENT
HISTORICAL UTILITY BILL ANALYSIS
AUTOMATED FAULT DETECTION & DIAGNOSIS
WORK ORDER MANAGEMENT
PLANNING & FORECASTING
MULTI DIMENSIONAL ANALYSIS
ADDITIONAL SERVICES
SOCIAL & COLLABORATIVE NETWORKING
LEED CERTIFICATION
ENERGY SOURCING
DEMAND RESPONSE
CARBON MONITORING & MITIGATION
OPERATIONAL DATA
ANALYTICAL DATA
HISTORICAL DATA
DATA GOVERNANCE
DATA QUALITY
POLICIES & STANDARDS
DATA MANAGEMENT

Figure 11B

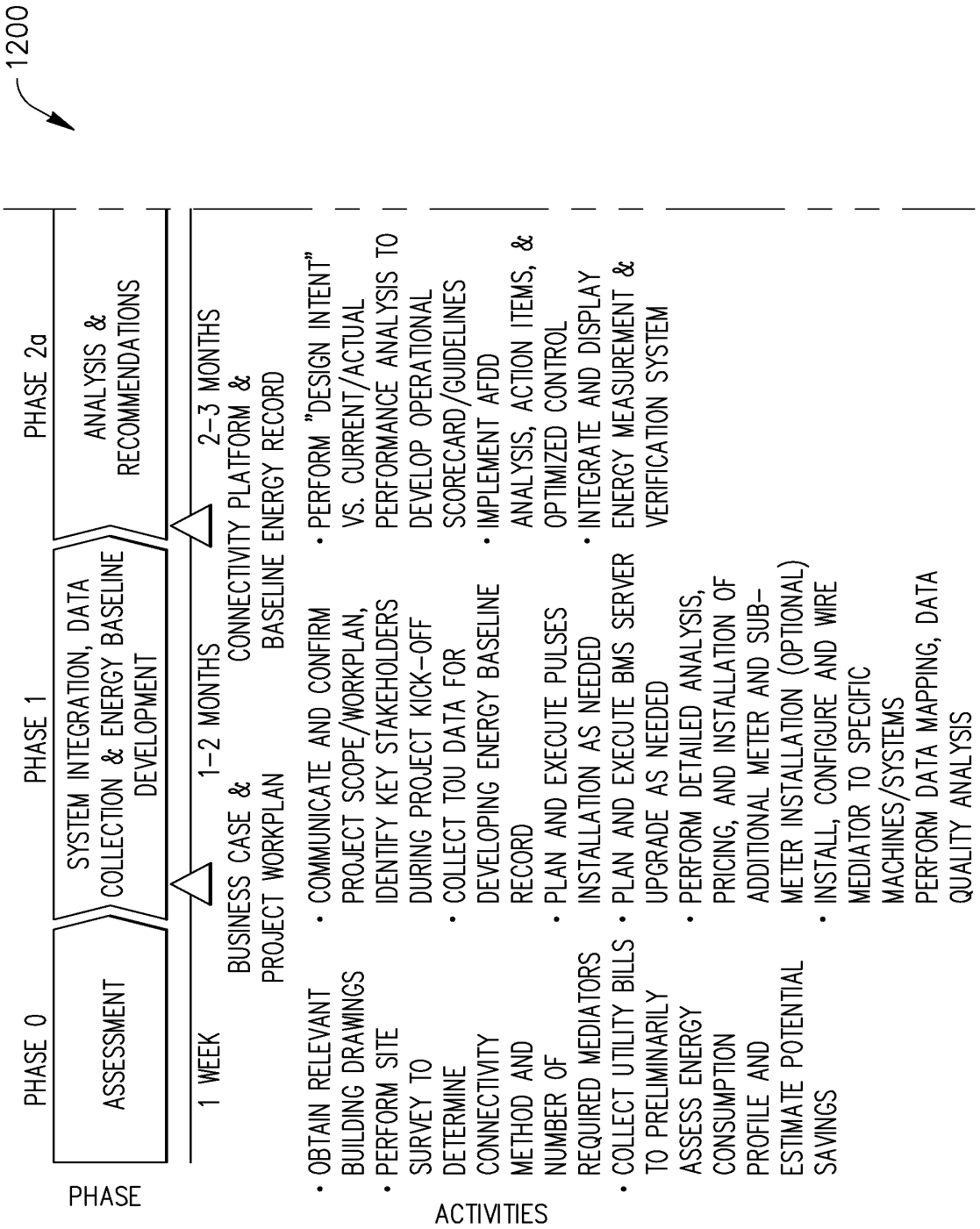

1200
PHASE
PHASE 0
ASSESSMENT
PHASE 1
SYSTEM INTEGRATION, DATA COLLECTION & ENERGY BASELINE DEVELOPMENT
PHASE 2a
ANALYSIS & RECOMMENDATIONS
ACTIVITIES
1 WEEK
BUSINESS CASE & PROJECT WORKPLAN
1–2 MONTHS
CONNECTIVITY PLATFORM & BASELINE ENERGY RECORD
2–3 MONTHS
• OBTAIN RELEVANT BUILDING DRAWINGS
• PERFORM SITE SURVEY TO DETERMINE CONNECTIVITY METHOD AND NUMBER OF REQUIRED MEDIATORS
• COLLECT UTILITY BILLS TO PRELIMINARILY ASSESS ENERGY CONSUMPTION PROFILE AND ESTIMATE POTENTIAL SAVINGS
• COMMUNICATE AND CONFIRM PROJECT SCOPE/WORKPLAN, IDENTIFY KEY STAKEHOLDERS DURING PROJECT KICK-OFF
• COLLECT TOU DATA FOR DEVELOPING ENERGY BASELINE RECORD
• PLAN AND EXECUTE PULSES INSTALLATION AS NEEDED
• PLAN AND EXECUTE BMS SERVER UPGRADE AS NEEDED
• PERFORM DETAILED ANALYSIS, PRICING, AND INSTALLATION OF ADDITIONAL METER AND SUB-METER INSTALLATION (OPTIONAL)
• INSTALL, CONFIGURE AND WIRE MEDIATOR TO SPECIFIC MACHINES/SYSTEMS
PERFORM DATA MAPPING, DATA QUALITY ANALYSIS
• PERFORM "DESIGN INTENT" VS. CURRENT/ACTUAL PERFORMANCE ANALYSIS TO DEVELOP OPERATIONAL SCORECARD/GUIDELINES
• IMPLEMENT AFDD ANALYSIS, ACTION ITEMS, & OPTIMIZED CONTROL
• INTEGRATE AND DISPLAY ENERGY MEASUREMENT & VERIFICATION SYSTEM

Figure 12A

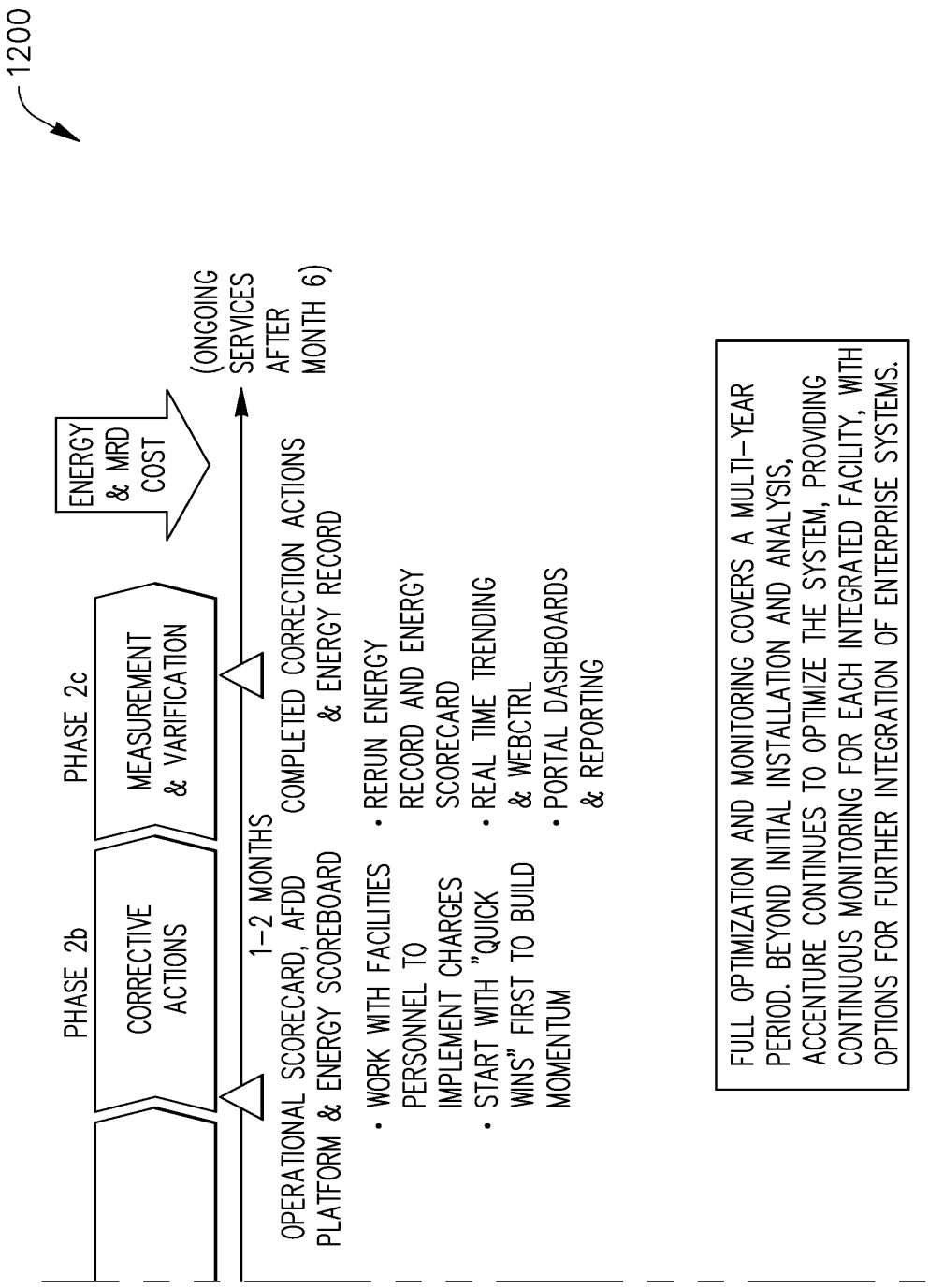

1200
PHASE 2b
CORRECTIVE ACTIONS
PHASE 2c
MEASUREMENT & VARIFICATION
ENERGY & MRD COST
(ONGOING SERVICES AFTER MONTH 6)
1–2 MONTHS
OPERATIONAL SCORECARD, AFDD PLATFORM & ENERGY SCOREBOARD
• WORK WITH FACILITIES PERSONNEL TO IMPLEMENT CHARGES
• START WITH "QUICK WINS" FIRST TO BUILD MOMENTUM
COMPLETED CORRECTION ACTIONS & ENERGY RECORD
• RERUN ENERGY RECORD AND ENERGY SCORECARD
• REAL TIME TRENDING & WEBCTRL
• PORTAL DASHBOARDS & REPORTING
FULL OPTIMIZATION AND MONITORING COVERS A MULTI–YEAR PERIOD. BEYOND INITIAL INSTALLATION AND ANALYSIS, ACCENTURE CONTINUES TO OPTIMIZE THE SYSTEM, PROVIDING CONTINUOUS MONITORING FOR EACH INTEGRATED FACILITY, WITH OPTIONS FOR FURTHER INTEGRATION OF ENTERPRISE SYSTEMS.

Figure 12B

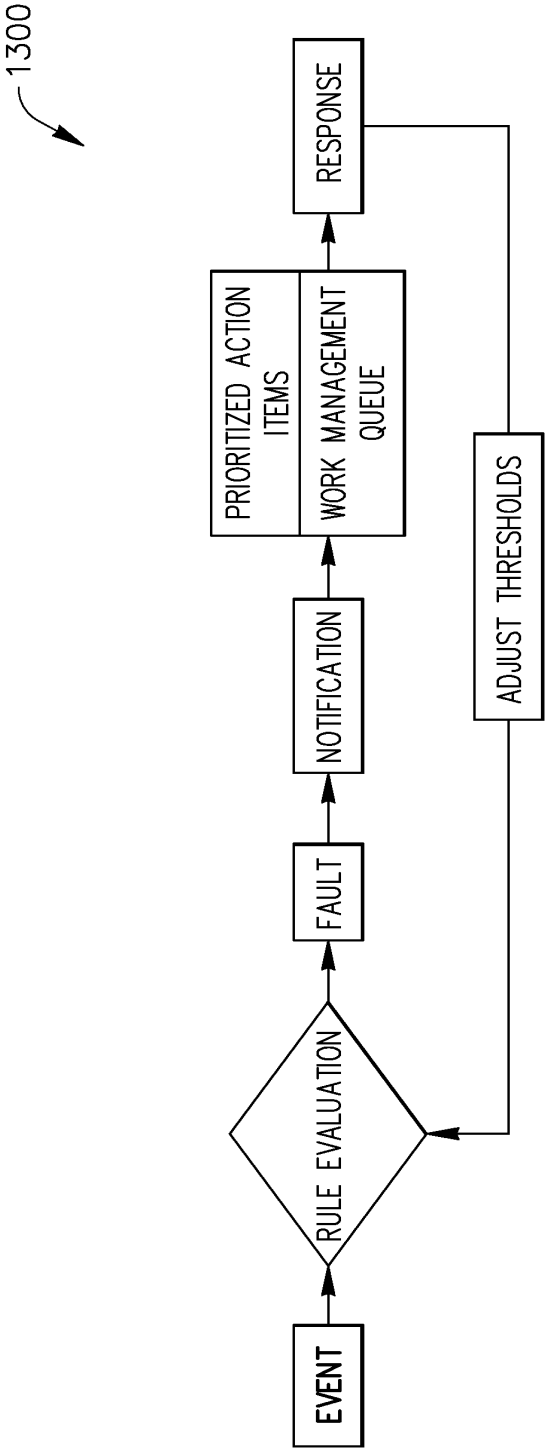

1300
EVENT
RULE EVALUATION
FAULT
NOTIFICATION
PRIORITIZED ACTION ITEMS
WORK MANAGEMENT QUEUE
RESPONSE
ADJUST THRESHOLDS

Figure 13

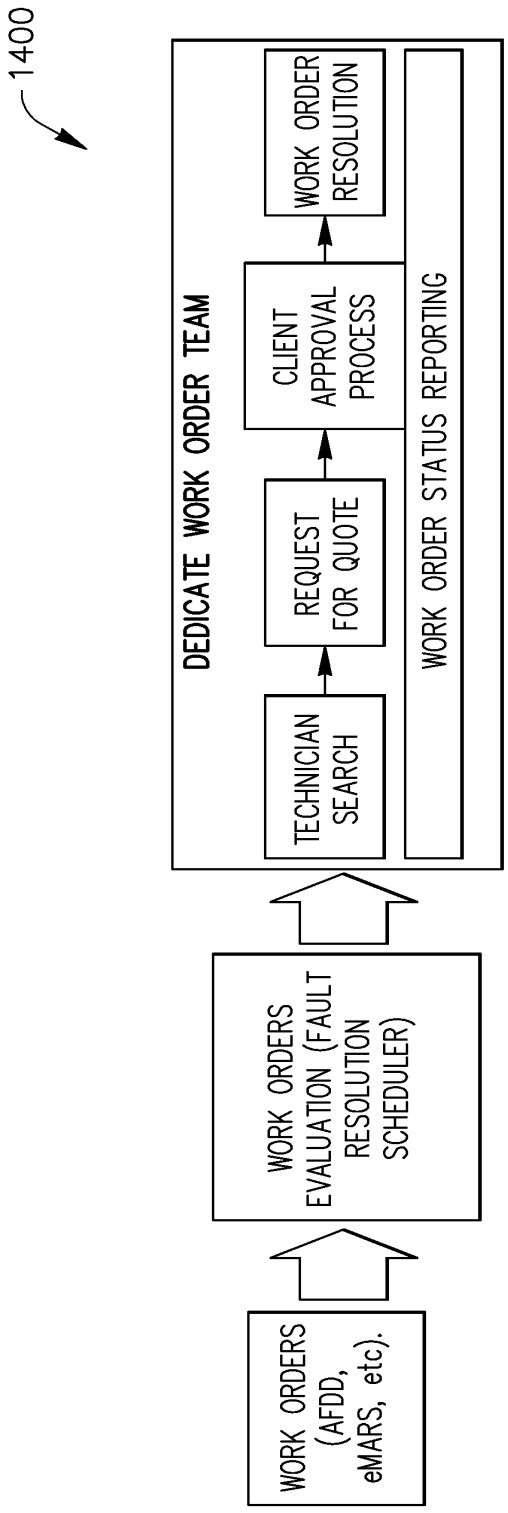

1400
WORK ORDERS (AFDD, eMARS, etc).
WORK ORDERS EVALUATION (FAULT RESOLUTION SCHEDULER)
DEDICATE WORK ORDER TEAM
TECHNICIAN SEARCH
REQUEST FOR QUOTE
CLIENT APPROVAL PROCESS
WORK ORDER RESOLUTION
WORK ORDER STATUS REPORTING

Figure 14

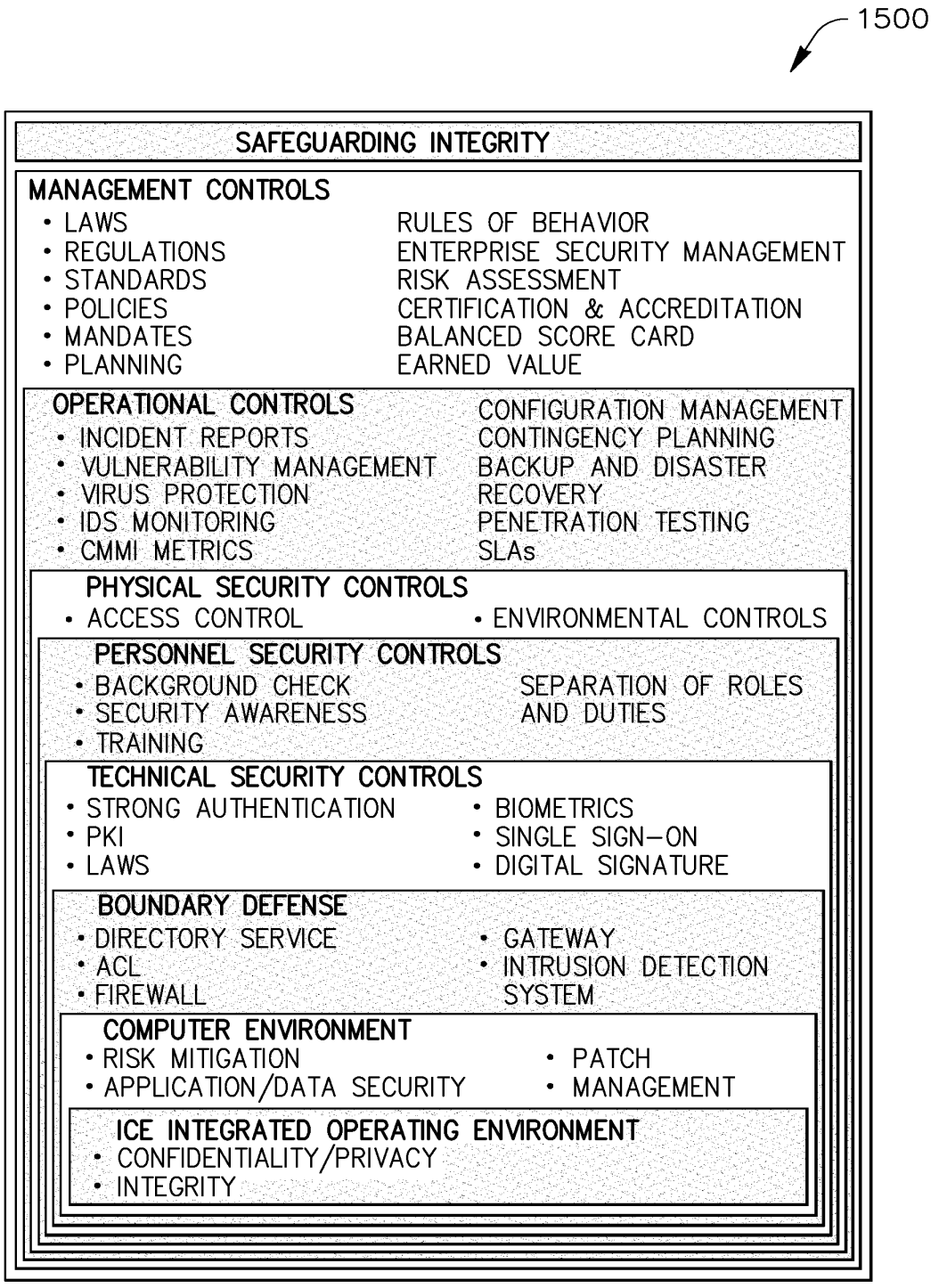

1500
SAFEGUARDING INTEGRITY
MANAGEMENT CONTROLS
• LAWS
• REGULATIONS
• STANDARDS
• POLICIES
• MANDATES
• PLANNING
RULES OF BEHAVIOR
ENTERPRISE SECURITY MANAGEMENT
RISK ASSESSMENT
CERTIFICATION & ACCREDITATION
BALANCED SCORE CARD
EARNED VALUE
OPERATIONAL CONTROLS
• INCIDENT REPORTS
• VULNERABILITY MANAGEMENT
• VIRUS PROTECTION
• IDS MONITORING
• CMMI METRICS
CONFIGURATION MANAGEMENT
CONTINGENCY PLANNING
BACKUP AND DISASTER RECOVERY
PENETRATION TESTING
SLAs
PHYSICAL SECURITY CONTROLS
• ACCESS CONTROL
• ENVIRONMENTAL CONTROLS
PERSONNEL SECURITY CONTROLS
• BACKGROUND CHECK
• SECURITY AWARENESS
• TRAINING
SEPARATION OF ROLES AND DUTIES
TECHNICAL SECURITY CONTROLS
• STRONG AUTHENTICATION
• PKI
• LAWS
• BIOMETRICS
• SINGLE SIGN-ON
• DIGITAL SIGNATURE
BOUNDARY DEFENSE
• DIRECTORY SERVICE
• ACL
• FIREWALL
• GATEWAY
• INTRUSION DETECTION SYSTEM
COMPUTER ENVIRONMENT
• RISK MITIGATION
• APPLICATION/DATA SECURITY
• PATCH
• MANAGEMENT
ICE INTEGRATED OPERATING ENVIRONMENT
• CONFIDENTIALITY/PRIVACY
• INTEGRITY

Figure 15

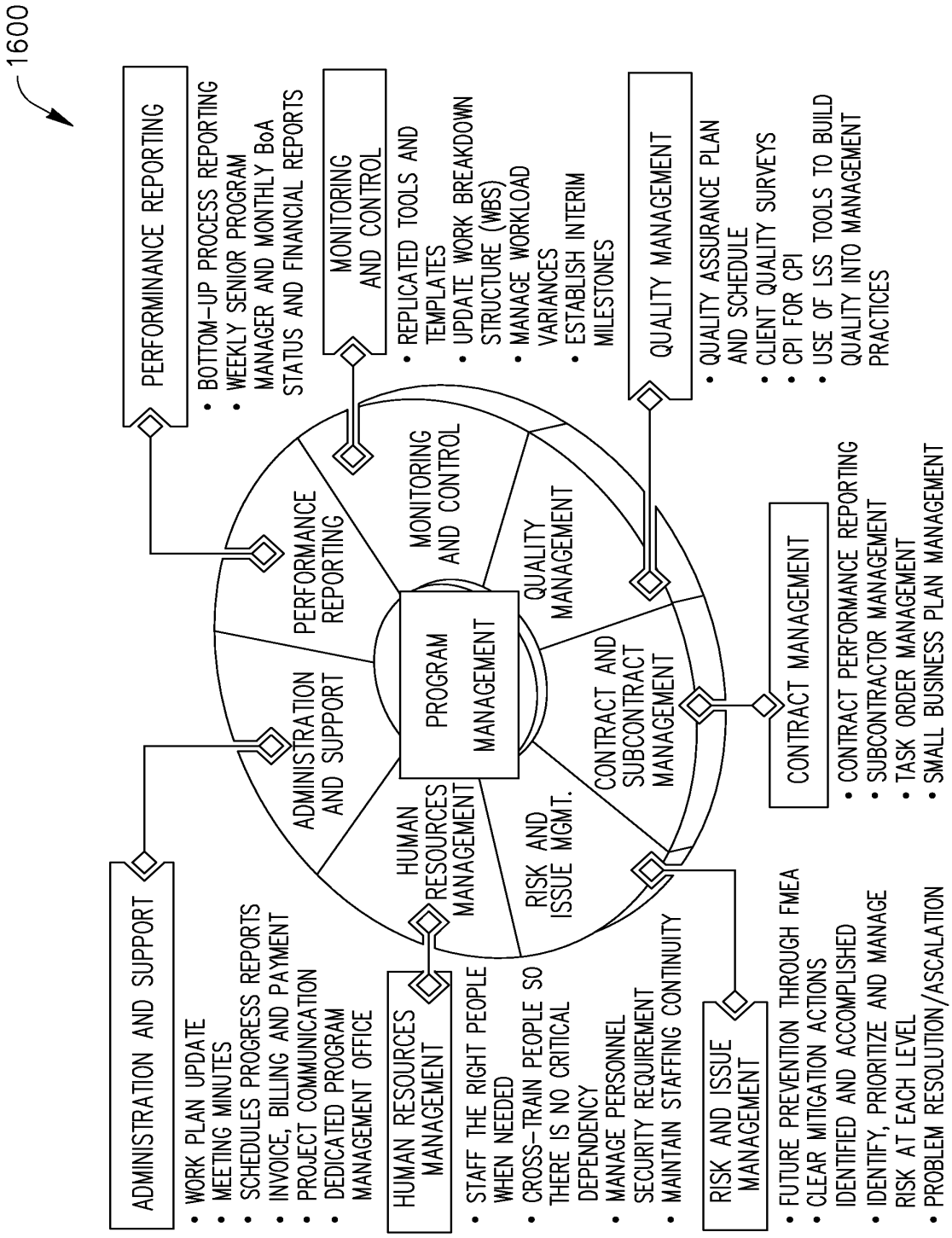

1600
PERFORMANCE REPORTING
• BOTTOM-UP PROCESS REPORTING
• WEEKLY SENIOR PROGRAM MANAGER AND MONTHLY BoA STATUS AND FINANCIAL REPORTS
MONITORING AND CONTROL
• REPLICATED TOOLS AND TEMPLATES
• UPDATE WORK BREAKDOWN STRUCTURE (WBS)
• MANAGE WORKLOAD VARIANCES
• ESTABLISH INTERIM MILESTONES
QUALITY MANAGEMENT
• QUALITY ASSURANCE PLAN AND SCHEDULE
• CLIENT QUALITY SURVEYS
• CPI FOR CPI
• USE OF LSS TOOLS TO BUILD QUALITY INTO MANAGEMENT PRACTICES
CONTRACT MANAGEMENT
• CONTRACT PERFORMANCE REPORTING
• SUBCONTRACTOR MANAGEMENT
• TASK ORDER MANAGEMENT
• SMALL BUSINESS PLAN MANAGEMENT
RISK AND ISSUE MANAGEMENT
• FUTURE PREVENTION THROUGH FMEA
• CLEAR MITIGATION ACTIONS IDENTIFIED AND ACCOMPLISHED
• IDENTIFY, PRIORITIZE AND MANAGE RISK AT EACH LEVEL
• PROBLEM RESOLUTION/ASCALATION
HUMAN RESOURCES MANAGEMENT
• STAFF THE RIGHT PEOPLE WHEN NEEDED
• CROSS-TRAIN PEOPLE SO THERE IS NO CRITICAL DEPENDENCY
• MANAGE PERSONNEL SECURITY REQUIREMENT
• MAINTAIN STAFFING CONTINUITY
ADMINISTRATION AND SUPPORT
• WORK PLAN UPDATE
• MEETING MINUTES
• SCHEDULES PROGRESS REPORTS
• INVOICE, BILLING AND PAYMENT
• PROJECT COMMUNICATION
• DEDICATED PROGRAM MANAGEMENT OFFICE
PROGRAM MANAGEMENT
PERFORMANCE REPORTING
MONITORING AND CONTROL
QUALITY MANAGEMENT
CONTRACT AND SUBCONTRACT MANAGEMENT
RISK AND ISSUE MGMT.
HUMAN RESOURCES MANAGEMENT
ADMINISTRATION AND SUPPORT

Figure 16

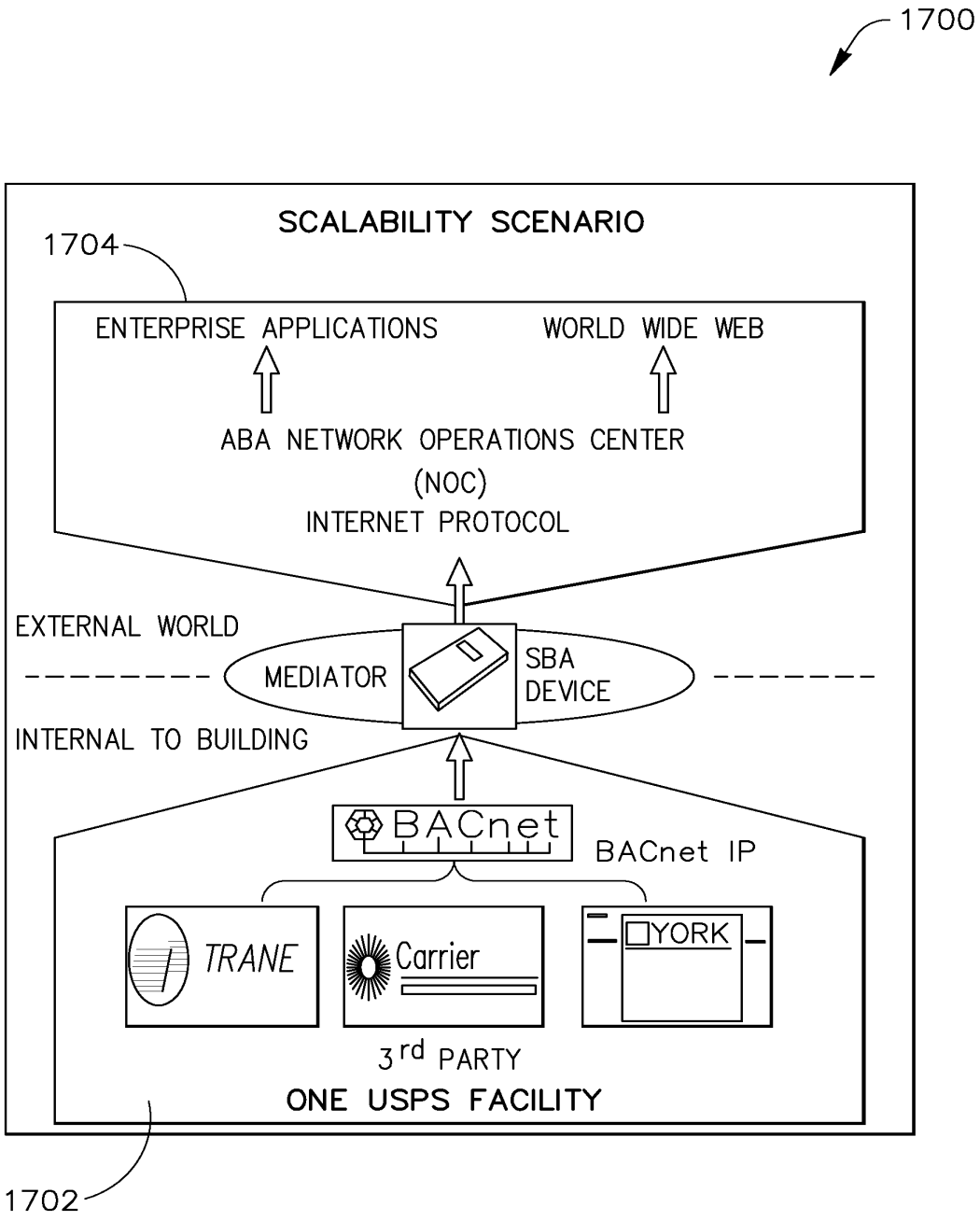

1700
SCALABILITY SCENARIO
1704
ENTERPRISE APPLICATIONS
WORLD WIDE WEB
ABA NETWORK OPERATIONS CENTER
(NOC)
INTERNET PROTOCOL
EXTERNAL WORLD
MEDIATOR
SBA
DEVICE
INTERNAL TO BUILDING
BACnet
BACnet IP
TRANE
Carrier
YORK
3rd PARTY
ONE USPS FACILITY
1702

Figure 17

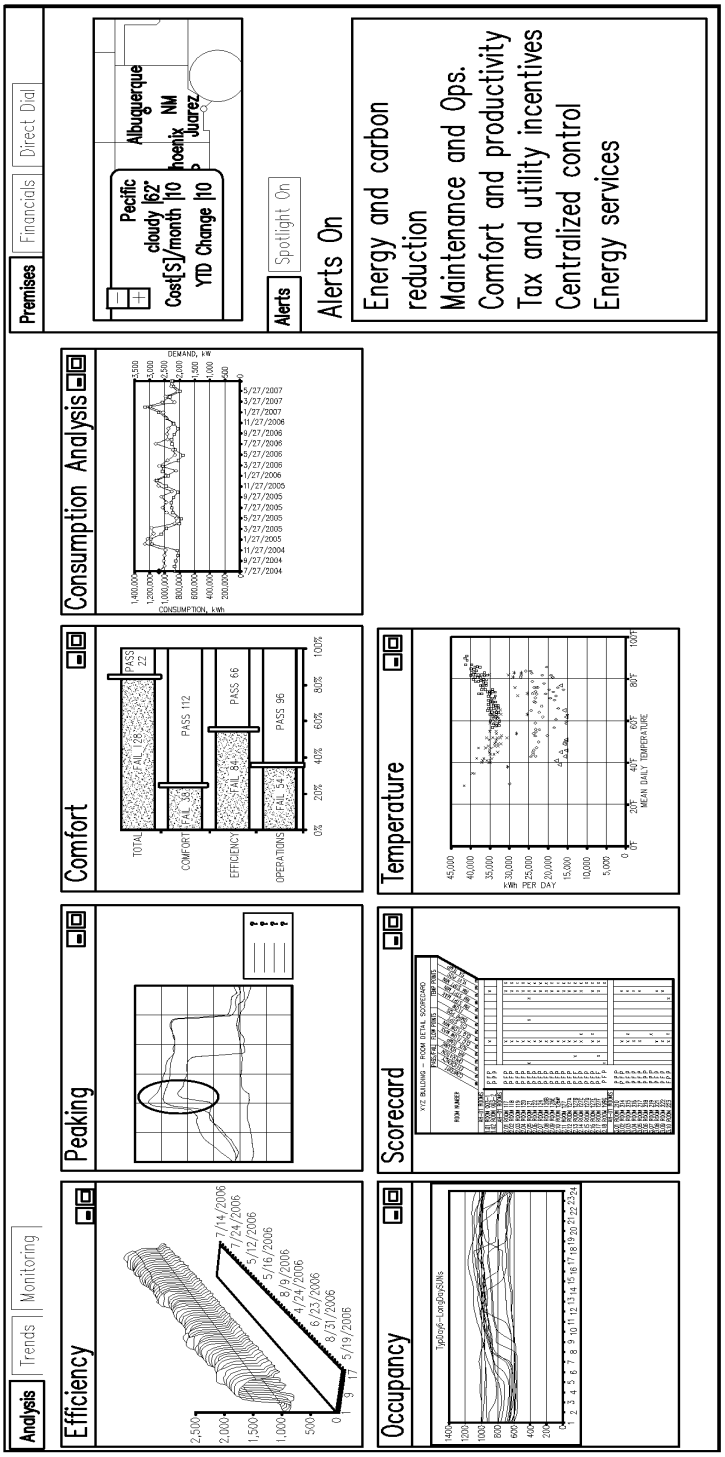

1800
Analysis
Trends
Monitoring
Premises
Financials
Direct Dial
Efficiency
Peaking
Comfort
Consumption Analysis
Occupancy
Scorecard
Temperature
Albuquerque
Alerts
Spotlight On
Alerts On
Energy and carbon reduction
Maintenance and Ops.
Comfort and productivity
Tax and utility incentives
Centralized control
Energy services

Figure 18

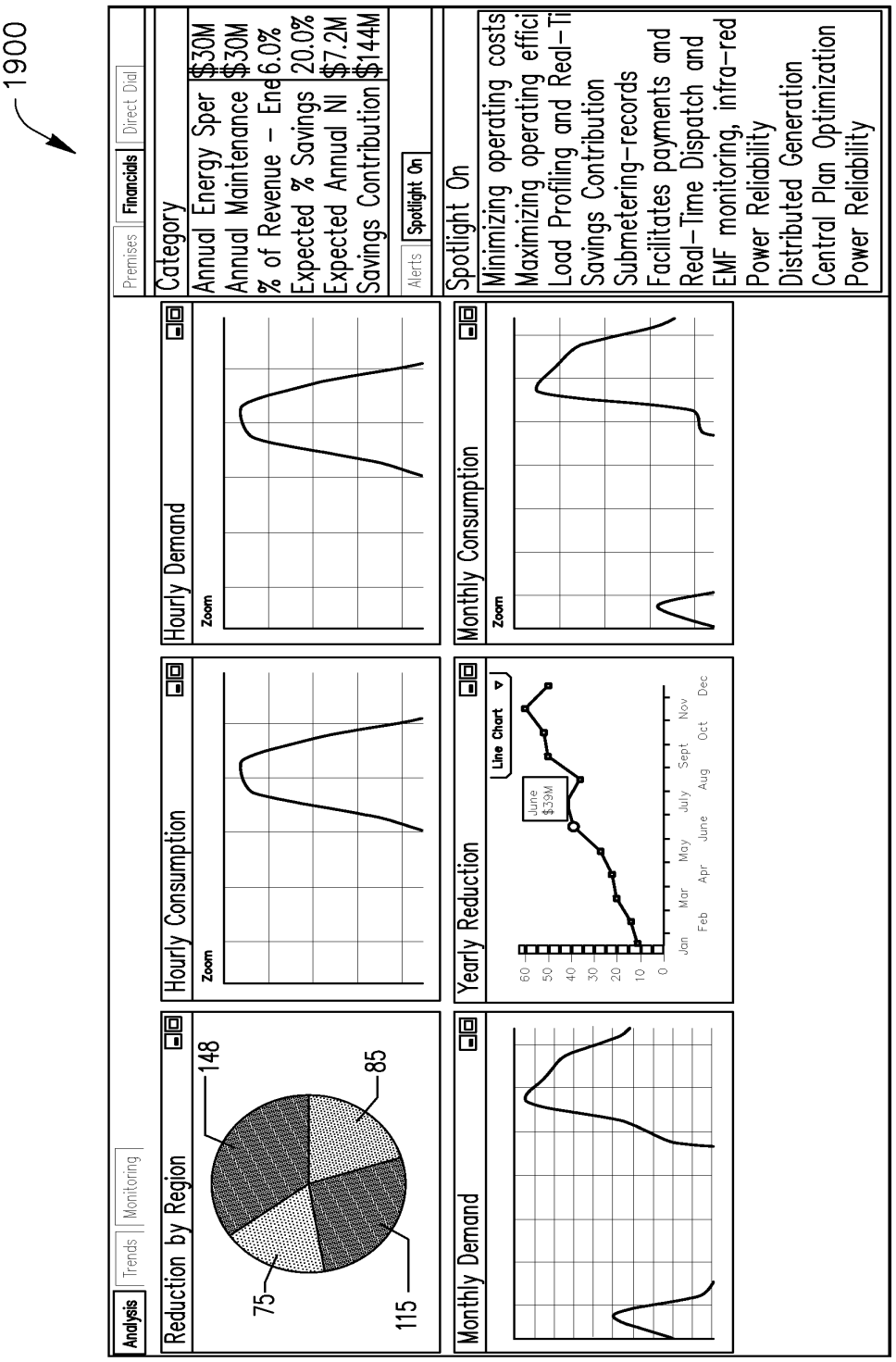

1900
Analysis
Trends
Monitoring
Premises
Financials
Direct Dial
Reduction by Region
148
85
75
115
Hourly Consumption
Zoom
Hourly Demand
Zoom
Monthly Demand
Yearly Reduction
Line Chart
June
$39M
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
Oct
Nov
Dec
Monthly Consumption
Zoom
Category
Annual Energy Sper $30M
Annual Maintenance $30M
% of Revenue – Ene 6.0%
Expected % Savings 20.0%
Expected Annual NI $7.2M
Savings Contribution $144M
Alerts
Spotlight On
Spotlight On
Minimizing operating costs
Maximizing operating effici
Load Profiling and Real-Ti
Savings Contribution
Submetering-records
Facilitates payments and
Real-Time Dispatch and
EMF monitoring, infra-red
Power Reliability
Distributed Generation
Central Plan Optimization
Power Reliability

Figure 19

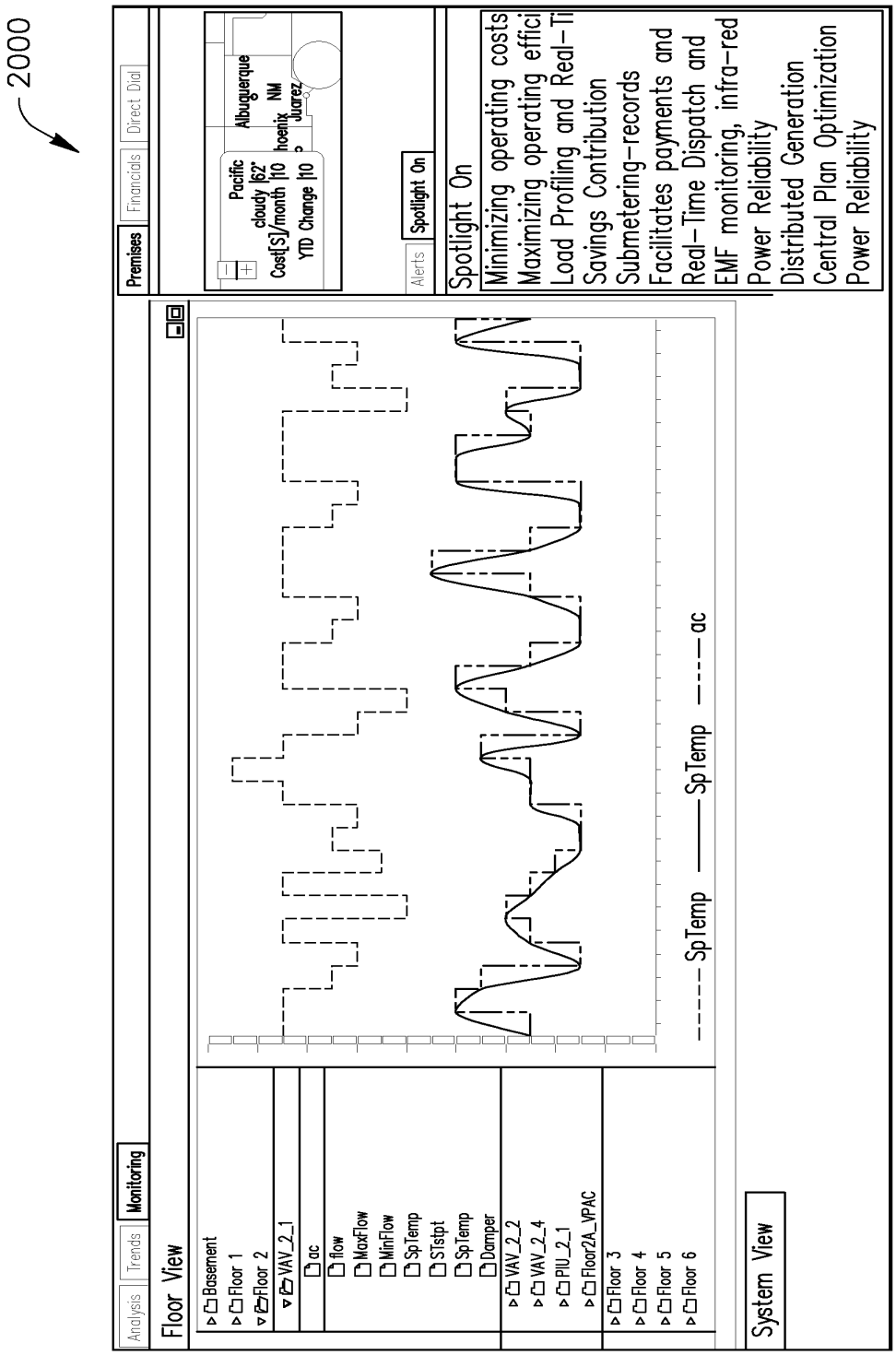

2000
Analysis
Trends
Monitoring
Floor View
Basement
Floor 1
Floor 2
VAV_2_1
ac
flow
MaxFlow
MinFlow
SpTemp
STstpt
SpTemp
Damper
VAV_2_2
VAV_2_4
PIU_2_1
Floor2A_VPAC
Floor 3
Floor 4
Floor 5
Floor 6
System View
SpTemp
SpTemp
ac
Premises
Financials
Direct Dial
Albuquerque
Pacific
cloudy 62°
Cost[$]/month 110
YTD Change 110
Alerts
Spotlight On
Spotlight On
Minimizing operating costs
Maximizing operating effici
Load Profiling and Real-Ti
Savings Contribution
Submetering-records
Facilitates payments and
Real-Time Dispatch and
EMF monitoring, infra-red
Power Reliability
Distributed Generation
Central Plan Optimization
Power Reliability

Figure 20

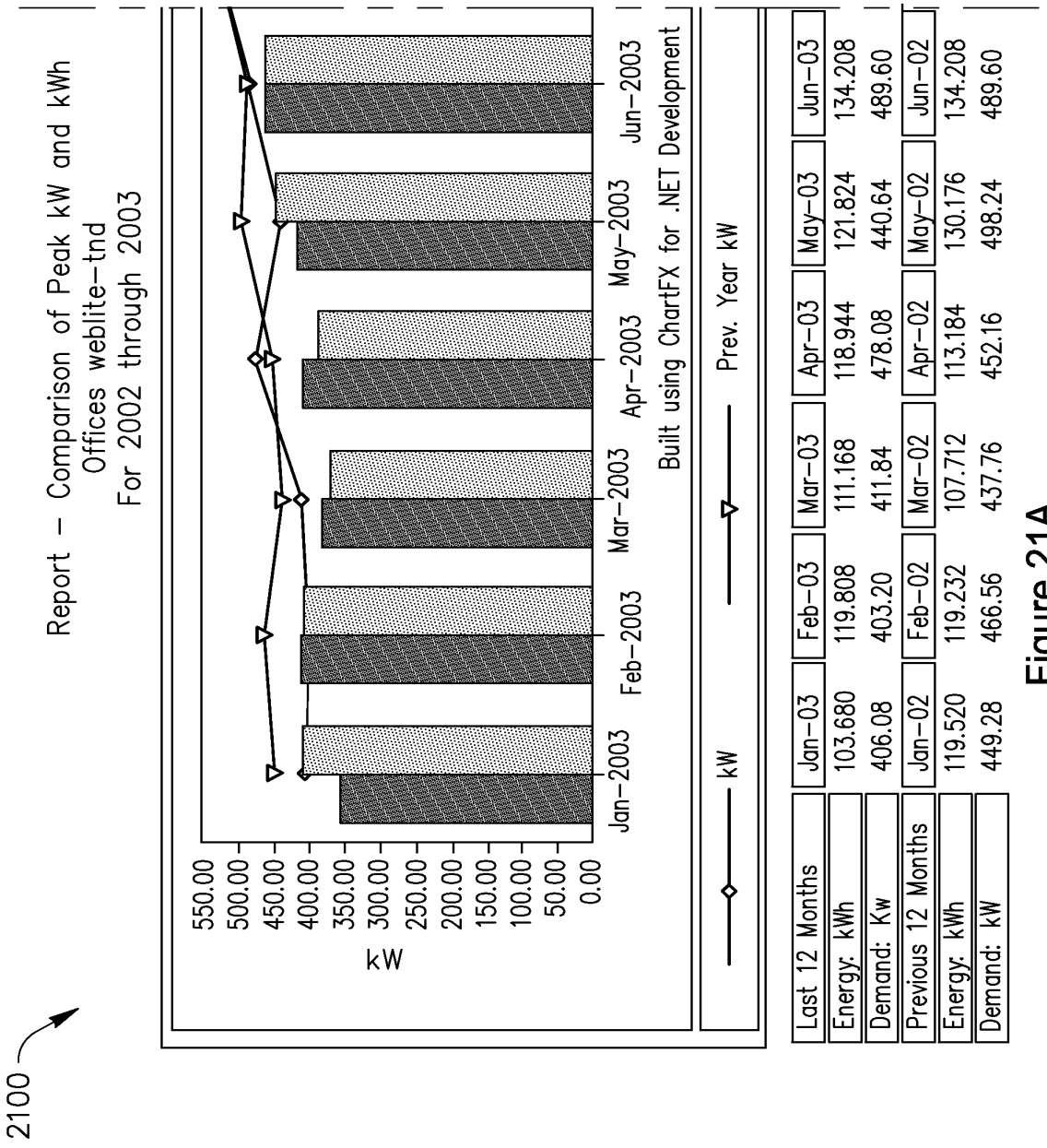
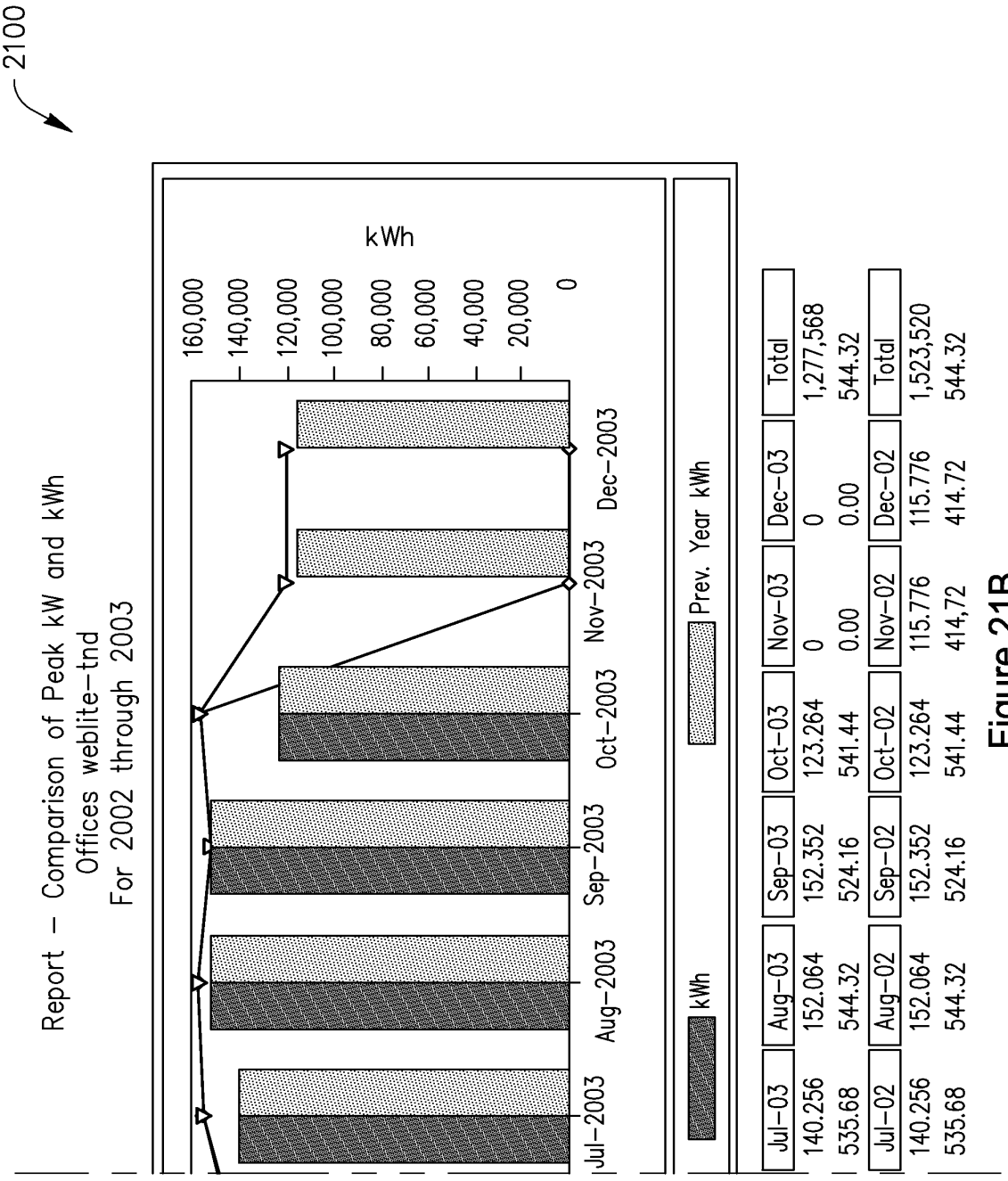

2100
Report - Comparison of Peak kW and kWh
Offices weblite-tnd
For 2002 through 2003
550.00
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
kW
Jan-2003
Feb-2003
Mar-2003
Apr-2003
May-2003
Jun-2003
Built using ChartFX for .NET Development
kW
Prev. Year kW
Last 12 Months
Energy: kWh
Demand: Kw
Previous 12 Months
Energy: kWh
Demand: kW
Jan-03
Feb-03
Mar-03
Apr-03
May-03
Jun-03
103.680
119.808
111.168
118.944
121.824
134.208
406.08
403.20
411.84
478.08
440.64
489.60
Jan-02
Feb-02
Mar-02
Apr-02
May-02
Jun-02
119.520
119.232
107.712
113.184
130.176
134.208
449.28
466.56
437.76
452.16
498.24
489.60

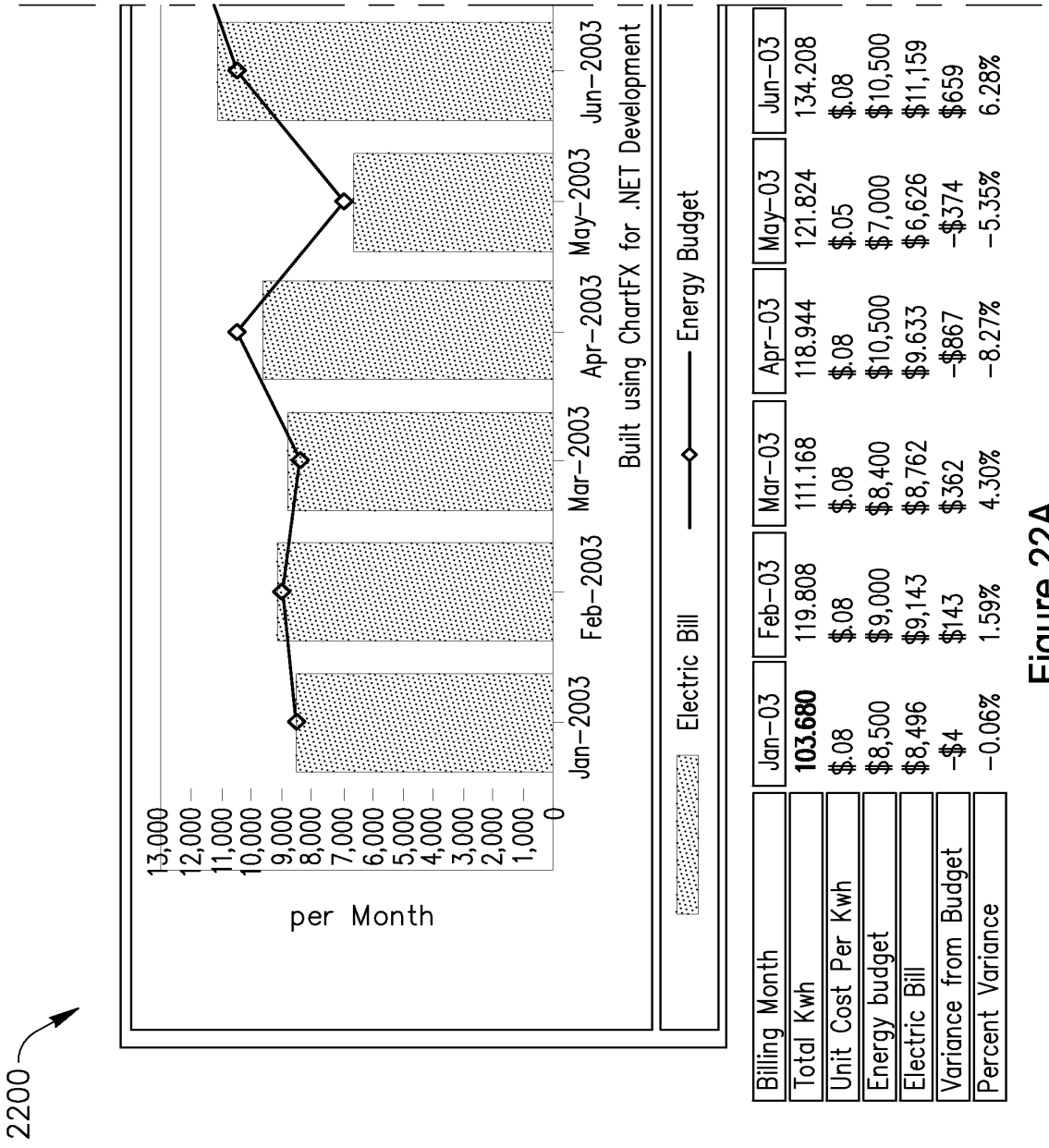
Figure 21A



Jul–03	Aug–03	Sep–03	Oct–03	Nov–03	Dec–03	Total
140.256	152.064	152.352	123.264	0	0	1,277,568
535.68	544.32	524.16	541.44	0.00	0.00	544.32

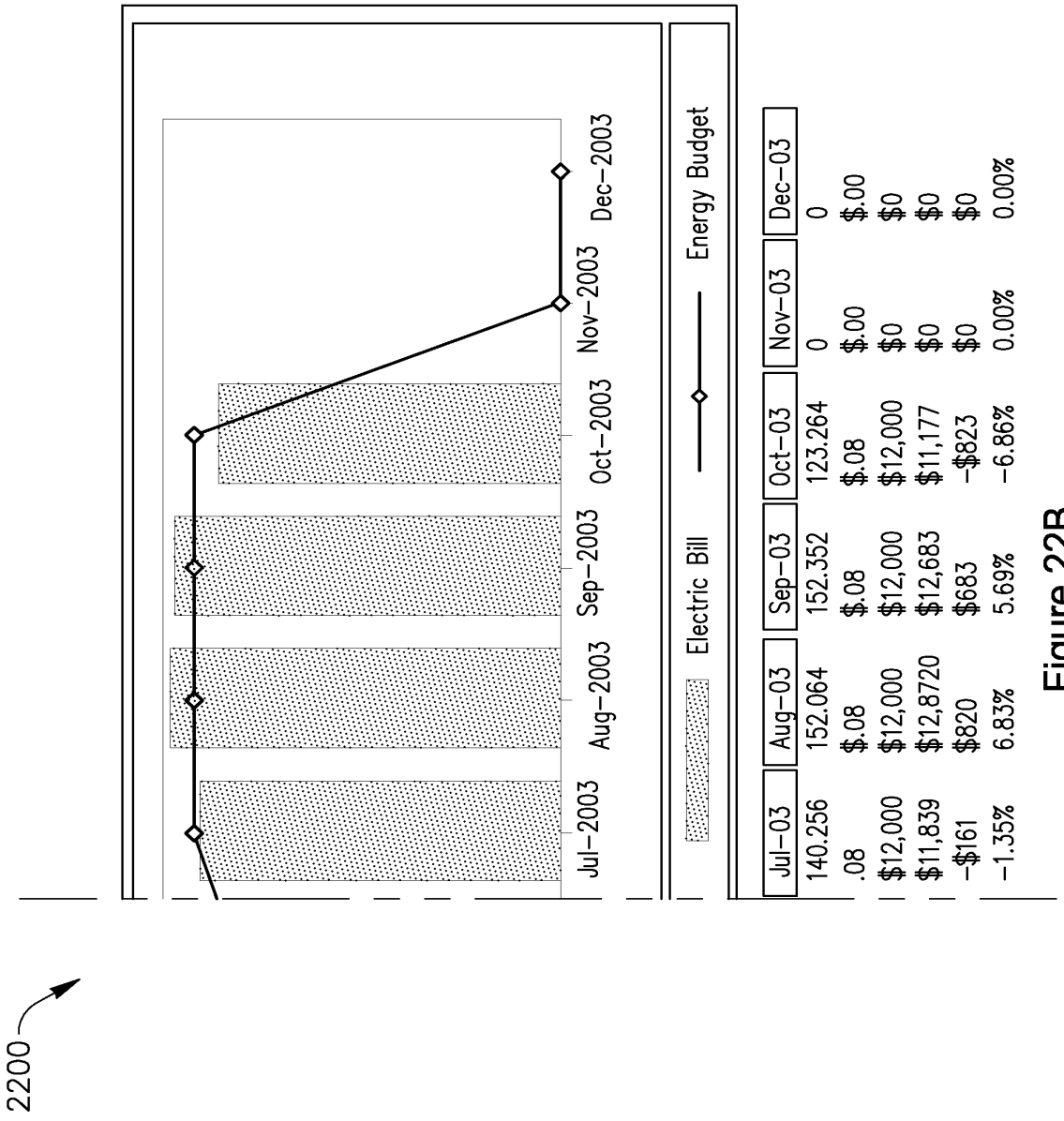
Jul–02	Aug–02	Sep–02	Oct–02	Nov–02	Dec–02	Total
140.256	152.064	152.352	123.264	115.776	115.776	1,523,520
535.68	544.32	524.16	541.44	414.72	414.72	544.32

Figure 21B



Billing Month	Jan–03	Feb–03	Mar–03	Apr–03	May–03	Jun–03
Total Kwh	**103.680**	119.808	111.168	118.944	121.824	134.208
Unit Cost Per Kwh	$.08	$.08	$.08	$.08	$.05	$.08
Energy budget	$8,500	$9,000	$8,400	$10,500	$7,000	$10,500
Electric Bill	$8,496	$9,143	$8,762	$9,633	$6,626	$11,159
Variance from Budget	-$4	$143	$362	-$867	-$374	$659
Percent Variance	-0.06%	1.59%	4.30%	-8.27%	-5.35%	6.28%

Figure 22A



	Jul–03	Aug–03	Sep–03	Oct–03	Nov–03	Dec–03
Electric Bill	140.256	152.064	152.352	123.264	0	0
Energy Budget	.08	$.08	$.08	$.08	$.00	$.00
	$12,000	$12,000	$12,000	$12,000	$0	$0
	$11,839	$12,8720	$12,683	$11,177	$0	$0
	-$161	$820	$683	-$823	$0	$0
	-1.35%	6.83%	5.69%	-6.86%	0.00%	0.00%

Figure 22B

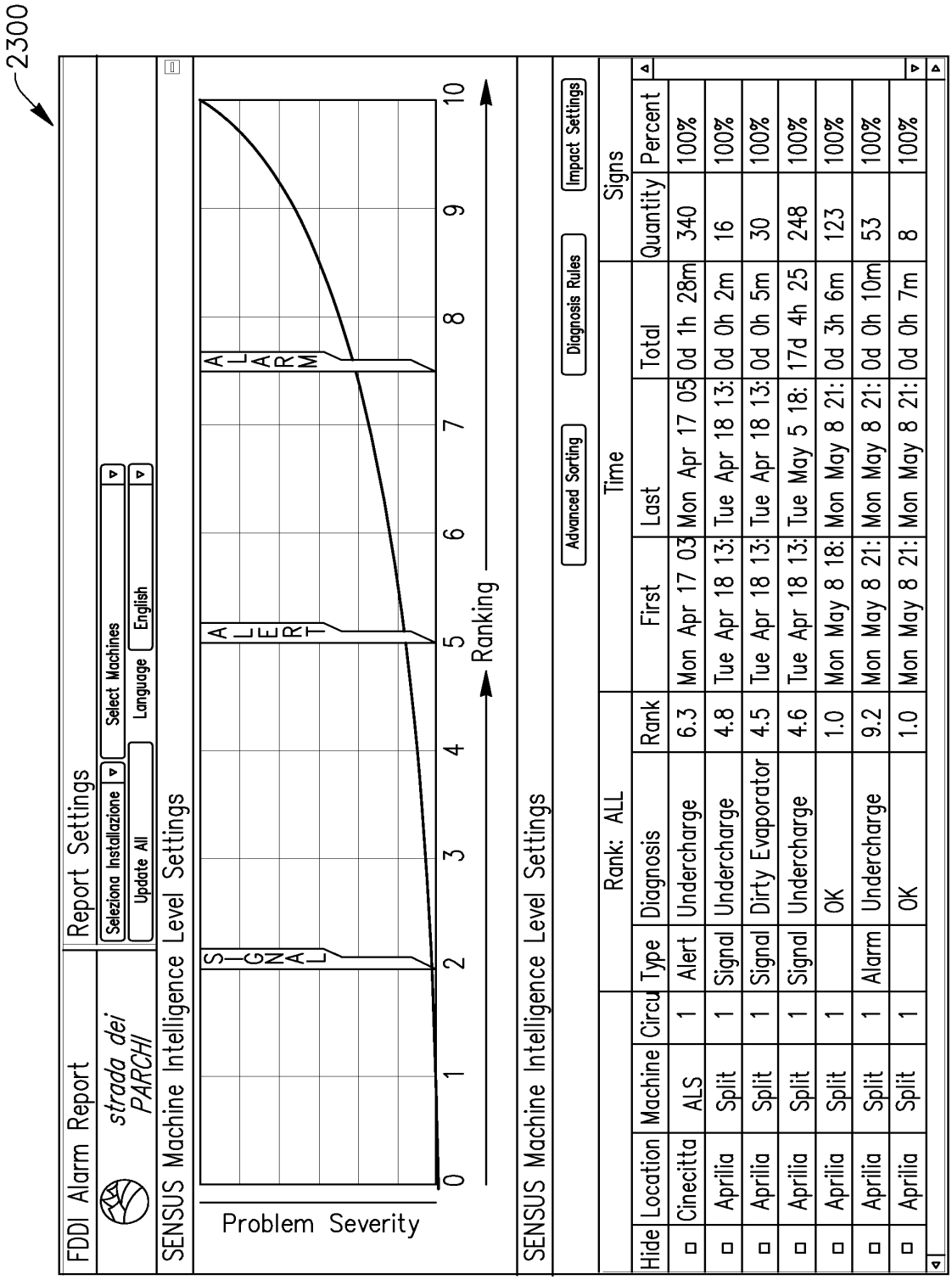

2300
FDDI Alarm Report
strada dei PARCHI
Report Settings
Seleziona Installazione
Select Machines
Update All
Language
English
SENSUS Machine Intelligence Level Settings
SIGNAL
ALERT
ALARM
Problem Severity
0 1 2 3 4 5 6 7 8 9 10
Ranking
SENSUS Machine Intelligence Level Settings
Advanced Sorting
Diagnosis Rules
Impact Settings
Rank: ALL
Time
Signs
Hide Location Machine Circu Type Diagnosis Rank First Last Total Quantity Percent
Cinecitta ALS 1 Alert Undercharge 6.3 Mon Apr 17 03 Mon Apr 17 05 0d 1h 28m 340 100%
Aprilia Split 1 Signal Undercharge 4.8 Tue Apr 18 13: Tue Apr 18 13: 0d 0h 2m 16 100%
Aprilia Split 1 Signal Dirty Evaporator 4.5 Tue Apr 18 13: Tue Apr 18 13: 0d 0h 5m 30 100%
Aprilia Split 1 Signal Undercharge 4.6 Tue Apr 18 13: Tue May 5 18: 17d 4h 25 248 100%
Aprilia Split 1 OK 1.0 Mon May 8 18: Mon May 8 21: 0d 3h 6m 123 100%
Aprilia Split 1 Alarm Undercharge 9.2 Mon May 8 21: Mon May 8 21: 0d 0h 10m 53 100%
Aprilia Split 1 OK 1.0 Mon May 8 21: Mon May 8 21: 0d 0h 7m 8 100%

Figure 23

2400

AH-06	AH-04	AH-03	AH-02	AH-01	Air Handler	
F	F	F	F	F	Comfort	Pass/Fail
P	P	P	P	P	Efficiency	
F	F	F	F	F	Operation	
					CCO	CC-HC
					CLG Valve	
			X	X	PCO	
		X			Pre-Heat Damper	
X					Pre-Heat Valve	
					EXH Damper Stat	Exhaust All
					Exhaust Fan	
X	X	X	X	X	EXH Fan Speed	
					Mixed Air Damper	MAD, RACO2
					Min OA SETPT	
					Mad Output	
X					CO2 Sensor	
	X		X	X	Static Pressure	Static Pressure
	X		X	X	SA Static SETPT	
					SA Fan SPD Output	
					AVG Space Temp.	Temperature
X					Mixer Air Temp.	
X	X	X	X	X	AVG Space Temp.	
					Max Space Temp.	
			X		Min Space Temp.	
					NGT CLG SETPT	
					NGT HTG SETPT	
					VRT OA Temp.	
X					Return Air Temp.	
			X	X	SA Temp.	
				X	SA Temp. SETPT	
					Warm up SETPT	
X					RA Humidity	

Figure 24

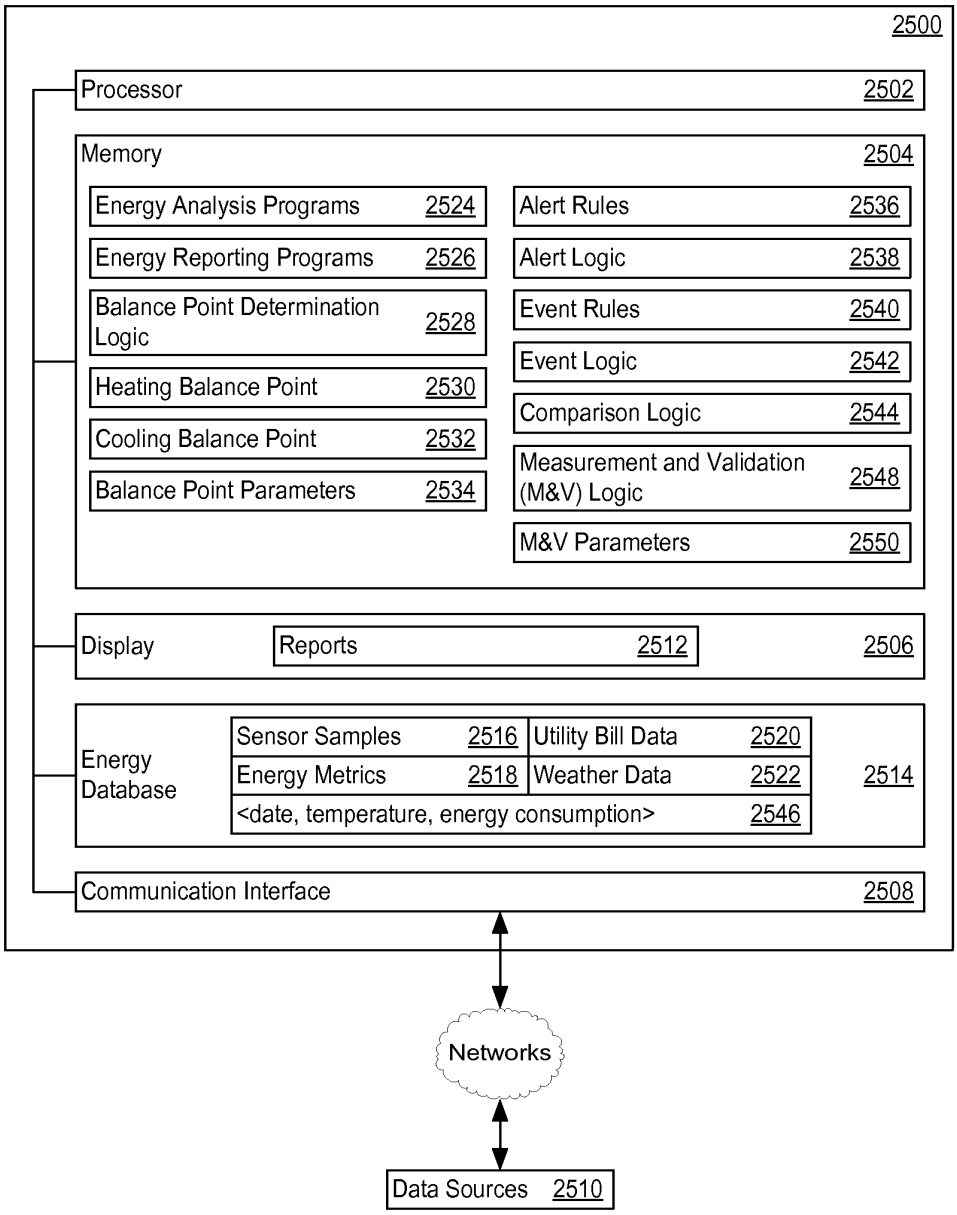

2500
Processor 2502
Memory 2504
Energy Analysis Programs 2524
Energy Reporting Programs 2526
Balance Point Determination Logic 2528
Heating Balance Point 2530
Cooling Balance Point 2532
Balance Point Parameters 2534
Alert Rules 2536
Alert Logic 2538
Event Rules 2540
Event Logic 2542
Comparison Logic 2544
Measurement and Validation (M&V) Logic 2548
M&V Parameters 2550
Display
Reports 2512
2506
Energy Database
Sensor Samples 2516
Utility Bill Data 2520
Energy Metrics 2518
Weather Data 2522
<date, temperature, energy consumption> 2546
2514
Communication Interface 2508
Networks
Data Sources 2510

Figure 25

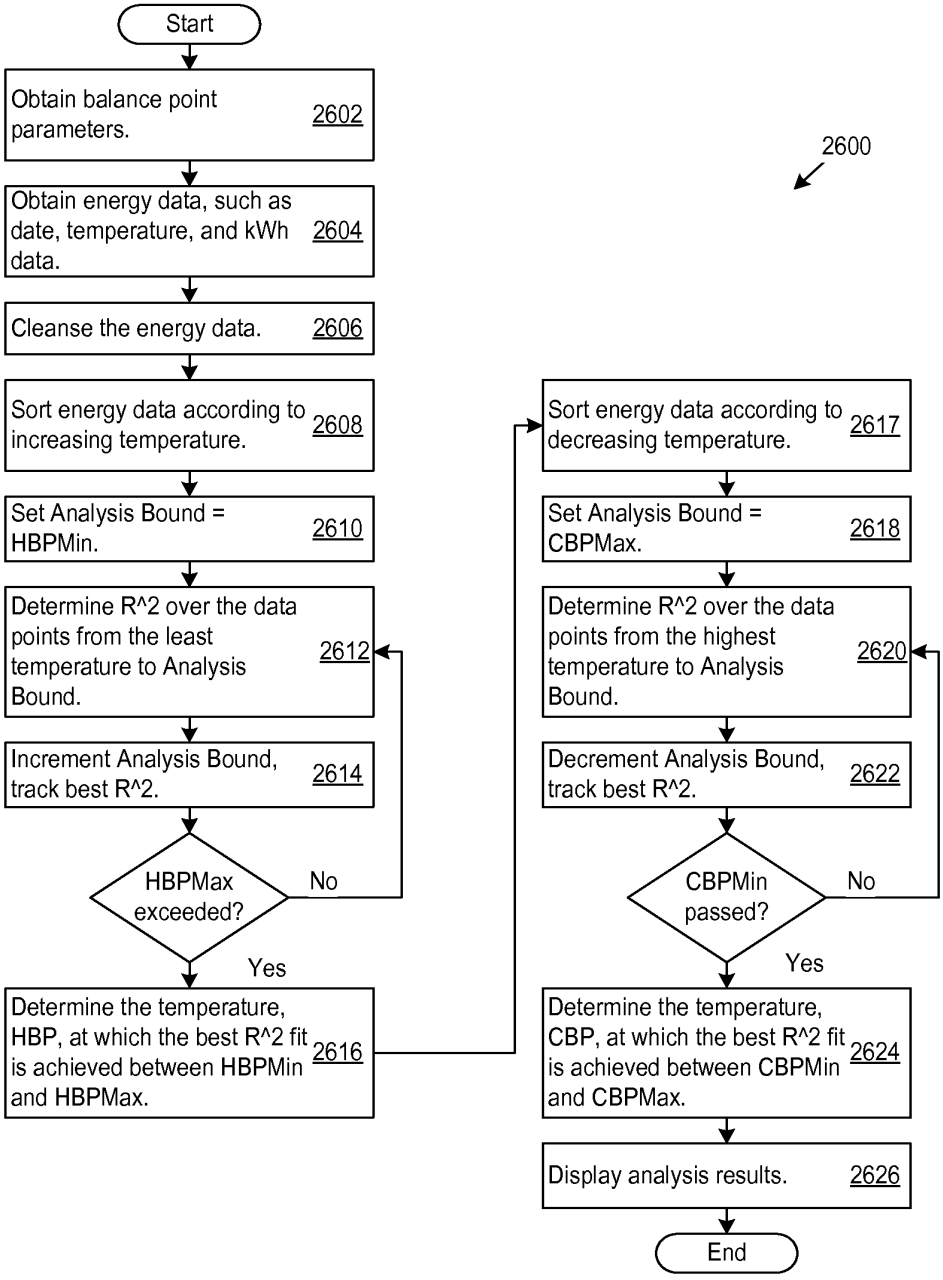

Start
Obtain balance point parameters. 2602
Obtain energy data, such as date, temperature, and kWh data. 2604
Cleanse the energy data. 2606
Sort energy data according to increasing temperature. 2608
Set Analysis Bound = HBPMin. 2610
Determine R^2 over the data points from the least temperature to Analysis Bound. 2612
Increment Analysis Bound, track best R^2. 2614
HBPMax exceeded?
No
Yes
Determine the temperature, HBP, at which the best R^2 fit is achieved between HBPMin and HBPMax. 2616
2600
Sort energy data according to decreasing temperature. 2617
Set Analysis Bound = CBPMax. 2618
Determine R^2 over the data points from the highest temperature to Analysis Bound. 2620
Decrement Analysis Bound, track best R^2. 2622
CBPMin passed?
No
Yes
Determine the temperature, CBP, at which the best R^2 fit is achieved between CBPMin and CBPMax. 2624
Display analysis results. 2626
End

Figure 26

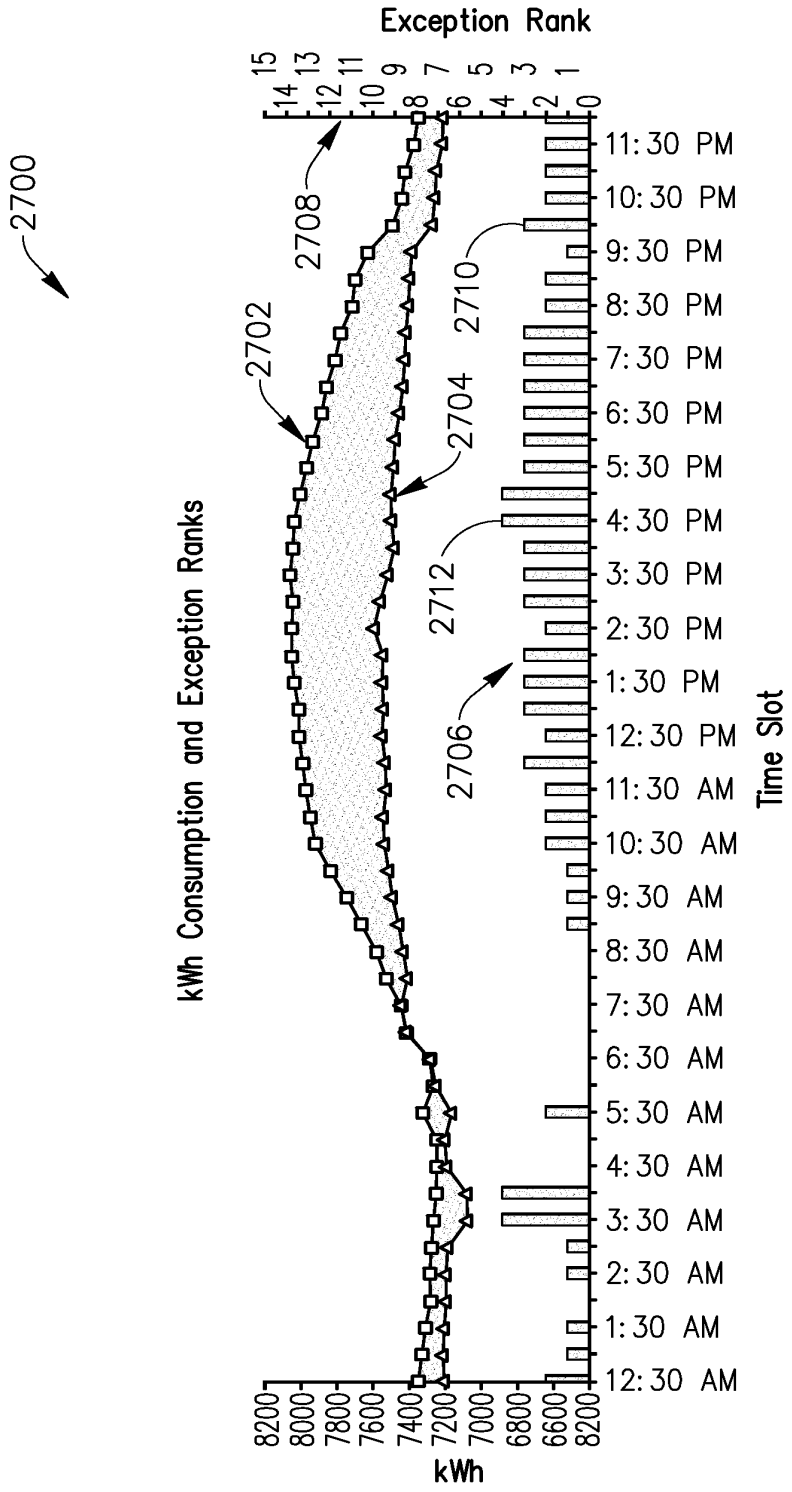

2700
Exception Rank
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
2708
2710
2702
2704
2712
2706
11:30 PM
10:30 PM
9:30 PM
8:30 PM
7:30 PM
6:30 PM
5:30 PM
4:30 PM
3:30 PM
2:30 PM
1:30 PM
12:30 PM
11:30 AM
10:30 AM
9:30 AM
8:30 AM
7:30 AM
6:30 AM
5:30 AM
4:30 AM
3:30 AM
2:30 AM
1:30 AM
12:30 AM
Time Slot
kWh Consumption and Exception Ranks
8200
8000
7800
7600
7400
7200
7000
6800
6600
8200
kWh

Figure 27

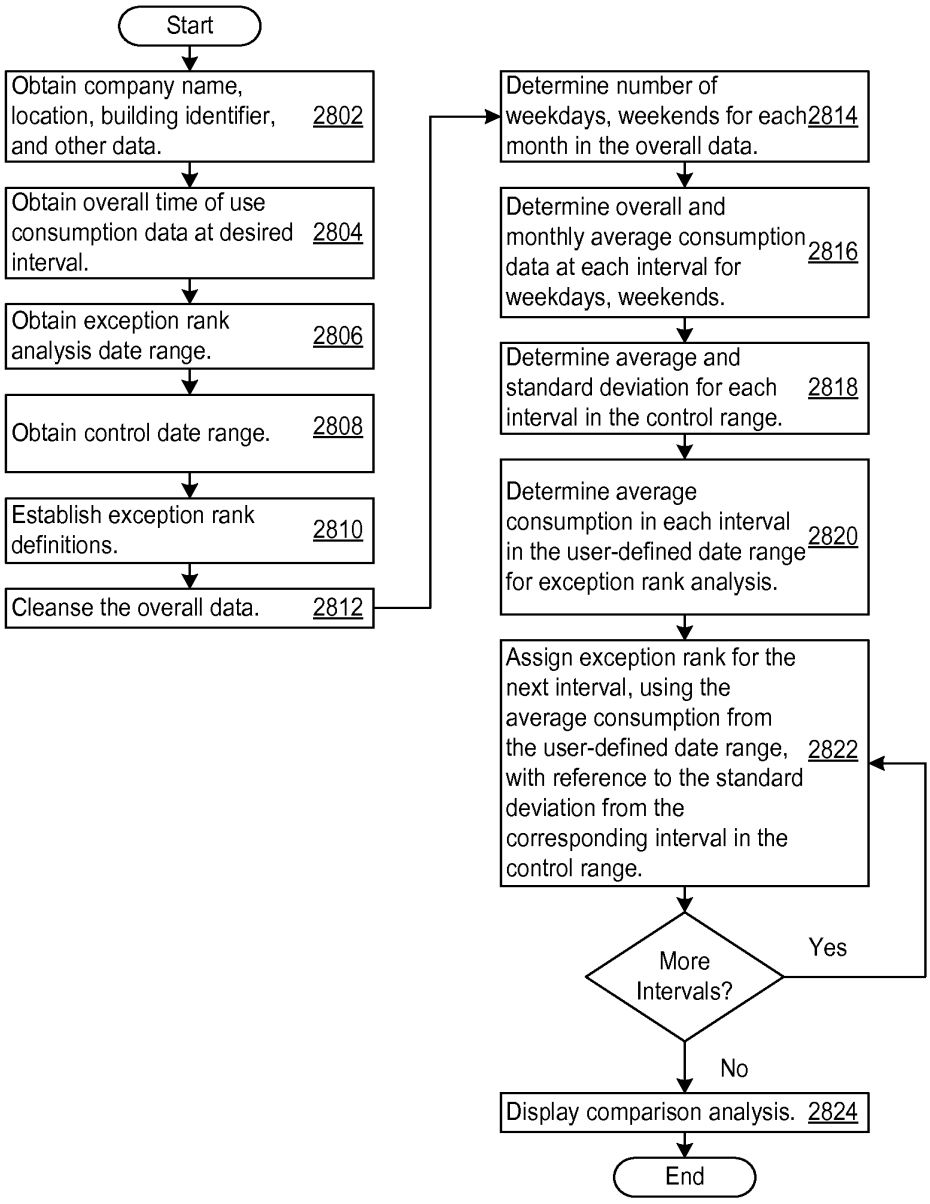

Start
Obtain company name, location, building identifier, and other data. 2802
Obtain overall time of use consumption data at desired interval. 2804
Obtain exception rank analysis date range. 2806
Obtain control date range. 2808
Establish exception rank definitions. 2810
Cleanse the overall data. 2812
Determine number of weekdays, weekends for each month in the overall data. 2814
Determine overall and monthly average consumption data at each interval for weekdays, weekends. 2816
Determine average and standard deviation for each interval in the control range. 2818
Determine average consumption in each interval in the user-defined date range for exception rank analysis. 2820
Assign exception rank for the next interval, using the average consumption from the user-defined date range, with reference to the standard deviation from the corresponding interval in the control range. 2822
More Intervals?
Yes
No
Display comparison analysis. 2824
End

Figure 28

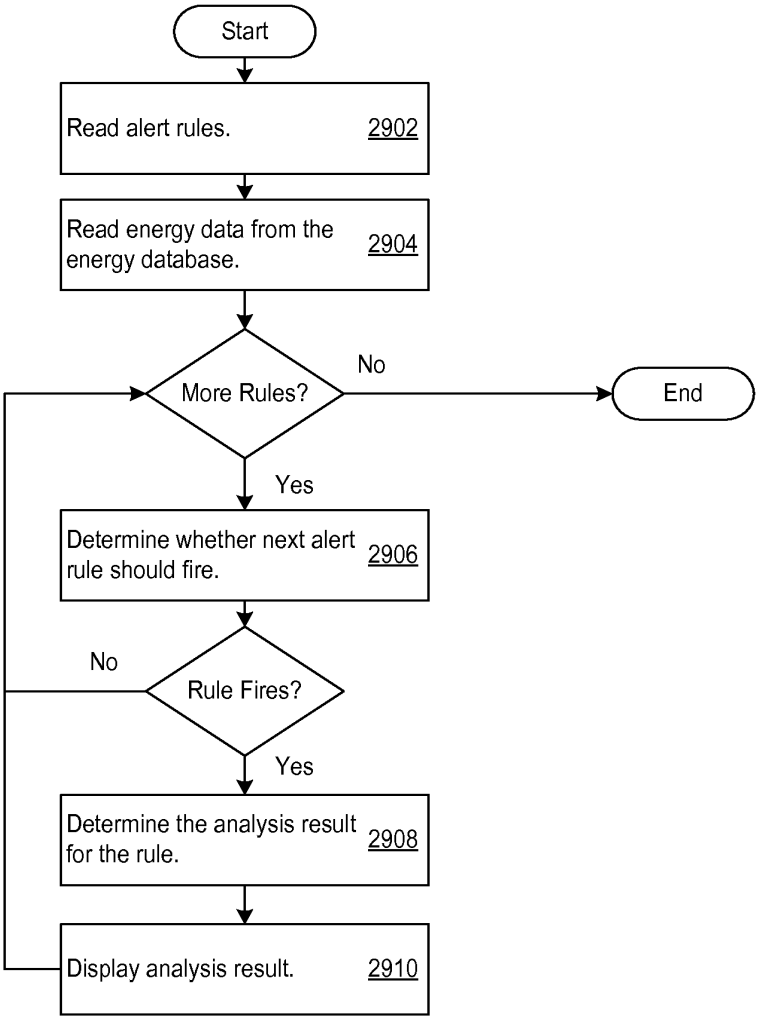

Start
Read alert rules. 2902
Read energy data from the energy database. 2904
More Rules?
No
End
Yes
Determine whether next alert rule should fire. 2906
Rule Fires?
No
Yes
Determine the analysis result for the rule. 2908
Display analysis result. 2910

Figure 29

Electronic Patent Application Fee Transmittal

Application Number:	12776159
Filing Date:	07-May-2010
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Filer:	John F. Nethery/Claire B. Briggs
Attorney Docket Number:	10022/1726

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	330	330
Utility Search Fee	1111	1	540	540
Utility Examination Fee	1311	1	220	220
Pages:				
Claims:				
Independent claims in excess of 3	1201	1	220	220
Miscellaneous-Filing:				
Late filing fee for oath or declaration	1051	1	130	130

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1440**

Electronic Acknowledgement Receipt

EFS ID:	7800476
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	John F. Nethery/Edward Popoca
Filer Authorized By:	John F. Nethery
Attorney Docket Number:	10022/1726
Receipt Date:	11-JUN-2010
Filing Date:	07-MAY-2010
Time Stamp:	18:31:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1440
RAM confirmation Number	4889
Deposit Account	231925
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	10022_1726_Trans_MsngPrts.PDF	63165 cad67c9f0525387236f6d6dd6171576dbba808c4	no	2
Warnings:					
Information:					
2	Applicant Response to Pre-Exam Formalities Notice	10022_1726_MsngPrts.PDF	64768 f860ada6aa045a9555708cdd563e4ae783a23391	no	2
Warnings:					
Information:					
3	Miscellaneous Incoming Letter	10022_1726_Remarks_SubofDrawings.PDF	38333 e21f2776aa4e0509d978b807b6162291744d0c7c	no	1
Warnings:					
Information:					
4	Drawings-only black and white line drawings	10022-1726_ReplacementDrawings.pdf	3032888 87cd917ff7c1b18b56589f143be30a2640aecb28	no	35
Warnings:					
Information:					
5	Fee Worksheet (PTO-875)	fee-info.pdf	38120 439f601d5418a425f6e7f10898615bb02025359f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3237274		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

This correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: June 11, 2010 Name: John F. Nethery, Reg. No. 42,928 Signature: _____

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay E. Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Not yet assigned
Filed:	May 7, 2010	Art Unit:	Not yet assigned
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.:	10022/1726		

TRANSMITTAL

Mail Stop Missing Parts
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Transmittal Cover Letter (2pp.); Response to Notice to File Missing Parts (2pp.); Remarks Accompanying Submission of Filing Fee and Submission of Replacement Drawings (1p.); 35 Sheets of Replacement Drawings (Containing Figures 1-29).

Fee calculation:

☐ No additional fee is required.

☐ Small Entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR § 1.17(_____).

☒ An additional filing fee has been calculated as shown below:

Claims as Filed	Col. 1	Col. 2		Small Entity			Not a Small Entity	
For	No. Filed	No. Extra		Rate	Fee	or	Rate	Fee
Basic Fee					$ 82	or		$ 330
Total Claims	20-20	0		x$26=	$	or	x$52=	$
Independent Claims	4-3	1		x$110=	$	or	x$220=	$220
Multiple Dependent Claims Present				+$195=	$	or	+$390=	$
Utility Application Size Fee when filing via EFS (see MPEP 607 Filing Fee)				No. of pages ____ X .75 = ____ - 100 = ____ / 50 = x $135=	$	or	No. of pages ____ X .75 = ____ - 100 = ____ / 50 = x $270=	$
Search Fee				+$270=	$	or	+$540=	$540
Examination Fee				+$110=	$	or	+$220=	$220
Surcharge								$130
*If the difference in col. 1 is less than zero, enter "0" in col. 2.				Total	$	or	Total	$1440

Fee payment:

☒ Please charge Deposit Account No. 23-1925 in the amount of $1440 for Filing Fee, Search Fee, Examination Fee, Extra Independent Claim Fee and Surcharge.

☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

June 11, 2010
Date

John F. Nethery (Reg. No. 42,928)

BRINKS HOFER GILSON & LIONE
NBC Tower – Suite 3600, 455 N. Cityfront Plaza Drive, Chicago, IL 60611-5599

Electronic Acknowledgement Receipt	
EFS ID:	7800476
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	John F. Nethery/Edward Popoca
Filer Authorized By:	John F. Nethery
Attorney Docket Number:	10022/1726
Receipt Date:	11-JUN-2010
Filing Date:	07-MAY-2010
Time Stamp:	18:31:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1440
RAM confirmation Number	4889
Deposit Account	231925
Authorized User	
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Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	10022_1726_Trans_MsngPrts.PDF	63165 cad67c9f0525387236f6d6dd6171576dbba808c4	no	2
Warnings:					
Information:					
2	Applicant Response to Pre-Exam Formalities Notice	10022_1726_MsngPrts.PDF	64768 f860ada6aa045a9555708cdd563e4ae783a23391	no	2
Warnings:					
Information:					
3	Miscellaneous Incoming Letter	10022_1726_Remarks_SubofDrawings.PDF	38333 e21f2776aa4e0509d978b807b6162291744d0c7c	no	1
Warnings:					
Information:					
4	Drawings-only black and white line drawings	10022-1726_ReplacementDrawings.pdf	3032888 87cd917ff7c1b18b56589f143be30a2640aecb28	no	35
Warnings:					
Information:					
5	Fee Worksheet (PTO-875)	fee-info.pdf	38120 439f601d5418a425f6e7f10898615bb02025359f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3237274		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
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National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/776,159	05/07/2010	Jay Hedley	10022/1726

CONFIRMATION NO. 1676

28164
ACCENTURE CHICAGO 28164
BRINKS HOFER GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

FORMALITIES LETTER

OC000000042190180

Date Mailed: 06/22/2010

NOTICE OF INCOMPLETE REPLY (NONPROVISIONAL)

Filing Date Granted

The U.S. Patent and Trademark Office has received your reply on 06/11/2010 to the Notice to File Missing Parts (Notice) mailed 05/20/2010 and it has been entered into the nonprovisional application. The reply, however, does not include the following items required in the Notice.

The period of reply remains as set forth in the Notice. You may, however, obtain EXTENSIONS OF TIME under the provisions of 37 CFR 1.136(a) accompanied by the appropriate fee (37 CFR 1.17(a)).

A complete reply must be timely filed to prevent ABANDONMENT of the above-identified application. Replies should be mailed to: Mail Stop Missing Parts, Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450.

- The signature of the following inventor(s) is missing from the oath or declaration:
  Jay Hedley

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/nfissha/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

This correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: July 22, 2010 Name: John F. Nethery, Reg. No. 42,928 Signature: _____

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of: Jay E. Hedley et al.			
Appln. No.:	12/776,159	Examiner:	Not yet assigned
Filed:	May 7, 2010	Art Unit:	2882
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.: 10022/1726			

RESPONSE TO NOTICE OF INCOMPLETE REPLY

Mail Stop Missing Parts
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In accordance with the Notice to File Missing Parts dated May 20, 2010, enclosed is the Declaration executed by Jay Hedley.

Respectfully submitted,

Dated: July 22, 2010

_____
John F. Nethery, Reg. No. 42,928
Attorney for Applicant(s)

BRINKS HOFER GILSON & LIONE
PO BOX 10395
CHICAGO, IL 60610
(312) 321-4200

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 C.F.R. §1.63)

As a below named inventor, I hereby declare:

My residence, mailing address, and citizenship are as stated below next to my name;

I believe I am an original, first and joint inventor of the subject matter that is claimed and for which a patent is sought on the invention entitled:

BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

the specification of which (check one)

☐ is attached hereto.

☒ was filed on May 7, 2010 as United States Application No. 12/776,159 and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge my duty to disclose to the United States Patent and Trademark Office all information that I know to be material to patentability as defined in 37 C.F.R. §1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or (f), or §365(b) of any foreign application(s) for patent or inventor's or plant breeder's rights certificate(s), or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's or plant breeder's rights certificate(s) or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s):			Priority Not Claimed
N.A.			☐
(Number)	(Country)	(Filing Date, MM/DD/YYYY)	
			☐
(Number)	(Country)	(Filing Date, MM/DD/YYYY)	

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below:

61/176,790	05/08/2009	Now Expired
(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: pending, or abandoned)
61/176,855	05/08/2009	Now Expired
(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: pending, or abandoned)

I hereby claim the benefit under 35 U.S.C. §120 of any United States applications(s), or §365(c) of any PCT International Application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in 37 C.F.R. §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Application Serial No.)	(Filing Date, MM/DD/YYYY)	(Status: patented, pending, abandoned)
N.A.		

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of inventor **Jay Hedley**	Full name of inventor **Boris Tsypin**
Signature Date July 21, 2010	Signature Date
Residence (City, State/Foreign Country) Arlington, VA	Residence (City, State/Foreign Country) Chicago, IL
Citizenship US	Citizenship US
Mailing Address 1200 N. Nash Street, Suite 1128 Arlington, VA 22209	Mailing Address 2052 N. Lincoln Park West Chicago, IL 60614
Full name of inventor **Deepak Raghu**	
Signature Date	
Residence (City, State/Foreign Country) Haryana, India	
Citizenship IN	
Mailing Address B182, Belvedere Park, DLF Phase 3, Gurgaon – 122001, Haryana, India	

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: July 22, 2010 Name: John F. Nethery, Reg. No. 42,928 Signature:

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of: Jay E. Hedley et al.			
Appln. No.:	12/776,159	Examiner:	Not yet assigned
Filed:	May 7, 2010	Art Unit:	2882
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.: 10022/1726			

PETITION AND FEE FOR EXTENSION OF TIME (37 CFR § 1.136(a))

Mail Stop Missing Parts
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is a petition for an extension of the time to respond to the Notice to File Missing Parts dated May 20, 2010 for a period of 1 month(s).

Applicant is: ☐ small entity (per 37 CFR 1.27) ☒ other than small entity

	Extension Months	Other Than Small Entity	Small Entity
☒	One Month	$130.00	$65.00
☐	Two Months	$490.00	$245.00
☐	Three Months	$1,110.00	$555.00
☐	Four Months	$1,730.00	$865.00
☐	Five Months	$2,350.00	$1,175.00

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Respectfully submitted,

Dated: July 22, 2010

John F. Nethery, Reg. No. 42,928
Attorney for Applicant(s)

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Electronic Patent Application Fee Transmittal

Application Number:	12776159
Filing Date:	07-May-2010
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Filer:	John F. Nethery/Claire B. Briggs
Attorney Docket Number:	10022/1726

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 1 month with $0 paid	1251	1	130	130

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**130**

Electronic Acknowledgement Receipt

EFS ID:	8069277
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	John F. Nethery/Magdalena Pieczonka
Filer Authorized By:	John F. Nethery
Attorney Docket Number:	10022/1726
Receipt Date:	22-JUL-2010
Filing Date:	07-MAY-2010
Time Stamp:	14:33:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$130
RAM confirmation Number	734
Deposit Account	231925
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10022-1726_ResptoIncompleteReply.pdf	208050 9f1770751ddebfa1ada79c90a7fbb0ed4b97fa18	yes	6

Multipart Description/PDF files in .zip description

Document Description	Start	End
Miscellaneous Incoming Letter	1	1
Applicant Response to Pre-Exam Formalities Notice	2	2
Oath or Declaration filed	3	4
Extension of Time	5	6

Warnings:

Information:

2	Fee Worksheet (PTO-875)	fee-info.pdf	30245 9dacd3c24909f4f6e504eaa9290cb800ae174a7c	no	2

Warnings:

Information:

Total Files Size (in bytes):	238295

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

This correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: July 22, 2010 Name: John F. Nethery, Reg. No. 42,928 Signature:

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay E. Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Not yet assigned
Filed:	May 7, 2010	Art Unit:	2882
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.:	10022/1726		

TRANSMITTAL

Mail Stop Missing Parts
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Transmittal Cover Letter (1p.); Response to Incomplete Reply (1p.); Executed Declaration of Jay Hedley (2pp.); Petition for 1 Mo. Ext. of Time (2pp.)

Fee calculation:

☐ No additional fee is required.

☐ Small Entity.

☒ An extension fee in an amount of $130 for a 1-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR § 1.17(_____).

☐ An additional filing fee has been calculated as shown below:

						Small Entity			Not a Small Entity	
	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra		Rate	Add'l Fee	OR	Rate	Add'l Fee
Total		Minus				x $26=			x $52=	
Indep.		Minus				x 110=			x $220=	
First Presentation of Multiple Dep. Claim						+$195=			+ $390=	
						Total	$		Total	$

Fee payment:

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Respectfully submitted,

July 22, 2010
Date

John F. Nethery (Reg. No. 42,928)

BRINKS HOFER GILSON & LIONE
NBC Tower – Suite 3600, 455 N. Cityfront Plaza Drive, Chicago, IL 60611-5599

BRINKS HOFER GILSON &LIONE

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/776,159	05/07/2010	2882	1440	10022/1726	20	4

CONFIRMATION NO. 1676

UPDATED FILING RECEIPT

28164
ACCENTURE CHICAGO 28164
BRINKS HOFER GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

OC00000042808779

Date Mailed: 07/30/2010

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Jay Hedley, Arlington, VA;
Boris Tsypin, Chicago, IL;
Deepak Raghu, Gurgaon, INDIA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 61/176,855 05/08/2009
and claims benefit of 61/176,790 05/08/2009

Foreign Applications

If Required, Foreign Filing License Granted: 05/17/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/776,159**

Projected Publication Date: 11/11/2010

Non-Publication Request: No

Early Publication Request: No

Title

BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Preliminary Class

378

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For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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FORM PTO-1449		SERIAL NO. 12/776,159	CASE NO. 10022/1726
LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT		FILING DATE May 7, 2010	GROUP ART UNIT 2882
(use several sheets if necessary)	APPLICANT(S): Jay Hedley et al.		CONFIRMATION NO. 1676

REFERENCE DESIGNATION **U.S. PATENT DOCUMENTS**

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	NAME	CLASS/ SUBCLASS	FILING DATE
	B1	US 2009/0018884 A1	01/15/2009	McConnell et al.		
	B2	US 2008/0147465 A1	06/19/2008	Raines et al.		
	B3	US 2006/0161450 A1	07/20/2006	Carey et al.		

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	COUNTRY	CLASS/ SUBCLASS	TRANSLATION YES OR NO
	B4	WO 2007/0139587 A1	12/06/2007	WO		

EXAMINER INITIAL		OTHER ART – NON PATENT LITERATURE DOCUMENTS (Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date page(s), volume-issue number(s), publisher, city and/or country where published.
	B5	PCT International Search Report received in International Application No. PCT/US2010/034111, 3pp., dated July 6, 2010.

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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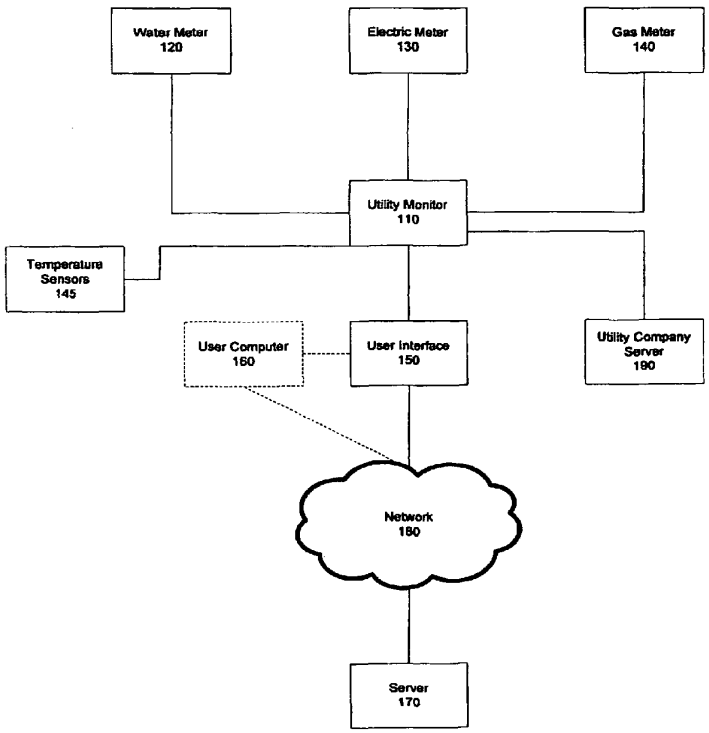
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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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[Continued on next page]

(54) Title: UTILITY MONITORING SYSTEMS AND METHODS OF USE



(57) Abstract: Various embodiments of the present disclosure provide methods, systems, and devices for monitoring one or more utilities consumed within a monitored area. At least certain disclosed methods include detecting an amount of a first utility consumed by a load associated with a device. An amount of a second utility consumed by a load associated with the device is detected. The identity of the device is determined based on the amount of the first and second utility consumed. In further disclosed methods, a utility monitoring method is disclosed that includes measuring an amount of a utility consumed by a first device at a first time and an amount of a utility consumed by a second device at a second time. The identity of the first device is determined based on the measured consumption of the first and second devices at the first and second time. In certain implementations, the electricity meter uses an effective variance analysis of the conductance waveform on an electrical circuit to identify specific appliances.

WO 2007/139587 A1

GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

UTILITY MONITORING SYSTEMS AND METHODS OF USE

[1] CROSS REFERENCE TO RELATED APPLICATION

[2] This application claims the benefit of, and incorporates by reference, U.S. Provisional Patent Application No. 60/803,323, filed May 26, 2006.

[3] TECHNICAL FIELD

[4] The present application relates generally to utility monitors and their methods of use. In particular examples, the present application provides a non-intrusive utility monitor which can be used to monitor a plurality of discrete loads.

[5] BACKGROUND

[6] In most residences and small businesses, utility consumers learn about their utility consumption through a bill delivered once per month. This system has limited ability to promote conservation since the consumer does not have feedback to associate their specific activities to a particular cost. This lack of information can result in a disconnect between the perception of utility costs and their actual costs. The lack of timely and / or specific information can also lead to inefficiencies and poor decision making by individuals. Although gasoline prices are often a top concern for consumers, the average household spends more than twice as much on utilities as on gasoline. In 2003, an average household spent $2811 on residential utilities, fuels, and public services; while spending $1333 on gasoline and motor oil.

[7] Large commercial businesses commonly employ technology for energy and utility management. Typically a building engineer reviews utility consumption data to ensure utilities are consumed in a cost effective manner. This technology has not penetrated the small business and residential market due to the system and installation expense. Moreover, the data provided by typical existing systems is not presented in a way that non-technical users can understand. Existing monitoring systems also typically do not monitor multiple utilities (i.e. natural gas, electric power, and water), or correlate the use of different utilities to one another.

[8] Many existing electricity monitoring devices attach sensors to each electrical appliance to be monitored. However, attaching sensors and transmitters to

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numerous appliances in the areas to be monitored can add substantial cost to the system. Such a configuration can also increase the complexity of the system and the difficulty of installing it.

[9] Some existing systems monitor electric loads at the point of service entry into the areas to be monitored, such as an electrical meter installed by a power company. However, such systems typically only analyze overall electricity use and do not analyze use by individual circuits or appliances.

[10] SUMMARY

[11] The present disclosure provides apparatus, systems, and methods for monitoring one or more utilities. In a particular embodiment, the present disclosure provides a utility monitoring method that improves on the above mentioned methods that are currently employed. An amount of a first utility consumed by a load associated with a device is detected. An amount of a second utility consumed by a load associated with the same device is detected. The identity of the device is determined based on the amount of the first and second utilities consumed. In a specific example, the first utility is electricity and the second utility is gas. In another example, the first utility is electricity and the second utility is water. In a further example, the first utility is water and the second utility is gas. In particular examples, electricity use is analyzed using a non-intrusive load monitoring algorithm, such as an effective variance analysis of the conductance waveform on an electrical circuit.

[12] According to a further disclosed utility monitoring method, an amount of a utility consumed by a first device at a first time is measured. An amount of a utility consumed by a second device at a second time is measured. The first device is identified based on the measured consumption of the first and second devices.

[13] In various disclosed methods, the time of day of the use, the duration of use, or the separation of time between uses are used to help identify the first device. In yet further methods sequence-based heuristics are used to identify which sequence of utility consumption is more probable.

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[14] The present disclosure also provides an energy monitoring system. In a particular embodiment, the energy monitoring system includes an electricity meter and another utility meter, such as a water meter or natural gas meter; a signal processor; and a user interface device or user computer in communication with the electricity meter and the other utility meter. In certain implementations, the electricity meter includes a non-intrusive load monitor algorithm, such as an effective variance analysis of the conductance waveform on an electrical circuit. In specific examples, the electricity meter is in communication with each of a plurality of circuits. In such examples, the system need not include the water meter. Some implementations of the electricity meter include a signal processor.

[15] In particular implementations that include an electricity meter in communication with each of a plurality of circuits, the electricity meter includes a power line modem or wireless transceiver. In further implementations, the electricity meter has multiple monitoring channels, each channel being in communication with a current transducer or voltage sensor attached to a circuit of a monitored area. In one example, each channel is in communication with a circuit at a circuit box, or fuse box, servicing a monitored area.

[16] Certain embodiments of the present disclosure include a user interface device. The user interface device is in communication with one or more utility meters. The user interface, in some examples, processes data from the utility meters, such as with a signal processor. In certain implementations, the user interface device includes a user input device and a display. The display may be used to communicate utility consumption information to the user. The user input device may be used by the user to select utility information to view, or to control operation of the utility monitoring system.

[17] In some embodiments of the disclosed systems, the user's computer is in communication with the utility meters. The user computer may also be used to process data (such as with a signal processor), display information to the user, or allow the user to control the monitoring system.

[18] In further embodiments, the user interface device serves as an interface between the utility meters and a user's computer. The user's computer may be used

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to display utility consumption information and other information to the user. The user's computer may also be used by the user to control the utility monitoring system. In yet further embodiments, the user's computer or remote system may communicate with the user interface using a network protocol, such as TCP/IP.

[19] In various embodiments, the user's computer or user interface device may be in communication with a remote network, such as with or through the internet. A remote network computer may store data from the utility meters, process such data, and transmit data to the user interface device or user's computer. For example, the remote network computer may contain profiles of various utility loads for comparison against the user's monitored area, such as for load identification or benchmarking. In other embodiments, load profiles are stored on the user's computer, the user interface device, or the signal processor. The remote system may be used to transmit applicable advertisements or offers to the user, in some examples such offers originate from appliance vendors, service organizations, or home improvement companies.

[20] Additional embodiments provide methods for identifying an electrical device based on the electrical consumption of the device. One such method includes measuring the voltage and current consumed by the appliance at a plurality of times. The conductance of the device is determined at each of the plurality of times. The device is identified based on the change in conductance over time. In some implementations, the device is identified by comparing the change in conductance over time to a reference value. In further implementations the change in conductance over time is analyzed using statistical analysis, such as subjecting the change in conductance over time to a least squares analysis, for example, an analysis of the effective variance of the conductance. In a specific example, the time over which the conductance is measured is at least about one minute. In a further example, the conductance is measured once per voltage cycle.

[21] The disclosed methods, systems, and apparatus can allow users to receive data regarding utility consumption relatively concurrently with such use. The availability of such data can better aid users in adjusting their utility use. In a particular example, consumption data is converted to an estimate of the

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environmental impacts of the utility consumption, such as an estimate of greenhouse gas emissions. The present disclosure can also allow utility consumption to be more easily, conveniently, and accurately attributed to various sources of consumption. In particular methods, the present disclosure allows the thermal efficiency of a monitored area to be measured. Such measurements can be used to help guide purchasing or renovation decisions for the monitored area.

[22] There are additional features and advantages of the subject matter described herein. They will become apparent as this specification proceeds.

[23] In this regard, it is to be understood that this is a brief summary of varying aspects of the subject matter described herein. The various features described in this section and below for various embodiments may be used in combination or separately. Any particular embodiment need not provide all features noted above, nor solve all problems or address all issues in the prior art noted above.

[24] BRIEF DESCRIPTION OF THE DRAWINGS

[25] Various embodiments are shown and described in connection with the following drawings in which:

[26] Figure 1 is a schematic diagram of a disclosed utility monitoring system.

[27] Figure 2 is a schematic diagram of a particular implementation of the utility monitoring system of Figure 1.

[28] Figure 3 is a schematic diagram of an implementation of the utility monitoring system of Figure 1 capable of monitoring a plurality of individual electrical circuits.

[29] Figure 4 is a graph of the average conductance waveforms for four appliances.

[30] Figure 5 is a graph of the average conductance waveforms of an air conditioner (2100 W) and a reading lamp (18 W).

[31] Figure 6 is a series of graphs showing chi-square calculations of the conductance waveforms of an air conditioner versus the air conditioner plus a reading lamp, and of an air conditioner versus itself.

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[32] Figure 7 is a graph of chi-square values versus averaging time.

[33] Figure 8 is a graph of simulated utility data for an electricity meter, a gas meter, and a water meter illustrating how loads can be identified based on analyzing multiple utilities.

[34] Figure 9 is a graph of simulated utility data from an electricity meter and a water meter illustrating how sequence heuristics can be used to identify loads.

[35] Figure 10 is a process diagram illustrating how data obtained from water, gas, and electricity meters may be deconvoluted to provide consumption information for specific loads.

[36] Figure 11 is a sample user interface screen that may be displayed on a user's computer or the user interface by the utility monitoring system of Figure 1.

[37] DETAILED DESCRIPTION

[38] As used herein, the singular forms "a," "an," and "the" refer to one or more than one, unless the context clearly dictates otherwise. As used herein, the term "includes" means "comprises." Unless the context clearly indicates otherwise, the disjunctive "or" includes the conjunctive "and."

[39] Utility Monitoring Systems

[40] Figure 1 illustrates, generally, a disclosed utility monitoring system 100. The utility monitoring system 100 includes a utility monitor 110 in communication with various utility meters 120, 130, 140. As used herein, "meter" refers to a device that can track consumption or use of a particular quantity. For example, an electrical meter that tracks electricity consumption can be a meter installed by a power company or another metering device, such as a supplemental electrical meter (not shown) installed in a circuit breaker panel.

[41] The utility monitor 110 can be, or include, a multiplexer, analog to digital converter, digital signal processor, or power line interface device. In Figure 1, the utility meters 120, 130, 140 are, respectively, a water meter, an electric meter, and a

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gas meter. However, the monitoring system 100 need not include all of the meters 120, 130, 140. In particular implementations, the monitoring system 100 includes additional meters, such as, for example, a heating oil meter (not shown). The monitoring system 100 can include additional monitors or sensors, such as temperature sensors 145 or other ambient sensors (such as humidity, or pressure sensors).

[42] The utility monitor 110 is in communication with a user interface 150. The user interface 150 may optionally be in communication with a user computer 160. The user interface 150 can be connected to the user computer 160 by, for example, USB, serial, parallel, SCSI, RS232, SPI, I2C, Ethernet, wireless protocol, power line communications (such as the Homeplug standard), ZigBee, or PS/2 connections. In some implementations, the user interface 150 is a stand alone component and need not be connected to the user computer 160. In further implementations, the user interface 150, or user computer 160, is in communication with a remote server 170 over a network 180, such as the internet. In some implementations, the utility monitor 110 is integrated into the user interface 150 or the user computer 160. In yet further implementations, the utility monitor 110 is omitted and the meters 120, 130, 140 communicate directly with the user interface 150 or the user computer 160. Some embodiments omit the user interface 150. The utility monitor 110 optionally communicates with utility providers 190.

[43] In some configurations, the utility meters 120, 130, 140 are directly connected to the user interface 150, or user computer 160, such as through a wired connection, including standard communication protocols and adapters such as RS-232, Ethernet, serial, parallel port, SPI, SCSI, I2C, ZigBee, and USB connections. In a particular example, the utility meters 120, 130, 140 send signals to the user interface 150 over power lines, such as using a power line modem. In a more particular example, the components of the system 100 communicate using the Homeplug communication standard. In further implementations, the utility meters 120, 130, 140 generate wireless signals that are receivable by a receiver (not shown) of the user interface 150 or the user computer 160. In some implementations, the user computer 160 accesses the user interface 150 through a web browser. For

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example, the user interface 150 may be assigned an internet protocol (IP) address. In particular examples, the user interface 150 communicates with the user computer 160, remote system 170, or network 180 using the TCP/IP protocol.

[44] In particular embodiments, such as the system 200 illustrated in Figure 2, the utility monitor 110 is connected to the utility meters 120, 130, 140 through respective adapters 182, 184, 186. In particular examples, the adapters 182, 184, 186 are designed to facilitate installation of the monitoring system 100.

[45] In some aspects, the adapters 182, 184, 186 are designed to be installed by a consumer or other end user. In other aspects, one or more of the adapters 182, 184, 186 are designed to be installed by a professional, such as an electrician or plumber. The adapters (or sensors) 182, 184, 186 may be powered by the local electrical supply (not shown), or may have a portable power supply (not shown), such as a battery. In particular examples, the portable power supply includes a solar cell, which may be used to power the adapter 182, 184, 186 or charge its batteries. Suitable adapters 182, 184, 186 are the Meter Interface Units (MIUs) available from Archnet of ShenZhen, China. In some implementations, the electrical adapter 184 or electricity meter 130 includes an in line shunt resistor, a current transducer, or a Hall Effect sensor. Suitable Hall Effect sensors are available from GMW Associates of San Carlos, CA, such as the Sentron CSA-1V.

[46] In particular implementations, the adapters 182, 184, 186, such as the adapter 182 for the water meter 120, include a photo sensor, such as an infrared or optical sensor, that detects rotation of a dial mechanism. In one example, the sensor detects reflection of light off of the dial mechanism.

[47] A light source, such as an optical or infrared LED, is included, in certain embodiments, to generate a signal to be measured. An integrated light emitting diode and photodiode is available from Honeywell (PN# HOA1180). A marker, such as a piece of more highly light absorbing or reflecting material, may be placed on the dial in order to help track rotation of the dial.

[48] In further examples, a separate meter, such as a flow meter, is installed in the gas line or water line. A separate meter may also be included on the electrical line, such as a voltage or current meter. In particular implementations, the electrical

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adapter 184 is installed between an electrical socket and an existing electrical meter, such as an electrical meter installed by a power company. Suitable socket adapters 184 are available from RIOTronics, Inc. of Englewood, CO. In some implementations, the adapters 182, 184, 186 read signals, such as wireless signals, generated by an existing meter, such as a meter installed by a utility company.

[49] In some implementations, the electrical adapter 184, or multiple electrical adapters 184, is connected to one or more individual circuits entering a measurement site. Each circuit may have a separate adapter 184, such as an electric metering device, or multiple circuits may be individually monitored by a single electrical adapter 184. In particular examples, the electrical adapter 184 includes a current transducer (not shown) attached to the wires corresponding to each breaker switch in a circuit box. A multi-channel analog to digital voltage sensor (not shown) may be in communication with the current transducer to simultaneously monitor multiple circuits.

[50] The user interface 150 collects data from utility monitor 110. In some implementations, the user interface 150 contains a processor and software or firmware for processing the collected data. The data or processed data can be transferred from the user interface 150 to the user computer 160. In particular examples, the user interface 150 includes a display and user input device. The user can, in some examples, be presented with information or control the system 100 using the user interface device 150. In some implementations, the user interface is a device running the PALM operating system (available from Palm, Inc., of Sunnyvale, CA), Embedded Linux (available from uClinux at www.uclinux.org) or the Windows Mobile (Pocket PC) operating system (available from Microsoft, Inc., of Redmond, WA).

[51] In embodiments where the user interface 150 transfers collected data to the user computer 160, or the utility meters 120, 130, 140 are directly connected to the user computer 160, suitable data processing software is installed on the user computer 160. In yet further implementations, the user interface 150, or user computer 160, is in communication with the remote server 170. The remote server

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170 processes the collected data and displays summary information, reports, or other information to a user on the user interface 150 or user computer 160.

[52] The consumption of a utility by a load, such as the use of an appliance, is associated with the consumption of one or more utilities, such as one or more of water, electricity, gas, propane, coal, hydrogen, and heating oil consumption. In embodiments where electricity adapters 184, such as current transducers, are mounted on individual breaker switches, the overall system 200 has additional information to associate with an electrical load. Data from one or more meters 120, 130, 140, adapters 182, 184, 186, or ambient sensors 145 may be used to identify a particular utility load.

[53] Figure 3 illustrates another architecture for a utility monitoring system 300. The monitoring system 300 includes an electricity meter adapter 310 installed at each circuit 318 in a circuit breaker panel 314. In particular implementations, each adapter 310 monitors multiple individual circuits 318. The monitoring system 300 also includes a gas meter 320. The gas meter 320 may be implemented as described in conjunction with systems 100 or 200. In further embodiments, the gas meter 320 is omitted or additional meters, such as water or heating oil meters, are included in the system 300.

[54] The gas meter 320 and electricity adapters 310 are in communication with a controller 330. The controller 330 includes a multiplexer 332, an analog to digital converter and digital signal processor 334, and a power line interface device 336, such as a power line modem. The controller 330 is in communication with a power line network interface device 340 which, in turn, is in communication with a user computer 350. Powerline network integrated circuits are available from Intellon (PN#INT5200) of Ocala, FL.

[55] In particular examples, the controller 330 is a Blackfin Digital Signal Processor (DSP), available from Analog Devices, Inc., of Norwood, MA. This particular DSP has built in network connectivity and an SPI interface (serial peripheral interface). In particular implementations, this controller 330 is programmed using DSP++ (Analog Devices, Inc.) or LabView (available from National Instruments, Inc., of Austin, TX). The analog to digital converter 334 may

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be a 16-bit converter connected via the SPI. The multiplexer 332 may, in particular examples, acquire data from up to 32 channels.

[56] Load Identification

[57] Various types of information contained in the collected data can be used to identify a particular load. For example measurements can be made of: the time the consumption began; the duration of the consumption; the rate of consumption; the total amount of utility consumed during a particular period; the maximum or peak use; the shape and magnitude of the electrical power waveform (such as the 60 Hz waveform); and any changes in the rate of consumption. These measurements can be compared to a library of standard values for different types of loads. The measurements can also be compared to a library of appliances previously observed on the utility signal. As an example of how consumption can be used to identify a load, a toilet flush can be distinguished from a shower based on the duration of the consumption, the total amount of water consumed, and the water flow rate.

[58] Time of day information can sometimes assist in identifying a load. For example water usage in the middle of the night is more likely to be due to a toilet flush than a shower. Repetitive periodic water usage throughout the day might be due to a sprinkler system whereas repetitive periodic water usage thought the day and night might be due to an ice maker. Even if the consumption patterns are not sufficient to completely identify the loads, they can still be used to help select the most likely candidates. The user can assist the appliance identification program by linking an unidentified appliance to the name of an appliance that is known have been in operation.

[59] When the data is electrical data, additional information may be measured and used to identify a load. For example, the shape and size of the 60 Hz conductance waveform (defined as the current divided by the voltage) may be used to help identify the load. Typical resistive appliances, such as incandescent lights and clothes irons, draw current that is in phase with the AC voltage. Appliances with a reactive and resistive load (such as a DC transformer for a stereo amplifier and a motor on a clothes washer) draw current that is out of phase with the voltage. Yet

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other appliances, such as computers, have switching power supplies that consume power for brief intervals during a voltage cycle. Analysis of the amplitude and temporal variation of the current and power waveforms can help identify specific loads connected to a circuit. The circuit can be characterized by its voltage and current measured at a particular sampling rate, such as 3840 Hz to provide 64 samples per voltage cycle.

[60] For some loads, the current or voltage may be very stable. For example, certain light bulbs are either on or off. Other loads may operate at discrete values, such as a ceiling fan with 3 speeds. Further types of loads will have a range of settings, such as a power drill having variable speed control. Finally, other loads (such as a refrigerator, TV, or computer) may have more complex combinations of conductance over time.

[61] Signal processing techniques can be used to disaggregate a bulk signal, such as the total household electrical or water use data, into its component loads based on the unique properties of each load. A library of properties of common loads can be maintained and accessed by the user interface 150, user computer 160, or remote system 170. For example, the library can include properties of appliances from model years that are most likely to be used in the monitored environment.

[62] When located on the user interface 150 or user computer 160, this library can be updated periodically, such as through the internet 180 by the remote server 170. Other programming of the user interface 150, or software running on the user computer 160, can also be updated via the internet, such as with improved algorithms, heuristics, and the like. In certain implementations, training or other user provided data is used to update a library that can be shared with other users. With a broad set of load profiles, the systems 100, 200, 300 will be able to, in particular examples, automatically identify the loads consuming at least about 90% of the utilities in the monitored area.

[63] In some aspects, the systems 100, 200, 300 use a processing algorithm that employs statistical analysis, such as a least squares fit, to identify individual loads. In a specific example, an effective variance analysis is performed on changes in conductance. Conductance is a useful parameter to characterize the power

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consumption behavior of an appliance since it is: (1) voltage independent (i.e. an appliance's conductance changes minimally with normal fluctuations in voltage delivered to the circuit) and (2) is additive for the calculation of power (i.e. the conductance on a circuit is the sum of the conductances of all appliances).

[64] In some examples, the voltage and current waveform is sampled at a sufficient rate such that many data points are collected for each voltage period. When the AC voltage V passes from negative to positive, current I and voltage V data points are each inserted into the first columns of a two dimensional array. The number of rows in the array is defined by the number of samples taken during a voltage cycle. When the AC voltage V passes from negative to positive again, the current and voltage data are inserted into the next columns of the arrays and so forth. With this data, instantaneous values of the Power P (I*V) measured in Watts and Conductance G (I/V) measured in Siemens can be calculated. In particular examples, the average and standard deviation of the rows of the conductance array is calculated on a one second basis.

[65] The current and voltage waveforms are measured as:

$$\mathbf{I} = I_1, I_2, \ldots I_n$$

$$\mathbf{V} = V_1, V_2, \ldots V_n$$

[66] Where n is the number of samples measured during each voltage cycle. Similarly, the conductance of each sample is also calculated:

$$\mathbf{G} = \frac{I_1}{V_1}, \frac{I_2}{V_2}, \ldots \frac{I_n}{V_n}$$

[67] The average and standard deviation of each element of I, V, and G is calculated for each non-transient (non-event) period by averaging over all voltage cycle waveforms over a period for example 1 second. To minimize memory needs for the system, the point-by-point calculations are used to calculate the mean and standard deviations. This is accomplished by tracking the number of measurements, the sum of the sample measurements, and the sum of squares of the sample measurements. The mean is calculated by the equation:

$$\boldsymbol{\mu}_m = \frac{\mathbf{x}_m + \sum_{j=1}^{m-1} \mathbf{x}_i}{m}$$

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[68] The standard deviation is subsequently calculated using the following equation:

$$\sigma_m = \sqrt{\frac{\mathbf{x}_m^2 + \sum_{j=1}^{m-1} \mathbf{x}_i^2}{m} - \boldsymbol{\mu}_m^2}$$

[69] In this case, the variable **x** is the waveform of conductance over the jth voltage cycle. An example of conductance waveforms for four appliances is shown in Figure 4. In this example, the data were collected with a 13-bit digital to analog converter with an electrical current sensitivity of 16 mA per bit. The Figure shows substantial variation of the conductance waveforms for the different appliances.

[70] The states of appliances on a particular circuit are identified by applying an effective variance calculation using all combinations of appliance waveforms known to exist on that particular circuit.

[71] The effective variance method seeks to find the minimum of the following equation:

$$\chi^2 = \sum_{i=1}^{n} \frac{\left(\mathbf{G}_i - \sum_{k=1}^{p} \mathbf{a}_{i,k}\mathbf{S}_k\right)^2}{\sigma_{\mathbf{G}_i}^2 + \sum_{k=1}^{p} \sigma_{a_{i,k}}^2 \mathbf{S}_k^2}$$

[72] Where χ^2 is the cost function to minimize, i is the element within a voltage cycle period, n is the number of elements within one period, k is a particular appliances out of a total of p known appliances within the appliance library, $\mathbf{a}_{i,k}$ is the ith element of the conductance array of appliance k, $\mathbf{S}_k$ is the binary state of appliance k (1 = on, 0 = off), and σ is the standard deviation of the ith element of either **G** or **a**.

[73] A transition event is defined to begin when the running χ^2 (comparing the interval from one period to the same sized interval in the next period) exceeds a certain threshold, indicating a change in the operational state of one or more appliances connected to the circuit. The transition event is defined to end when the running χ^2 falls below a predetermined threshold. Typical applications use an interval of 1 second for the running χ^2 calculation. All combinations of $\mathbf{S}_k$ are tested

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to find the minimum χ^2. If the minimum χ^2 is above a certain threshold, a new device is added to the appliance library.

[74] For a total of p appliances, there are 2^p different combinations of **S**. Since devices are generally turned on one at a time, **S** usually changes only one element at a time and the search for the optimal **S** can begin with p different combinations of S thereby reducing the number of calculations needed to find **S**. When looking at power increases, the number of combinations to be analyzed can be further reduced by omitting devices that are already on as possible candidates. Similarly, when looking at power reductions, devices that were not previously on can be omitted in determining possible candidates. In these situations, the number of combinations is less than p.

[75] For appliances that are continuously variable (i.e. a light with a dimmer), the different states will initially be identified as different appliances. As the user trains the appliance identification algorithm, the algorithm will identify the appliance based on the interpolation of already measured appliance states.

[76] The disaggregation algorithm is configured, in some embodiments, to identify small loads that are turned on while a much larger load is active. Failure to achieve this separation can cause the load identification techniques to inaccurately group various appliances and produce erroneous results. The following example demonstrates the ability of the effective variance technique to determine the operational state of an 18 W reading lamp while a 2100 W air conditioner is turned on.

[77] A comparison of the conductance profiles are shown in Figure 5. The error bars in the chart indicate that the variability of the conductance samples of the combination of both reading lamp plus air conditioner spans the conductance samples of the air conditioner alone.

[78] A stochastic analysis was performed by simulating waveforms assuming each ith measurement of conductance is normally distributed about its mean. A random number generator was used to add error to each average value to simulate the variation of repeated measurements. The uncertainty of the average sample value (i.e. the standard error) decreases as the number of samples increases and is

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defined as the standard deviation divided by the square root of the number of samples. Based on this relationship, the average conductance waveforms for a variety of averaging periods ranging from 0.0167 seconds (one voltage cycle) up to 30 seconds were simulated.

[79] The χ^2 was calculated for each sample point in the waveforms by comparing one simulation of the air conditioner conductance (i.e. the test set) with another simulation of the air conditioner conductance ("case one"). The standard deviations of each conductance measurement were used in calculating the χ^2. This calculation was repeated for the conductance waveform of the test set comparing it with the conductance of the air conditioner plus the reading lamp ("case two").

[80] The top panel of Figure 6 shows the χ^2 values calculated for only one voltage cycle. It can be seen that these are indistinguishable, indicating that when averaging for one voltage period (0.0167 seconds), the operational state of the lamp can not be determined when the air conditioner is on. As averaging periods increase the average χ^2 times the number of waveforms sampled increases for case two, whereas the values for case one remain constant.

[81] Figure 7 shows a comparison of the average χ^2 values times the number of voltage cycles for a range of averaging periods. The load identification algorithm selects the combination of appliances with the lowest chi-square. This example shows that the operational state of the lamp can be determined while the air conditioning is on after approximately 1 second. This is a substantial improvement in appliance selectivity over existing methods that use only real and reactive power (and occasionally odd number harmonic components) to infer the operational state of appliances. Accordingly, the averaging period can be chosen to provide a desired level of load resolution.

[82] The disclosed methods can also yield other useful information for power quality assurance such as THD (total harmonic distortion Eq. 4) and PF (power factor Eq. 5) which are useful for electric utilities and more informed users:

$$THD(\%) = 100 * \frac{I_{n=1}}{\sum_{2}^{\infty} I_n}\% \qquad \text{Eq. 4}$$

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$$PF = \frac{\sum_{n=1}^{\infty} V_n * I_n * \cos(\varphi_n - \phi_n)}{\sum_{n=1}^{\infty} V_n * I_n} \qquad \text{Eq. 5}$$

where n is the index of the fundamental frequency of the current I and voltage V. The term (φ-ϕ) is the difference in phase angles between the current and voltage.

[83] The THD and PF are typically monitored by electric utilities, and large power consumers often face penalties for violating established standards. The disclosed systems can be used to monitor these quantities and determine which loads have a detrimental effect on the power quality. Examples of data processing techniques that can be used or modified for use in electrical load analysis in the disclosed systems and methods are disclosed in Hart, "Nonintrusive Appliance Load Monitoring," *Proceedings of the IEEE* 80(12), 1870-1891 (December 1992), and U.S. Patent 5,717,325, each of which is expressly incorporated by reference herein in its entirety (in the case of any inconsistency with the present disclosure, the present disclosure shall control).

[84] In particular embodiments, the disaggregation algorithm uses time sequence heuristics based on likely or historical load use. Appliances are often used in a particular order. For example, a user's morning routine may be to take a shower, blow dry their hair, start a coffee maker, and make toast. In one aspect, the time a particular load consumes a utility can be used to help identify the load. For example, the aforementioned activities may typically occur in the morning. Accordingly, when discriminating between two possible loads to assign to a particular source of consumption, the time the load was activated may indicate assigning one load over another. Similarly, a particular sequence of loads may be indicated as more probable than another sequence. For example, "shower"-"hair dryer"-"coffee maker" may be indicated as more likely than "washing machine"-"hair dryer"-"coffee maker". Both time-based and sequence-based heuristics may be weighted such that heuristics that are more probably true are weighted more heavily than heuristics that are less probable.

[85] In further embodiments, the disaggregation algorithm uses a combination of data from two or more utilities to identify a load. For example, certain appliances,

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such as a dishwasher, use multiple utilities. Appliances that use a combination of utilities can thus be distinguished from appliances that use fewer utilities. Analyzing data from multiple utilities can also be used to identify loads, even when the load only consumes one utility.

[86] For example, Figure 8 presents simulated utility data simultaneously obtained from a gas meter, an electric meter, and a water meter. During the observed time, the user flushed a toilet, ran a washing machine, and took a bath or a shower. In addition, the user's furnace was activated.

[87] Looking at the water trace, area 406 represents the toilet flushing. Areas 416, 418, 420 represent wash and multiple rinse cycles of the washing machine. Area 426 represents the user's bath or shower. The toilet flush 406 can be distinguished from the shower 426 and washing machine cycles 416, 418, 420 based on the duration of the utility use and the pattern of use. For example, the washing machine pattern 416, 418, 420 may be a standard water use pattern for the particular washing machine model owned by the user. The toilet flush 406 may be identified because it uses a fixed amount of water per flush.

[88] Areas 430, 432, 434 of the electricity trace represent wash and rinse motor cycles of the washing machine. Again, the areas 430, 432, 434 may be characteristic of the particular washing machine used. The identification of areas 416, 418, 420 and 430, 432, 434 as being due to the washing machine is further confirmed by the relation of water use to electricity use. The washing machine would be expected to use both electricity and water. Furthermore, the water and electricity use show a clear pattern of the washing machine filling with water, followed by activation of the washing machine motor.

[89] The electricity trace also shows a longer, less intense period of electricity use at area 440. The area 440 may correspond to lighting used during the user's shower.

[90] The gas trace shows heater use at areas 450, 452. Areas 450, 452 can be assigned to the heater based on the duration and magnitude of the heater use, as heating likely uses a consistent gas draw rate. Furthermore, areas 450, 452 do not correspond to any electricity or water consumption, further confirming that the gas use is due to a heater. Gas use area 460 is assigned to a gas hot water heater. This

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assignment can be based on the degree and duration of gas use, as well as the correlation with hot water use during the user's shower, as confirmed by the electricity use area 440 and the water use area 426.

[91] Figure 9 presents electricity and water traces for simulated utility use. The water trace contains an area 510 associated with a morning shower. An area 520 represents a sink running and an area 530 represents activation of an automatic sprinkler system. The electricity trace exhibits an area 540 associated with the use of a hairdryer and an area 550 representing activation of a toaster.

[92] The identification of the utility loads can made based on the time of day of the consumption, the correlation of different utility consumption, and sequence heuristics. For example, the relatively long, steady water consumption of area 510 is closely followed in time by the short, high electricity consumption area 540. The combination of these two events, as well as the time of day, helps confirm the assignment of these areas to a shower and hair dryer.

[93] Similarly, without any other information, the area 550 might be difficult to assign to a toaster versus a number of other small wattage appliances. However, the time of day, occurrence after the shower 510, and before the running of the sink at area 520, helps establish area 550 as being due to a toaster as part of the user's morning routine. If the time of day indicated that the sun was up, this would indicate that area 550 was unlikely to be a lighting device. In case of conflict, such as the time of day indicating that it was dark outside, the multiple data streams can be compared and the most probable load chosen based on the heuristics most likely to produce the correct result. In case of error, the user can correct the system and help train the system to be more accurate in future predictions. The results can be presented with a particular confidence level to give the user an idea of the likely accuracy of the data.

[94] For example, in certain implementations, a user can program the user interface 150, such as by adding or editing library entries or by training the user interface 150 with user input. For example, the systems 100, 200, 300 can include a handheld unit, such as a PALM based or Window Mobiles based computer. As an example, during a training session, the handheld unit displays a list of devices within

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the monitored area and the user indicates if the devices are on or off. In further embodiments, the handheld unit may specifically direct a user to turn a load on or off. With sufficient training, the systems 100, 200, 300 can identify when most of the major devices are on and how much of a particular utility each device is consuming. The user can then associate particular loads, behaviors, settings, and activities with specific costs.

[95] Figure 10 presents a dataflow diagram of a process 600 of using the disclosed utility monitoring systems, such as the monitoring systems 100, 200, 300. Gas use is measured at a plurality of times at steps 608, 610, 612. Electricity use is measured at a plurality of times at steps 618, 620, 622. Water use is measured at a plurality of times at steps 628, 630, 632. Of course, the gas, electricity, and water use may be continuously monitored, with times 608, 610, 612, 618, 620, 622, 628, 630, 632 representing particular data points.

[96] The acquired data is transmitted to, and stored in, a storage device in process 640. The storage device may be, for example, the user interface device 150, the user computer 160, or the remote server 170. The data is then processed, sequentially or in parallel, using various data analysis or disaggregation processes. For example, the rate of utility use, total amount of utility consumed, time of consumption, duration of consumption, and degree of consumption (such as the highest amount of the utility drawn) are analyzed in process 644. Process 648 analyzes the data using sequence based heuristics, as previously described. Process 652 analyzes the data using correlation based heuristics, as previously described. For example, process 652 may correlate water use to electricity or gas use. Process 656 may apply phase lag heuristics or analysis to the data. The above-described effective variance analysis of the conductance may be applied in process 658. The processes 644, 648, 652, 656, 658 may be applied multiple times, such as in an iterative process, in order to disaggregate the acquired data into utility use information for discrete loads in a monitored area.

[97] A process 660 receives the results of the processes 644, 648, 652, 656, 658. In particular implementations, the process 660 applies further heuristics, or hierarchical rules regarding the processes 644, 648, 652, 656, 658 to select the most

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likely sources of utility use giving rise to the observed data. In further implementations, the process 660 consults a database 664 of utility loads in order to help identify discrete loads. The process 660 may send data back to one or more of the processes 644, 648, 652, 656, 658 for additional analysis.

[98] Once the observed data has been disaggregated into utility consumption from discrete loads, the information may be presented to a user at process 670. For example, the information may be presented on the user interface 150 or user computer 160.

[99] Methods of Using Utility Monitoring Systems

[100] When the disclosed systems include water monitoring, the systems can be used to detect water leaks. For example, the system can be used to locate a leaky faucet, toilet, or sprinkler. In particular implementations, water consumption exceeding a certain duration, or exceeding a certain duration and particular rate, may indicate a leak or similar problem. In some implementations, the system provides a notification to the user, such as an alert when the user accesses the system, an email, page, or telephone call. In further implementations, the system may shut off the water, such as to prevent damage to the monitored area, or may automatically call a service provider. Similar measures may be implemented with other utilities, such as gas or electricity.

[101] The system can also be in communication with, or otherwise monitored by, a utility company. In such implementations, the system can be used to enforce restrictions, such as watering restrictions. The system can prevent unauthorized use, or restrictions can be enforced, such as by issuing a fine, after data is reviewed by the utility. Similar measures can be implemented for gas or other utilities.

[102] In certain aspects of the present disclosure, it is undesirable, unnecessary, or overly complicated to identify numerous individual small loads. Accordingly, loads can be grouped into a particular category. For example, rather than measuring the electricity use of multiple incandescent or fluorescent light bulbs, data can be collected or calculated for all such similar loads. Abnormally low or high sub-loads

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can generate a flag or alarm to indicate to the user that there may be an issue with a particular load category.

[103] The user computer 160 receives data from the user interface 150 and can present a user with various reports. Such reports may be presented on the user interface 150, in particular examples. Such reports may include, for example, utility consumption summaries for a load, load category, or group of loads, such as a circuit. The consumption summary may be for a particular time period, such as a day, week, month, year, or period of years. Consumption over various periods of time can be used to track increased utility consumption over a time period. In further implementations, the user reports are provided to the user computer 160 over the network 180, such as from the remote server 170. In some configurations, the user interface device 150 provides the reports to the user, and may be in communication with the network 180 or remote server 170.

[104] Consumption for a particular load can be compared, or benchmarked, against standard values. For example, a particular appliance may be associated with a standard data pattern. Comparison of the measured data with the standard data may be used to indicate the condition of the user's appliance, such as whether the appliance needs maintenance or should be replaced. The comparison may be used to help identify the type of maintenance or repair needed. For example, increased fan effort over time may indicate a clogged air filter in a furnace or air conditioning unit.

[105] In further aspects, the user's consumption data is compared to similar users, such as users in the same zipcode, who have similar loads, or who have similar monitored areas. Such a comparison may allow a user to determine if they are consuming more utilities, or producing more pollution, than other similarly situated users. Such data can enable changes in user behavior, such as consuming less utilities or installing more efficient loads.

[106] Figure 11 illustrates an embodiment of a user interface screen 700 that can be displayed on the user interface device 150 or user computer 160. The screen 700 presents the total cost of consumed utilities 710 and the abatement cost 720 associated with pollution caused by the utility consumption 710 and estimated green house gas emissions 725. A picture 730 of the monitored area is presented and the

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consumed utilities 710 are broken down by type, such as lighting 740, appliances 742, and gas 744. The user can get more information on each of these utility subcomponents, such as a detailed report for each associated load, by activating an appropriate link 750.

[107] The screen 700 also presents climate control information 760, including heating costs 762, cooling costs 764, the temperature 766 outside the monitored area, and the temperature 768 within the monitored area. The screen 700 also rates the efficiency of the climate control system, such as using a star rating system 770. A user may choose to see more detailed information regarding each climate control component by selecting an appropriate link 772.

[108] In another aspect, the data from the system may be used to benchmark the efficiency of the heating, ventilation, air conditioning, and insulation of a building, collectively referred to as the "thermal efficiency." When configured to measure electric power and natural gas (or heating oil) consumption, the device can attribute specific costs to the HVAC system. Users can benchmark their building's thermal efficiency by calculating a U factor based on the following equations:

$$U_{Heating} = \frac{\text{Heating Energy} + \text{Ventilation Energy}}{\text{Building Area} \cdot (\text{Inside Temperature} - \text{Outside Temperature})}$$

$$U_{Cooling} = \frac{\text{Cooling Energy} + \text{Ventilation Energy}}{\text{Building Area} \cdot (\text{Outside Temperature} - \text{Inside Temperature})}$$

This feature is useful for comparing the efficiencies of different buildings and deciding how to invest in HVAC and/or insulation upgrades. Such information can affect building purchasing decisions.

[109] In a further aspect, the consumption for a particular load can be used to help the user determine whether the user should purchase a new appliance. For example, based on use history, as well as projections based on such historical consumption, the projected cost of a new appliance can be calculated and compared to the projected cost of continuing to use the existing appliance. If a significant amount of utility consumption can be avoided, the user may decide to purchase a newer or more efficient appliance. In particular examples, the systems 100, 200, 300 are used to determine whether, for example, a gas or electric appliance, such as a water heater, oven, range, clothes drying, or furnace, will be more cost effective.

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[110] The systems 100, 200, 300 may also be used to help a user to decide whether to take steps to make the monitored area more energy efficient. In particular examples, the systems 100, 200, 300 can estimate the energy savings that may be achieved through various measures, such as the installation of insulation, installation of energy efficient windows, or repair of leaky air ducts.

[111] The disclosed systems, particularly those linked to a remote server 170, may be used to present the user with offers from merchants or service technicians. For example, a company may advertise a new, more efficient refrigerator to a user through the system. In particular examples, the user's data is shared with such merchants and technicians so that the advertisements or solicitations are tailored to the user. For example, a user whose data indicates an appliance is in need of repair may receive advertisements from a service technician in the user's area. In particular aspects, the user may choose to subscribe to a service plan and a service technician may automatically be dispatched when the system indicates a load is in need of repair. In particular examples, a user can choose whether to receive such solicitation, or whether to share their data.

[112] In certain aspects, the systems 100, 200, 300 are used to control or set load use based on the user's cost preferences. For example, the system 100 can provide a thermostat setting that will yield a particular monthly energy cost. The user may also be presented with a range of temperature options and their associated costs. The user may manually set or program the thermostat. In further examples, the systems 100, 200, 300 are in communication with the thermostat and automatically control the thermostat in accordance with a user's energy or cost preferences.

[113] In some implementations, the thermostat is capable of variably heating or cooling different sub-areas of a monitored site, such as different rooms in a house or hotel. In one example, a user can manually set different heating or cooling programs for the sub-areas. In another example, the systems 100, 200, 300 automatically adjust utility use based on programmed conditions. For example, an absence of utility consumption in a particular room may indicate that it is unoccupied. Accordingly, the systems 100, 200, 300 may adjust the heating or cooling to that room to use less energy. If utility consumption subsequently indicates the room is

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occupied, the systems 100, 200, 300 appropriately adjust the heating or cooling to the room.

[114] The systems 100, 200, 300, in further embodiments, function as a security system. Unexpected patterns of utility consumption can indicate energy siphoning or unauthorized access from or to the monitored area. For example, a user can indicate that he or she is going on vacation so that the system 100, 200, 300 expects minimal energy consumption. In some examples, energy consumption above the minimal level triggers an alarm or notifies law enforcement authorities, or a security company.

[115] In certain aspects, the present disclosure is used to schedule utility use based on variable rates. For example, a utility may be priced lower at off-peak hours. A user may program the system to activate or change utility consumption based on such rate data. In a particular implementation, the system automatically switches utility consumption, when possible or according to a program, such as a user defined program, to off-peak times.

[116] Some embodiments of the present disclosure allow a user to monitor, and attempt to mitigate, their utility consumption and its associated environmental consequences. For example, the system may display both the actual utility cost of the user's behavior and the predicted environmental cost of their behavior. For example, the user may be presented with the monetary cost required to abate the environmental damage associated with their utility consumption. Even if the user is not concerned by the cost of their utility consumption, they may wish to mitigate environmental damage. The system may present the user with options to both reduce their utility consumption and ways to reduce the environmental consequences of their actions. In certain situations, a user may wish to pay more for some utilities in order to reduce the environmental consequences of their actions.

[117] Although the present disclosure generally describes apparatus, systems, and methods for monitoring utility consumption, the present disclosure may also be applied to utility generation. For example, a monitored area may receive supplemental electrical power from solar cells. The systems 100, 200, 300 are, in certain implementations, configured to regulate power drawn from the supplemental

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source and the main source, such as drawing power from the main source to make up for any shortfall in the amount generated by the supplemental source. In further implementations, the systems 100, 200, 300 measure an amount of power generated by the supplemental source and transferred to a main power grid, as a user may receive payment for such generated power.

[118] The systems and methods of the present disclosure can provide a number of advantages. One such advantage is that utility consumption information can be immediately provided to a user. Such a configuration can be advantageous compared to other systems which periodically upload data to a remote data collection site for processing. In particular embodiments, presently disclosed systems continuously provide data to a user interface, allowing the user to immediately view current utility consumption data. Because aspects of the present disclosure allow a user to track utility consumption associated with particular loads, such as appliances, the user can make informed decisions about their utility consumption.

[119] It is to be understood that the above discussion provides a detailed description of various embodiments. The above descriptions will enable those skilled in the art to make many departures from the particular examples described above to provide apparatuses constructed in accordance with the present disclosure. The embodiments are illustrative, and not intended to limit the scope of the present disclosure. The scope of the present disclosure is rather to be determined by the scope of the claims as issued and equivalents thereto.

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We claim:

1. A utility monitoring method comprising:

measuring an amount of a first utility consumed by a load associated with a device;

measuring an amount of second utility consumed by a load associated with the device; and

based on the amount of the first and second utilities measured, determining the identity of the device.

2. The utility monitoring method of claim 1, wherein the first utility and the second utility are electricity, water, gas, oil, propane, coal, hydrogen, or solar power.

3. The utility monitoring method of claim 1, wherein the first and second utilities are consumed at different times.

4. A utility monitoring method comprising:

measuring an amount of a utility consumed by a first device at a first time to determine a utility amount consumed by the first device;

measuring an amount of a utility consumed by a second device at a second time, which may be the same as the first time, to determine a utility amount consumed by the second device; and

determining the identity of the first device based on the measured consumption of the first and second devices at the first and second time.

5. The utility monitoring method of claim 4, wherein determining the identify of the first device based on the measured consumption of the first and second devices at a first and second time comprises selecting the more probable sequence of consumption of the first device and a first possible second device and the first device and a second possible second device.

6. The utility monitoring method of claim 4, wherein the utility amount consumed by the first device is an amount of a first utility consumed by the first device,

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further comprising measuring an amount of second utility consumed the first device.

7. The utility monitoring method of claim 6, wherein the utility amount consumed by the second device is an amount of a first utility consumed by the second device, further comprising measuring an amount of a second utility consumed the second device.

8. The utility monitoring method of claim 4, further comprising measuring an amount of a utility consumed by the first device at a third time, which may be the same as the second time if the second time is different than the first time.

9. A utility monitoring system comprising:
an electricity monitor in communication with an electrical source to a monitored area;
a water monitor in communication with a water source to the monitored area;
a signal processor in communication with the electricity monitor and the water monitor; and
a user interface device in communication with the signal processor;
whereby data from the electricity meter is disaggregated into individual load components and presented to a user.

10. The utility monitoring system of claim 9, further comprising a user computer in communication with the user interface device.

11. The utility monitoring system of claim 10, wherein the user computer is in communication with a remote network.

12. The utility monitoring system of claim 10, wherein the user computer comprises a processor configured to perform the method of claim 1.

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13. The utility monitoring system of claim 10 wherein the user computer comprises a processor configured to perform the method of claim 4.

14. The utility monitoring system of claim 9, wherein the user interface is in communication with a remote network.

15. The utility monitoring system of claim 9, wherein the user interface device comprises a processor configured to perform the method of claim 1.

16. The utility monitoring system of claim 9, wherein the user interface device comprises a processor configured to perform the method of claim 4.

17. The utility monitoring system of claim 9, wherein the electricity meter is in communication with each of a plurality of circuits.

18. A utility monitoring method comprising:
acquiring electricity consumption data from each of a plurality of circuits;
transmitting the electricity consumption data to a user interface device or user computer;
applying disaggregation algorithms to the electricity consumption data to identify individual sources of electricity consumption in the electricity consumption data; and
presenting a user with electricity consumption data for each of the plurality of individual sources.

19. The utility monitoring method of claim 18, wherein applying disaggregation algorithms to the consumption data comprises:
measuring an amount of electricity consumed by a load associated with a device;
measuring an amount of another utility consumed by loads associated with the device; and

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based on the amount of the measured electricity and other utilities measured, determining the identity of the device.

20. The utility monitoring method of claim 18, wherein applying disaggregation algorithms to the consumption data comprises:
measuring an amount of electricity consumed by a first device at a first time;
measuring an amount of electricity consumed by a second device at a second time; and
determining the identity of the first appliance based on the measured electricity consumption of the first and second devices at the first and second time.

21. The utility monitoring method of claim 18, wherein applying disaggregation algorithms to the consumption data comprises:
determining an amount of electricity consumed by a first device at a first time;
measuring the amount of another utility consumed by the first device at a second time, which may be the same as the first time;
determining an amount of electricity consumed by a second device at a third time, which may be the same as the first or second time;
measuring an amount of another utility consumed by the second device at a fourth time, which may be the same as the first, second, or third time; and
determining the identity of the first appliance based on the amount of electricity and another utility consumed by the first and second devices at the first, second, third, and fourth times.

22. The utility monitoring method of claim 18, wherein transmitting the electricity consumption data to a user interface device or user computer occurs at least substantially in real time.

23. A method of disaggregating electrical consumption data comprising:

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obtaining voltage and current data from a plurality of electrical devices;

analyzing the conductance waveforms of the voltage and current data;

comparing the conductance waveforms to a library of standard waveforms; and

identifying the plurality of electrical devices based on comparing the conductance waveforms to a library of standard waveforms.

24. The method of claim 23 wherein comparing the conductance waveforms to a library of standard waveforms comprises performing an effective variance analysis.

25. The method of claim 23, further comprising determining power state transitions of the plurality of electrical devices based on changes in the conductance waveforms.

26 The method of claim 23, further comprising averaging the conductance waveforms prior to comparing the conductance waveforms to a library of standard waveforms.

27 The method of claim 23 further comprising providing an at least substantially real time estimate of greenhouse gas emissions due to each of the plurality of electrical devices.

28. The method of claim 23, further comprising determining the thermal efficiency of a monitored area.

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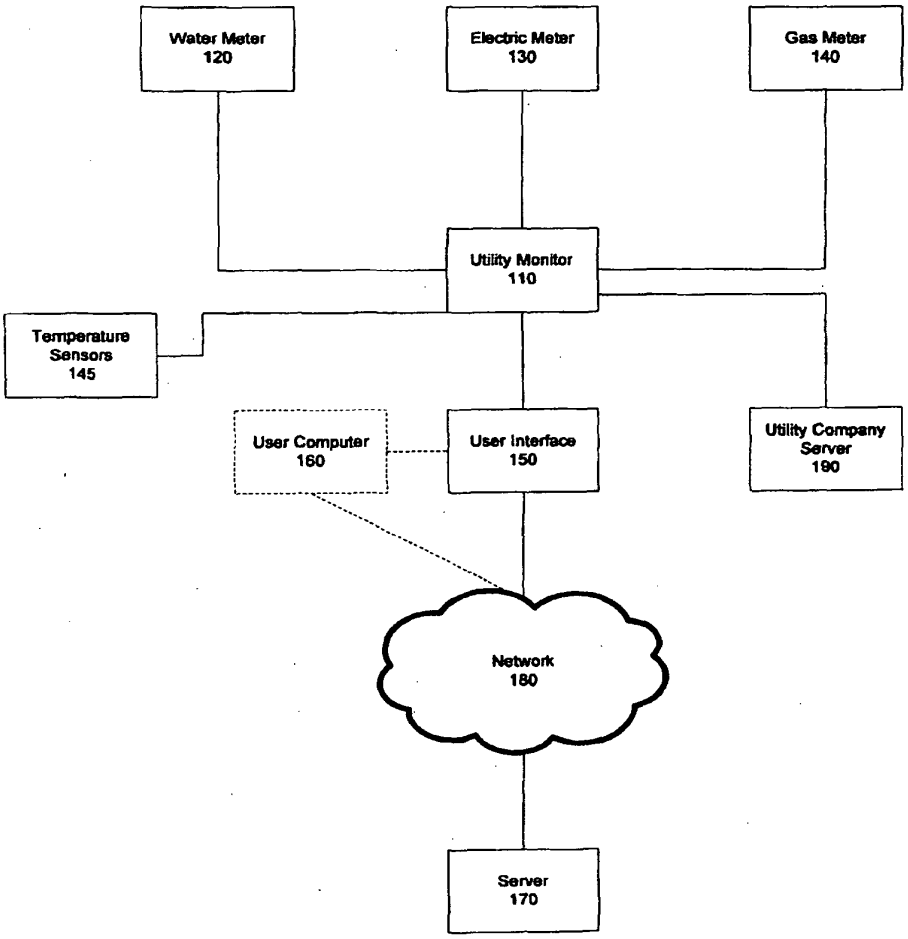


Figure 1

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Page 235

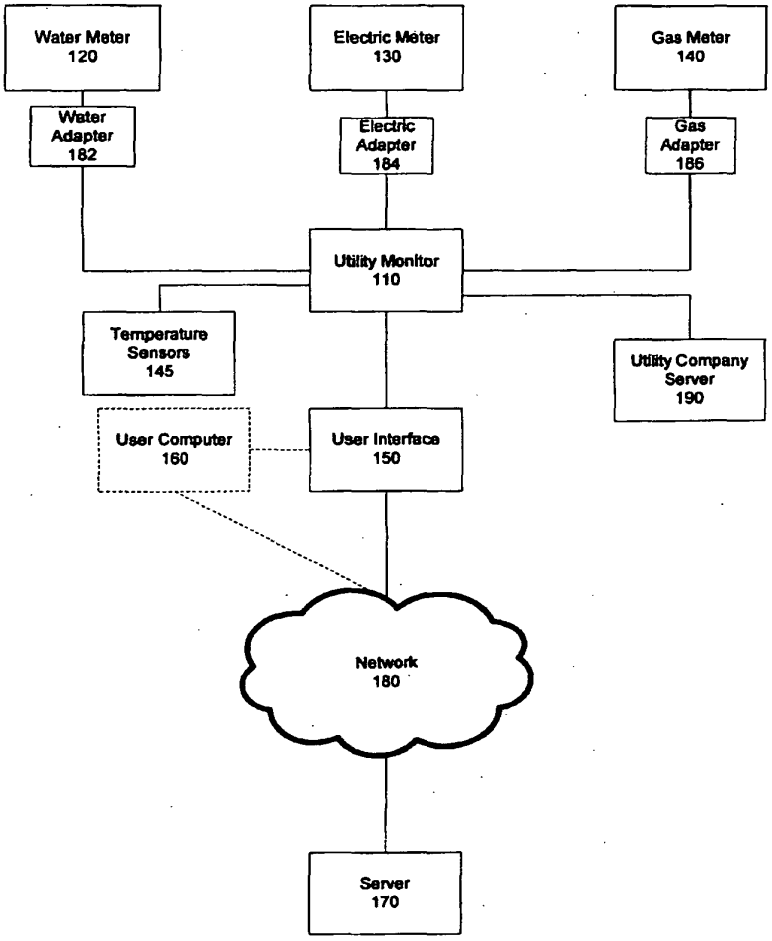


Figure 2

WILLOW TECH. EX. 1005
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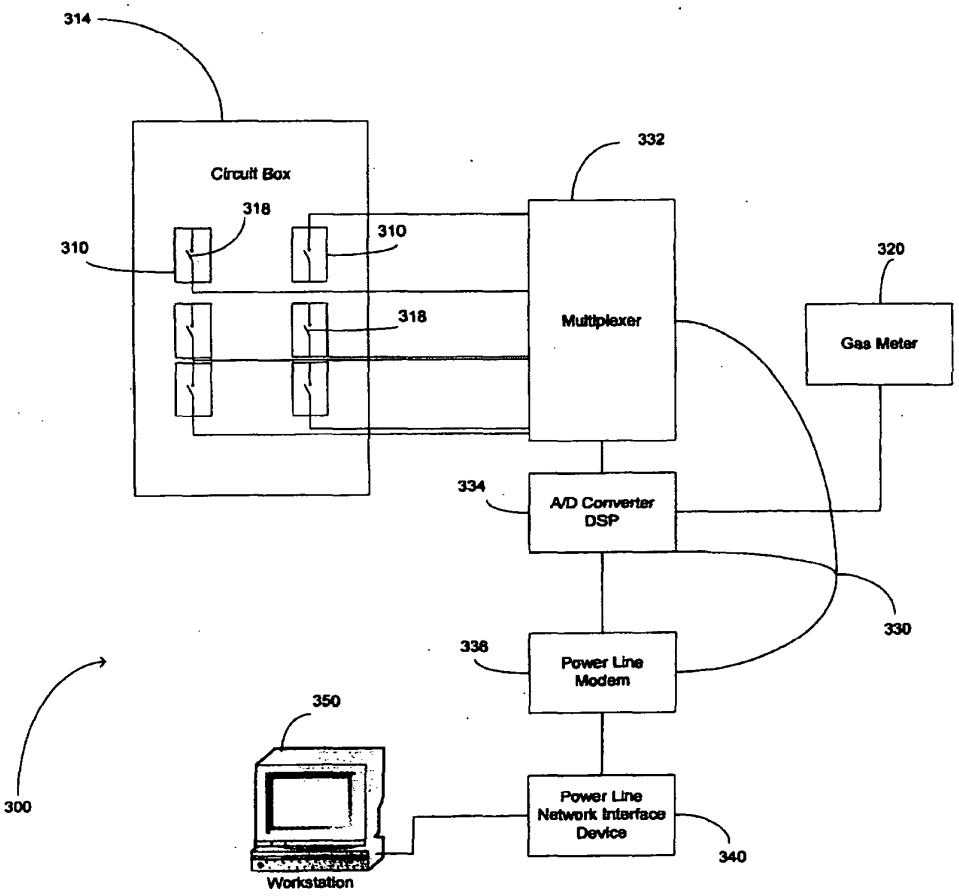


Figure 3

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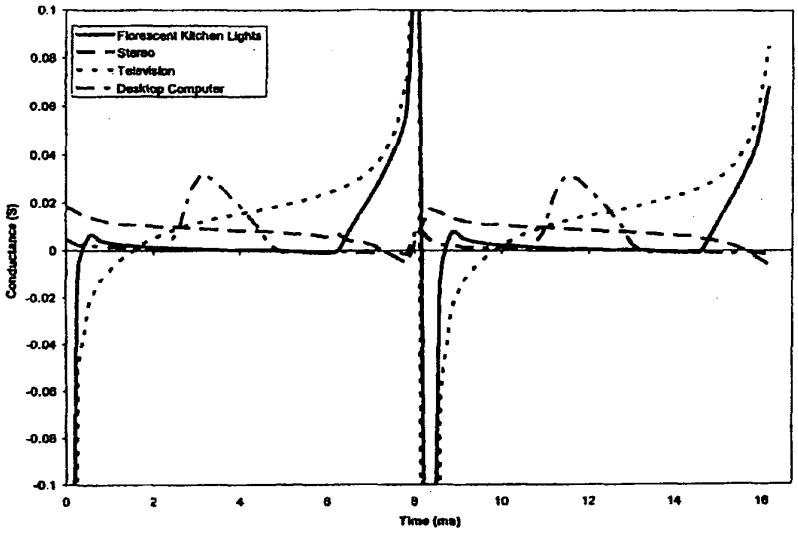


Figure 4

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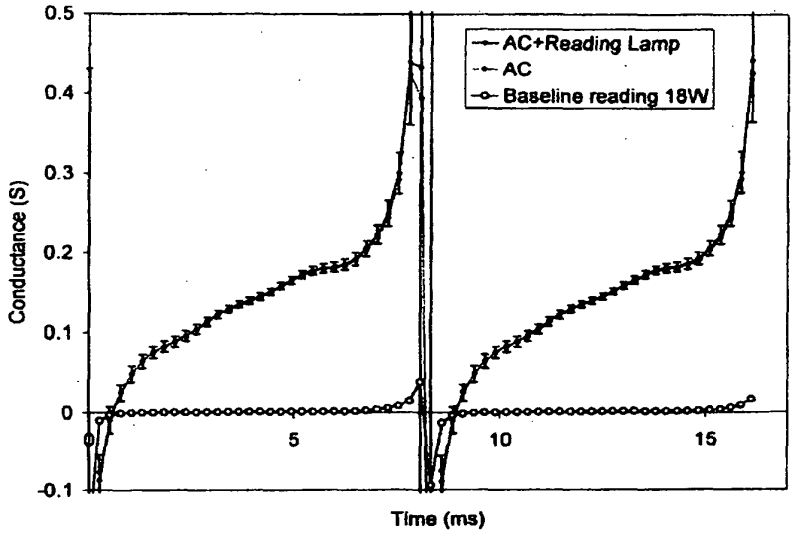

0.5
0.4
0.3
0.2
0.1
0
-0.1
Conductance (S)
5
10
15
Time (ms)
AC+Reading Lamp
AC
Baseline reading 18W

Figure 5

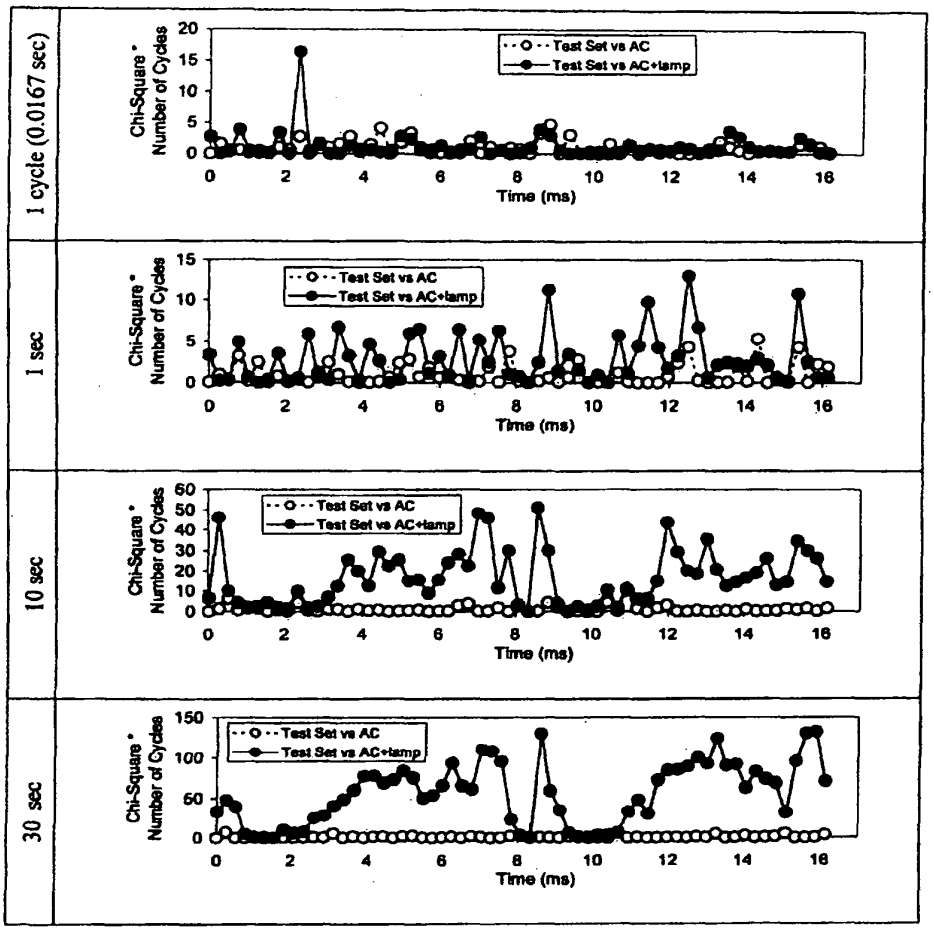


Figure 6

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Page 240

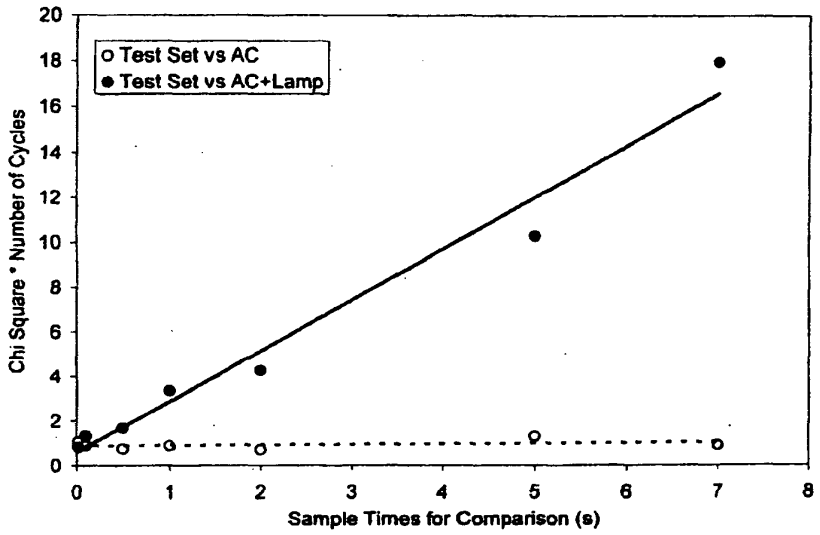


Figure 7

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Page 241

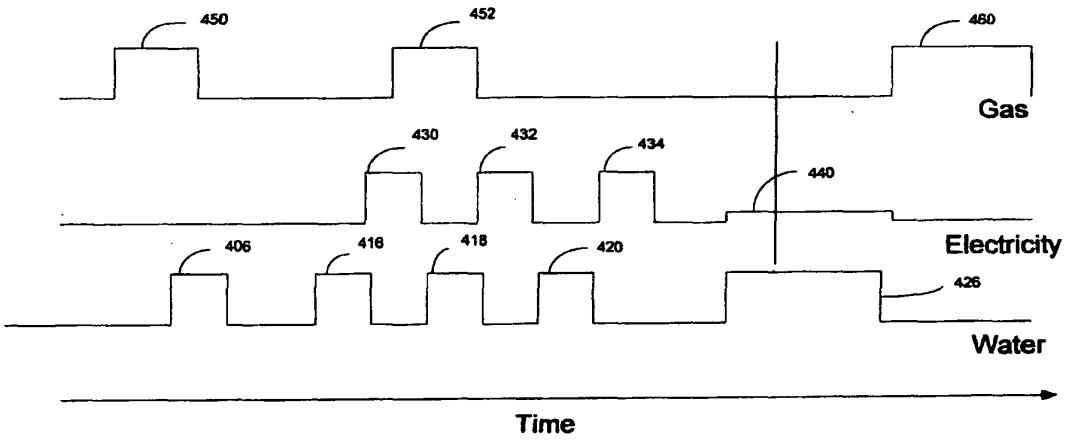

450
452
460
Gas
430
432
434
440
Electricity
406
416
418
420
426
Water
Time

Figure 8

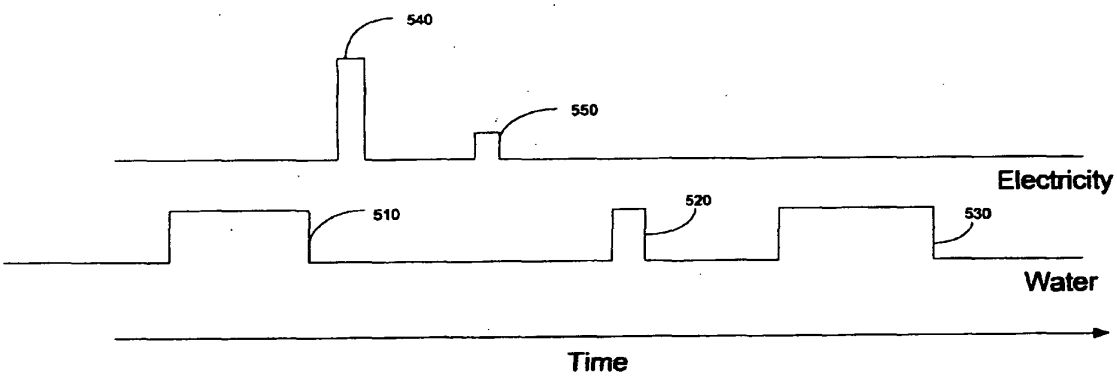


Figure 9

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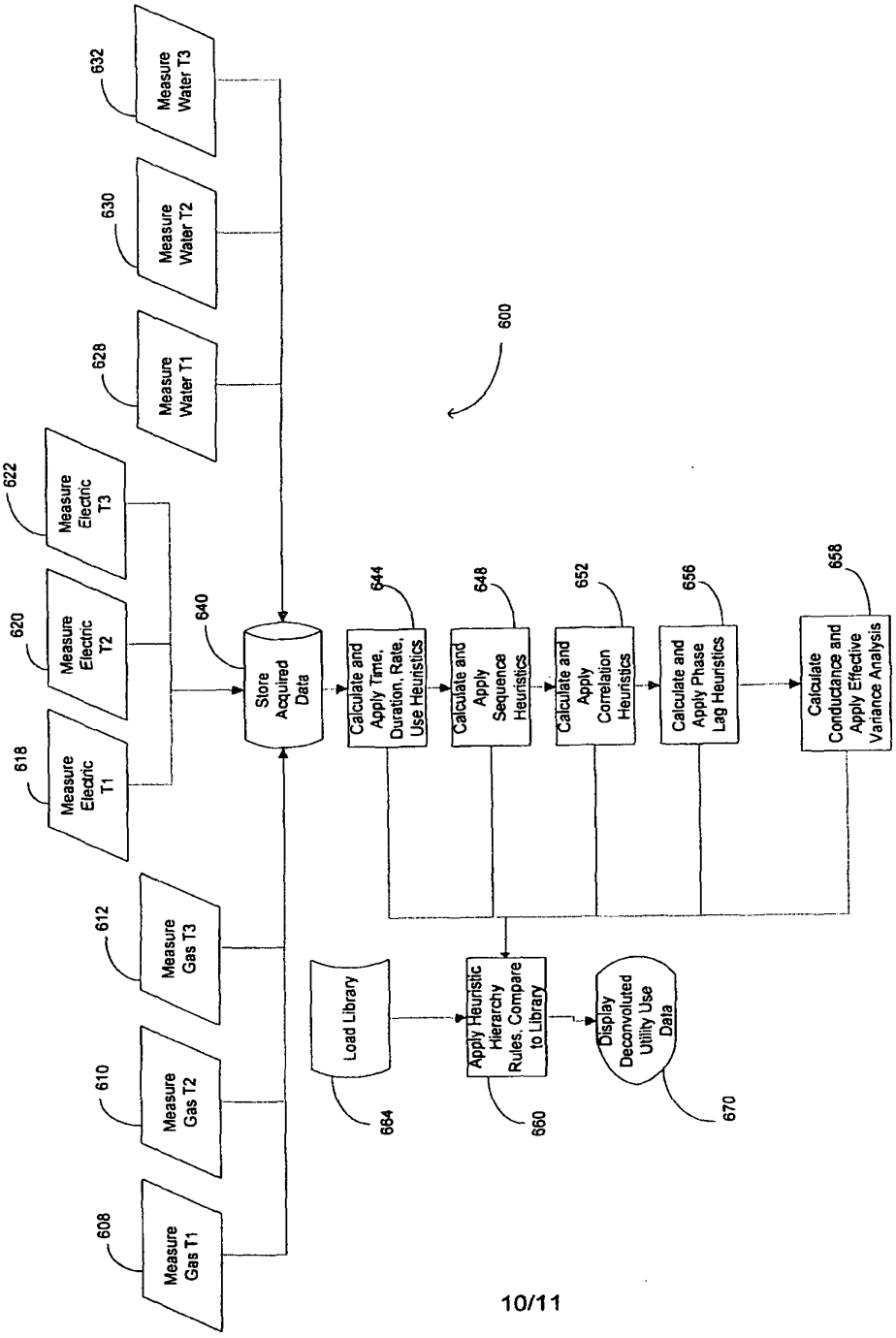


Figure 10

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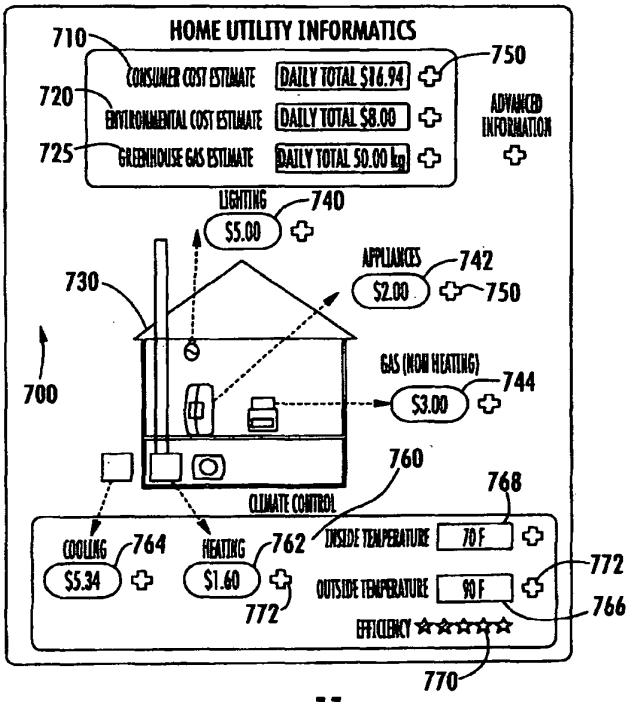


FIG. 11

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2006/048134

A. CLASSIFICATION OF SUBJECT MATTER

G06Q 10/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC8 G06Q 10/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models since 1975.
Japanese utility models and applications for utility models since 1975.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
e-KIPASS(KIPO internal) "measure, water, gas, oil, electricity, consumption"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1489719 A2 (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 22 December 2004 See abstract; figure 1; claims 1-10.	1 - 28
A	JP 15-088004 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 20 March 2003 See abstract; figure 1; claims 1-20.	1 - 28
A	KR 10-2003-0042112 A (LG.PHILIPS DISPLAYS KOREA CO., LTD.) 28 May 2003 See abstract; figure 2; claims 1-2.	1 - 28
A	KR 10-2006-0039171 A (LG ELECTRONICS INC.) 8 May 2006 See abstract; figures 1-2; claims 1-23.	1 - 28

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 JUNE 2007 (18.06.2007)	**18 JUNE 2007 (18.06.2007)**
Name and mailing address of the ISA/KR Korean Intellectual Property Office 920 Dunsan-dong, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer KIM, Soo Seob Telephone No. 82-42-481-8377

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/US2006/048134

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP1489719A2	22.12.2004	CN1573340A	02.02.2005
		EP1489719A3	02.05.2007
		JP17032235	03.02.2005
		KR2004111164A	31.12.2004
		US2004260490AA	23.12.2004
		US6983210BB	03.01.2006
JP15088004	20.03.2003	CN1251158C	12.04.2006
		CN1395109A	05.02.2003
		KR2003004117A	14.01.2003
KR2003042112	28.05.2003	NONE	
KR2006039171A	08.05.2006	NONE	

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 10022-1727	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US2010/034111	International filing date *(day/month/year)* 07 May 2010	(Earliest) Priority Date *(day/month/year)* 08 May 2009
Applicant ACCENTURE GLOBAL SERVICES GMBH		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☒ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 25

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/034111

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 21
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/034111

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06Q 10/00 (2010.01)
USPC - 705/7
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - G06Q 10/00, 40/00, 99/00 (2010.01)
USPC - 705/7, 35

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
MicroPatent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/0161450 A1 (CAREY et al) 20 July 2006 (20.07.2006) entire document	1-20
A	WO 2007/139587 A1 (KUHNS et al) 06 December 2007 (06.12.2007) entire document	1-20
A	US 2008/0147465 A1 (RAINES et al) 19 June 2008 (19.06.2008) entire document	1-20
A	US 2009/0018884 A1 (MCCONNELL et al) 15 January 2009 (15.01.2009) entire document	1-20

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 June 2010	06 JUL 2010
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

Electronic Acknowledgement Receipt

EFS ID:	8309574
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	John F. Nethery/Nkosi Harvey
Filer Authorized By:	John F. Nethery
Attorney Docket Number:	10022/1726
Receipt Date:	27-AUG-2010
Filing Date:	07-MAY-2010
Time Stamp:	16:36:32
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10022_1726_SuppIDS.PDF	156085 235968f0e0c247f7b4a47a22f8a0c33738c1a41b	yes	4

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Miscellaneous Incoming Letter	1	1
	Transmittal Letter	2	3
	Information Disclosure Statement (IDS) Filed (SB/08)	4	4

Warnings:					
Information:					
2	Foreign Reference	WO2007139587.pdf	1897562 59b8457fc3adf0c5218c0e72130d4a8f11c78c0e	no	46
Warnings:					
Information:					
3	NPL Documents	INTLSR.pdf	575014 4b93e2da49f182f661cfd0fd3d043ddd60c452d3	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	2628661		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

This correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: August 27, 2010 Name: John F. Nethery, Reg. No. 42,928 Signature: _____

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay E. Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Not yet assigned
Filed:	May 7, 2010	Art Unit:	2882
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.:	10022/1726		

TRANSMITTAL

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Transmittal Cover Letter (1p.); Supplemental Information Disclosure Statement and PTO Form 1449 (3pp.); 2 Cited References (B4 and B5).

Fee calculation:

☒ No additional fee is required.

☐ Small Entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR § 1.17(_____).

☐ An additional filing fee has been calculated as shown below:

					Small Entity			Not a Small Entity	
	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra	Rate	Add'l Fee	OR	Rate	Add'l Fee
Total		Minus			x $26=			x $52=	
Indep.		Minus			x 110=			x $220=	
First Presentation of Multiple Dep. Claim					+$195=			+ $390=	
					Total	$		Total	$

Fee payment:

☐ Please charge Deposit Account No. 23-1925 in the amount of $_____ for _____.

☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

August 27, 2010
Date

John F. Nethery (Reg. No. 42,928)

BRINKS HOFER GILSON & LIONE
NBC Tower – Suite 3600, 455 N. Cityfront Plaza Drive, Chicago, IL 60611-5599

BRINKS HOFER GILSON &LIONE

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

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Date: August 27, 2010 Name: John F. Nethery, Reg. No. 42,928 Signature: _____

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay E. Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Not yet assigned
Filed:	May 7, 2010	Art Unit:	2882
For:	Building Energy Consumption Analysis System	Confirmation No.:	1676

Attorney Docket No: 10022/1726

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

In accordance with the duty of disclosure under 37 CFR §1.56 and §§1.97-1.98, and more particularly in accordance with 37 CFR §1.97(b), Applicant hereby cites the following reference(s):

U.S. PATENT DOCUMENTS		
DOCUMENT NO.	**DATE**	**NAME**
US 2009/0018884 A1	01/15/2009	McConnell et al
US 2008/0147465 A1	07/19/2008	Raines et al.
US 2006/0161450 A1	07/20/2006	Carey et al.
FOREIGN PATENT DOCUMENTS		
DOCUMENT NO.	**DATE**	**COUNTRY**
WO 2007/139587	12/06/2007	WO

OTHER ART – NON PATENT LITERATURE DOCUMENTS
PCT International Search Report received in International Application No. PCT/US2010/034111, 3pp., dated July 6, 2010.

Applicant is enclosing Form PTO-1449 (one sheet), along with a copy of each listed reference for which a copy is required under 37 CFR §1.98(a)(2). As each of the listed references is in English, no further commentary is believed to be necessary, 37 C.F.R §1.98(a)(3). Applicant respectfully requests the Examiner's consideration of the above reference(s) and entry thereof into the record of this application.

By submitting this Statement, Applicant is attempting to fully comply with the duty of candor and good faith mandated by 37 CFR §1.56. As such, this Statement is not intended to constitute an admission that any of the enclosed references, or other information referred to therein, constitutes "prior art" or is otherwise "material to patentability," as that phrase is defined in 37 CFR §1.56(a).

The Applicant or Applicants have calculated no fee to be due in connection with the filing of this Information Disclosure Statement. However, the Director is authorized to charge any fee deficiency associated with the filing of this Information Disclosure Statement to a deposit account, as authorized in the Transmittal accompanying this Information Disclosure Statement.

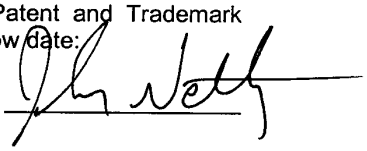
Respectfully submitted,

August 27, 2010
Date

John F. Nethery
Attorney for Assignee
(Reg. No. 42,928)

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

This correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: September 27, 2010 Name: John F. Nethery, Reg. No. 42,298 Signature: 

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay E. Hedley et al.	
Appln. No.:	12/776,159	Examiner: Not yet assigned
Filed:	May 7, 2010	Art Unit: 2882
For:	Building Energy Consumption Analysis System	Conf. No.: 1676
Attorney Docket No: 10022/1726		

PRELIMINARY AMENDMENT

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Prior to examination of the above-identified application, please amend the application as follows. Amendments to the Specification begin on page 2. Remarks being on page 3. Thirty five (35) replacement drawing sheets are submitted with this preliminary amendment, for drawings 1-29.

In the Specification:

Please replace the paragraph starting with "Figure 7 shows" on page 3, line 3 with the following amended paragraph:

[015] ~~Figure 7~~ Figures 7A, 7B, 7C, and 7D show findings that the system may generate from its analysis.

Please replace the paragraph starting with "Figure 8 shows" on page 3, line 4 with the following amended paragraph:

[016] ~~Figure 8~~ Figures 8A, 8B, and 8C show example baseline reports 800 that the system may generate.

Please replace the paragraph starting with "Figure 11 shows" on page 3, line 9 with the following amended paragraph:

[019] ~~Figure 11~~ Figures 11A and 11B show a system architecture for building energy analysis.

Please replace the paragraph starting with "Figure 12 shows" on page 3, line 10 with the following amended paragraph:

[020] ~~Figure 12~~ Figures 12A and 12B shows a phased implementation plan for the system.

Please replace the paragraph starting with "Figure 21 shows" on page 3, line 24 with the following amended paragraph:

[029] ~~Figure 21~~ Figures 21A and 21B show a dashboard screenshot for a monitoring reporting screen of historical energy comparison that the system may generate.

Please replace the paragraph starting with "Figure 22 shows" on page 3, line 25 with the following amended paragraph:

[030] ~~Figure 22~~ Figures 22A and 22B show a dashboard screenshot for a monitoring reporting screen of actual energy usage versus budged amount that the system may generate.

REMARKS

The amendments address that several of the Figures were separated into multiple sheets in order for the draftsperson to meet the formal drawing requirements. On June 11, 2010 replacement drawings were also filed. The draftsperson has since corrected errors in those drawings, and the drawings filed with this Preliminary Amendment supersede the June 11, 2010 submission.

Respectfully submitted,

Dated: September 27, 2010

John F. Nethery, Reg. No. 42,928
Attorney for Applicant(s)

BRINKS HOFER GILSON & LIONE
PO BOX 10395
CHICAGO, IL 60610
(312) 321-4200

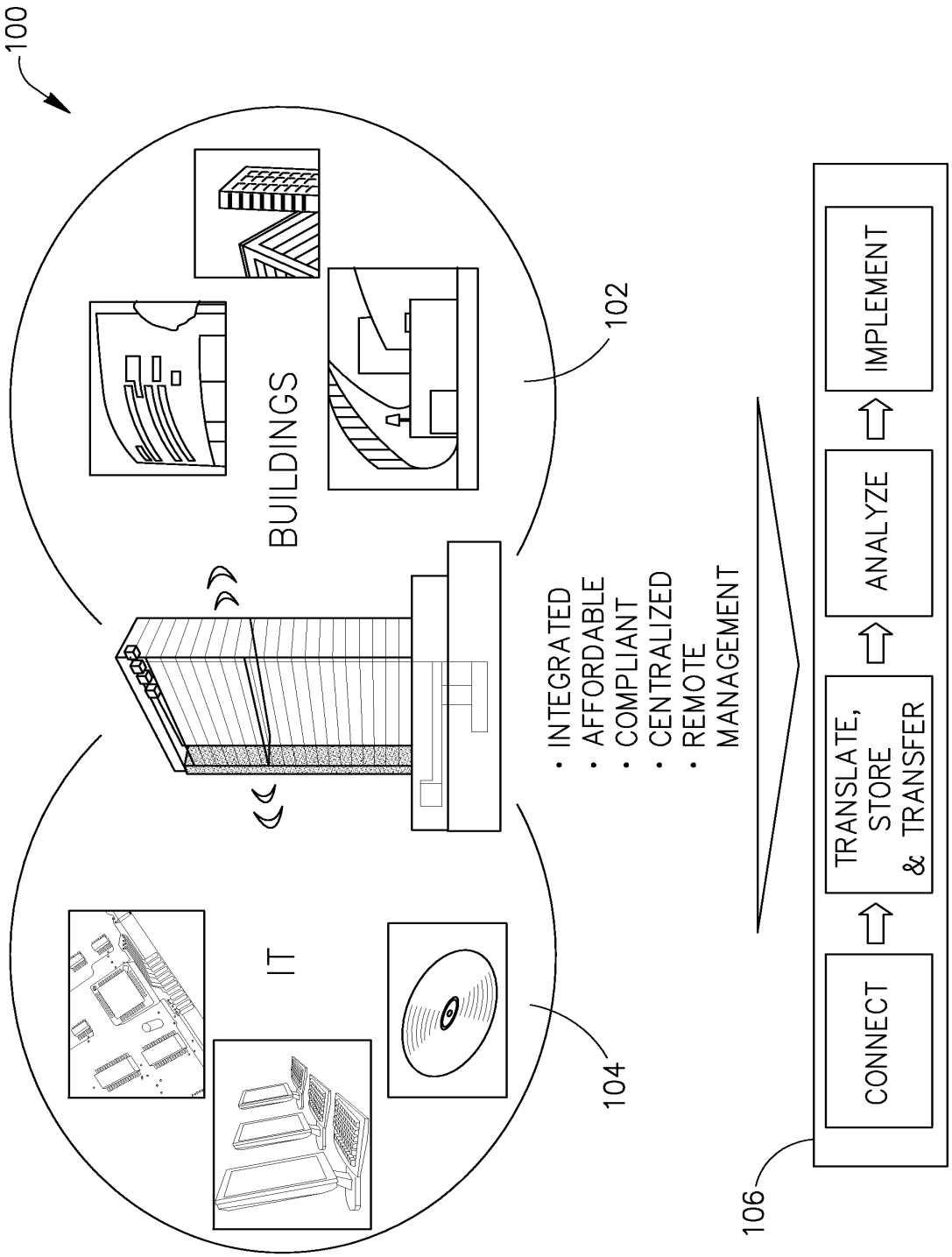

100
BUILDINGS
102
IT
104
• INTEGRATED
• AFFORDABLE
• COMPLIANT
• CENTRALIZED
• REMOTE MANAGEMENT
CONNECT
TRANSLATE, STORE & TRANSFER
ANALYZE
IMPLEMENT
106

Figure 1

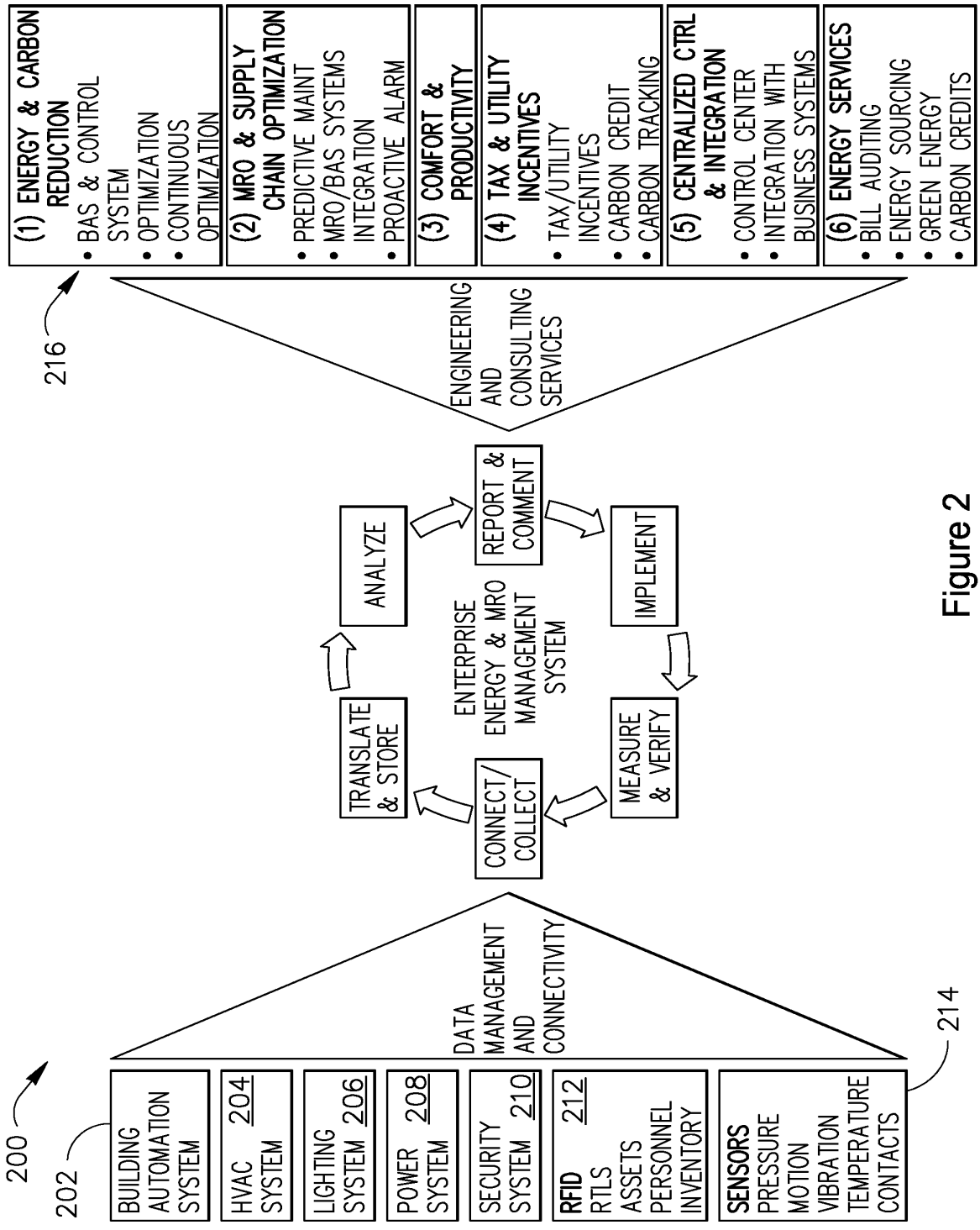

200
202
BUILDING AUTOMATION SYSTEM
HVAC 204 SYSTEM
LIGHTING SYSTEM 206
POWER 208 SYSTEM
SECURITY SYSTEM 210
RFID 212 RTLS ASSETS PERSONNEL INVENTORY
SENSORS PRESSURE MOTION VIBRATION TEMPERATURE CONTACTS
214
DATA MANAGEMENT AND CONNECTIVITY
CONNECT/ COLLECT
TRANSLATE & STORE
ANALYZE
REPORT & COMMENT
IMPLEMENT
MEASURE & VERIFY
ENTERPRISE ENERGY & MRO MANAGEMENT SYSTEM
216
ENGINEERING AND CONSULTING SERVICES
(1) ENERGY & CARBON REDUCTION
• BAS & CONTROL SYSTEM
• OPTIMIZATION
• CONTINUOUS OPTIMIZATION
(2) MRO & SUPPLY CHAIN OPTIMIZATION
• PREDICTIVE MAINT
• MRO/BAS SYSTEMS INTEGRATION
• PROACTIVE ALARM
(3) COMFORT & PRODUCTIVITY
(4) TAX & UTILITY INCENTIVES
• TAX/UTILITY INCENTIVES
• CARBON CREDIT
• CARBON TRACKING
(5) CENTRALIZED CTRL & INTEGRATION
• CONTROL CENTER
• INTEGRATION WITH BUSINESS SYSTEMS
(6) ENERGY SERVICES
• BILL AUDITING
• ENERGY SOURCING
• GREEN ENERGY
• CARBON CREDITS

Figure 2

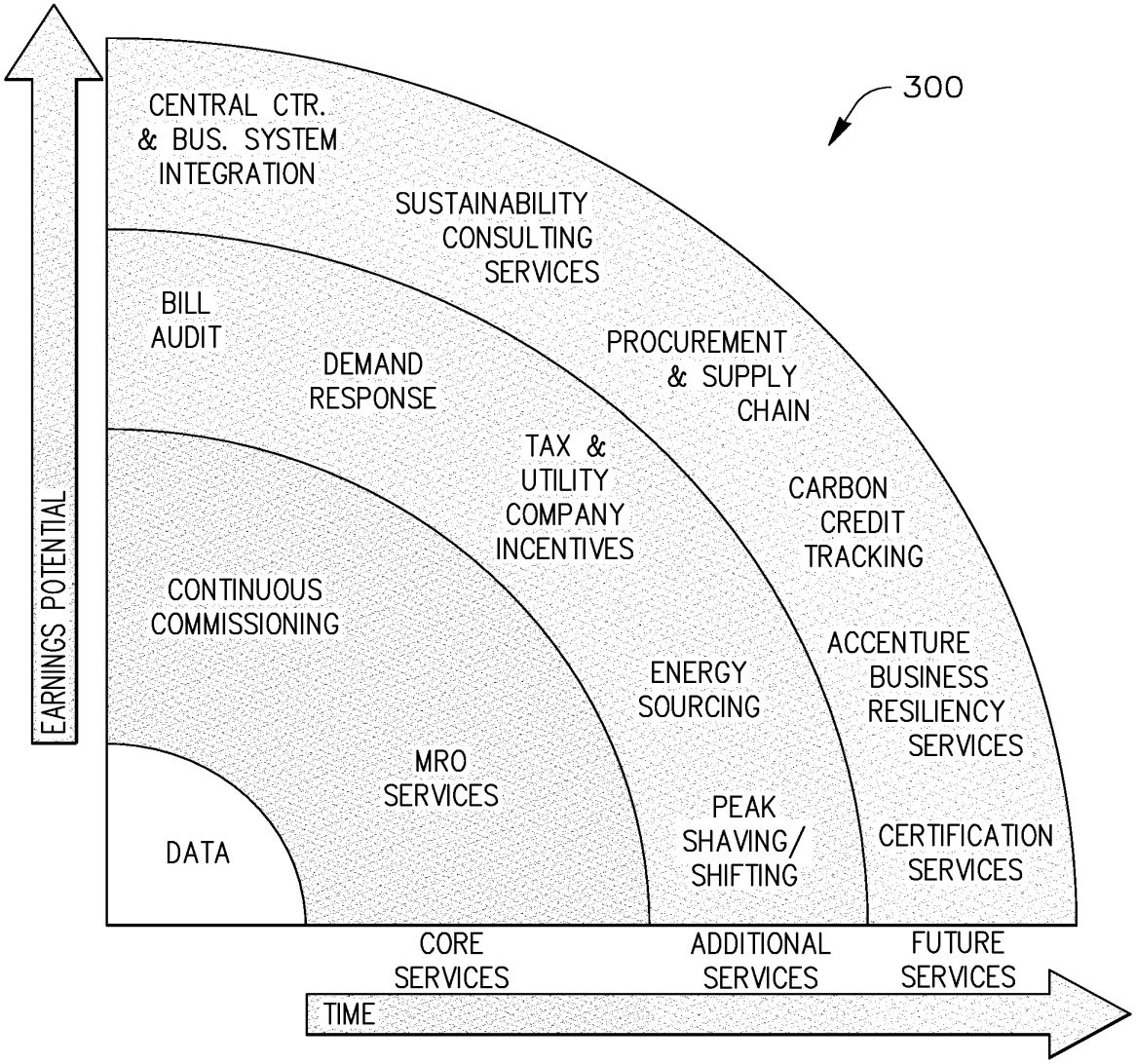

300
CENTRAL CTR. & BUS. SYSTEM INTEGRATION
SUSTAINABILITY CONSULTING SERVICES
BILL AUDIT
DEMAND RESPONSE
PROCUREMENT & SUPPLY CHAIN
TAX & UTILITY COMPANY INCENTIVES
CARBON CREDIT TRACKING
CONTINUOUS COMMISSIONING
ENERGY SOURCING
ACCENTURE BUSINESS RESILIENCY SERVICES
MRO SERVICES
PEAK SHAVING/ SHIFTING
CERTIFICATION SERVICES
DATA
EARNINGS POTENTIAL
CORE SERVICES
ADDITIONAL SERVICES
FUTURE SERVICES
TIME

Figure 3

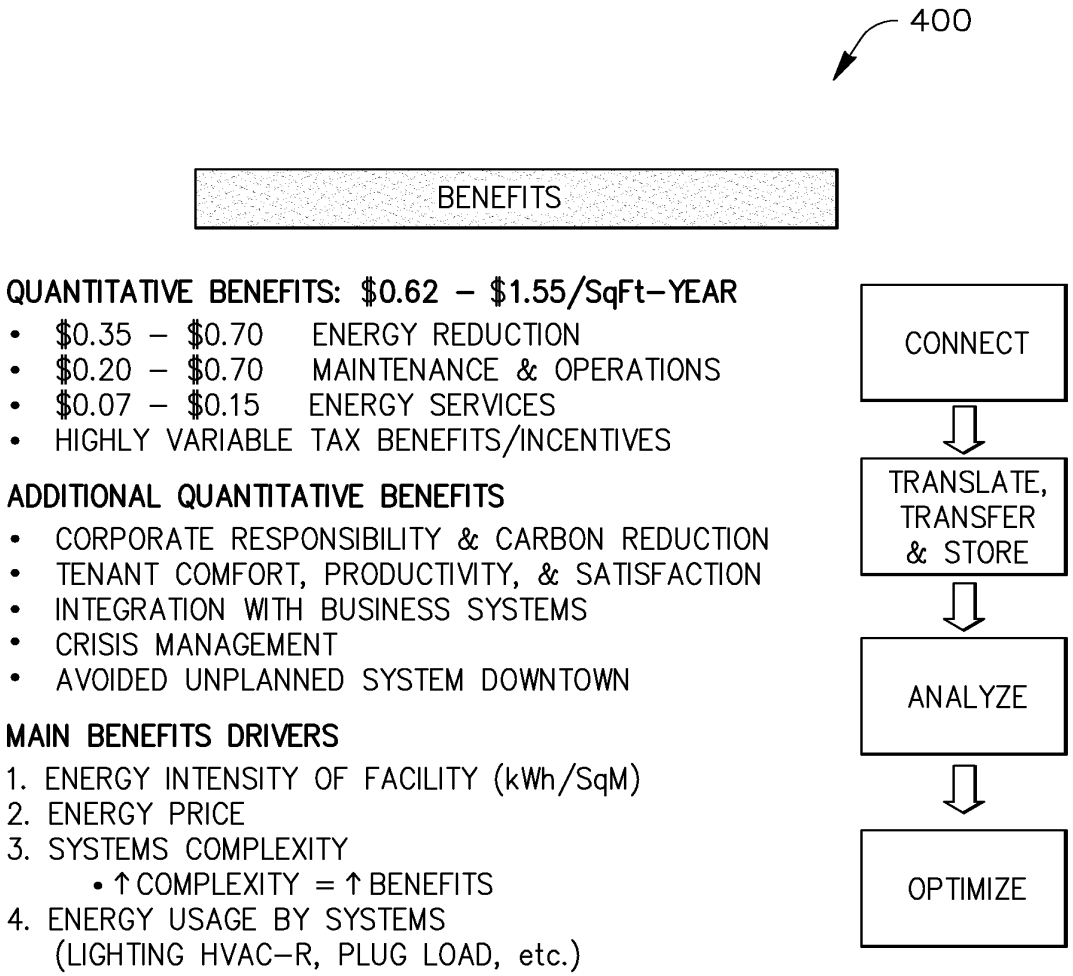

400
BENEFITS
QUANTITATIVE BENEFITS: $0.62 – $1.55/SqFt–YEAR
• $0.35 – $0.70 ENERGY REDUCTION
• $0.20 – $0.70 MAINTENANCE & OPERATIONS
• $0.07 – $0.15 ENERGY SERVICES
• HIGHLY VARIABLE TAX BENEFITS/INCENTIVES
ADDITIONAL QUANTITATIVE BENEFITS
• CORPORATE RESPONSIBILITY & CARBON REDUCTION
• TENANT COMFORT, PRODUCTIVITY, & SATISFACTION
• INTEGRATION WITH BUSINESS SYSTEMS
• CRISIS MANAGEMENT
• AVOIDED UNPLANNED SYSTEM DOWNTOWN
MAIN BENEFITS DRIVERS
1. ENERGY INTENSITY OF FACILITY (kWh/SqM)
2. ENERGY PRICE
3. SYSTEMS COMPLEXITY
• ↑ COMPLEXITY = ↑ BENEFITS
4. ENERGY USAGE BY SYSTEMS
(LIGHTING HVAC–R, PLUG LOAD, etc.)
CONNECT
TRANSLATE, TRANSFER & STORE
ANALYZE
OPTIMIZE

Figure 4

500

ENERGY & MAINTENANCE SERVICES IMPACT ANALYSIS

ANNUAL REVENUE	$1,000,000,000
ANNUAL NET INCOME (8%)	$80,000,000
SHARES OUTSTANDING	100,000,000
ANNUAL EARNINGS PER SHARE	$0.80
END OF YEAR SHARE PRICE	$16.00
PRICE EARNING RATIO (P/E)	20
MARKET CAPITALIZATION	$1,600,000,000
ANNUAL ENERGY SPEND	$30,000,000
ANNUAL MAINTENANCE SPEND	
PERCENT OF REVENUE REPRESENTED ENERGY & MAINTENANCE SPEND	$30,000,000
EXPECTED % SAVINGS FROM ANNUAL ENERGY & MAINTENANCE SPEND	6.0%
EXPECTED ANNUAL NI INCREASE @ 40% TAX RATE	20.0%
ENERGY & MAINTENANCE SAVINGS CONTRIBUTION	$7,200,000
SHAREHOLDER VALUE	$144,000,000
ADDITION TO SHARE PRICE	**$1.44**
SHARE PRICE AFTER INSTITUTION OF TOTAL ENERGY & MAINTENANCE MANAGEMENT	**$17.44**
PERCENTAGE INCREASE IN SHARE PRICE AND EPS	**9.0%**

Figure 5

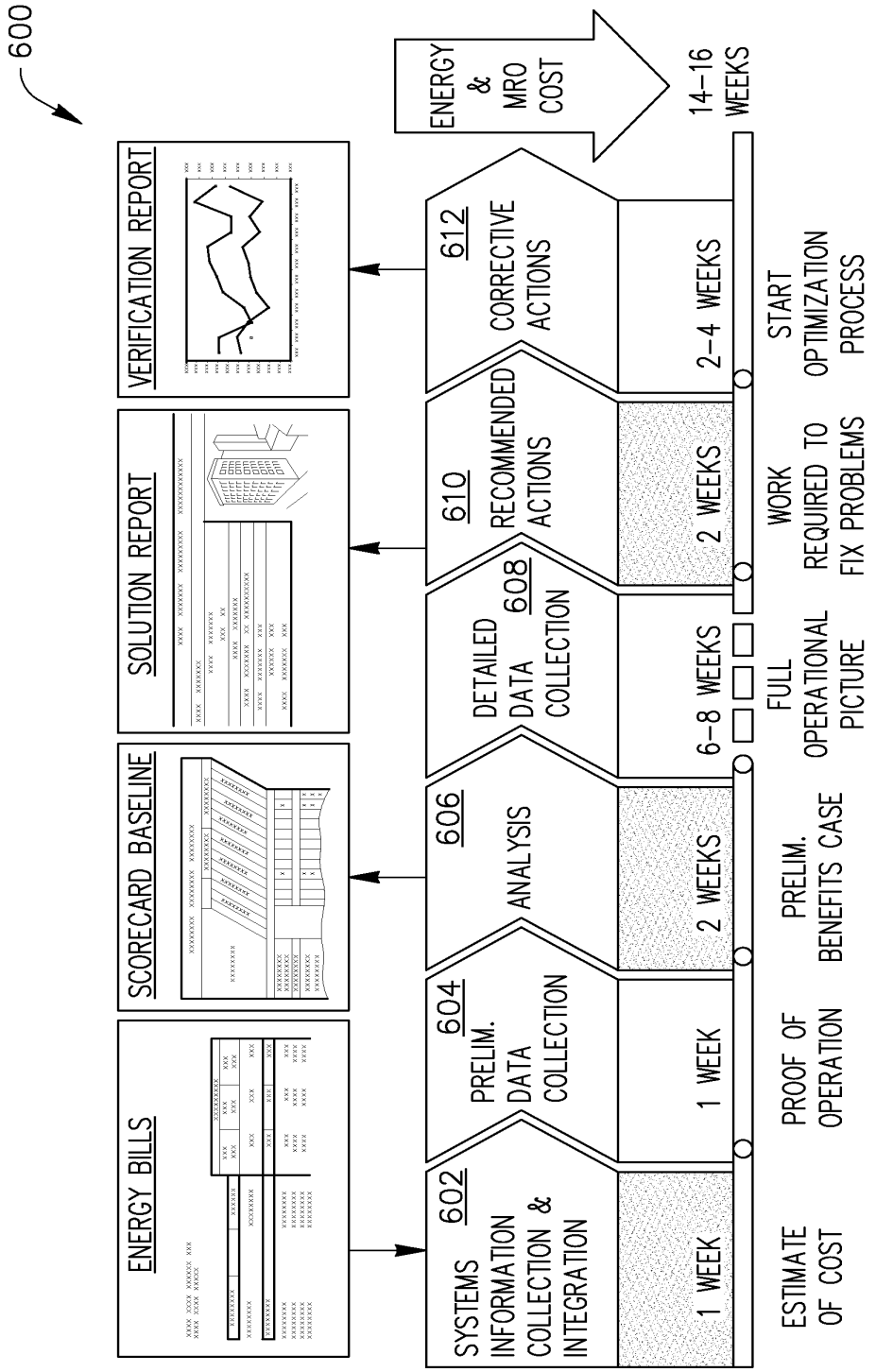

600
ENERGY BILLS
SCORECARD BASELINE
SOLUTION REPORT
VERIFICATION REPORT
SYSTEMS INFORMATION COLLECTION & INTEGRATION 602
PRELIM. DATA COLLECTION 604
ANALYSIS 606
DETAILED DATA COLLECTION 608
RECOMMENDED ACTIONS 610
CORRECTIVE ACTIONS 612
ENERGY & MRO COST
14–16 WEEKS
1 WEEK
1 WEEK
2 WEEKS
6–8 WEEKS
2 WEEKS
2–4 WEEKS
ESTIMATE OF COST
PROOF OF OPERATION
PRELIM. BENEFITS CASE
FULL OPERATIONAL PICTURE
WORK REQUIRED TO FIX PROBLEMS
START OPTIMIZATION PROCESS

Figure 6

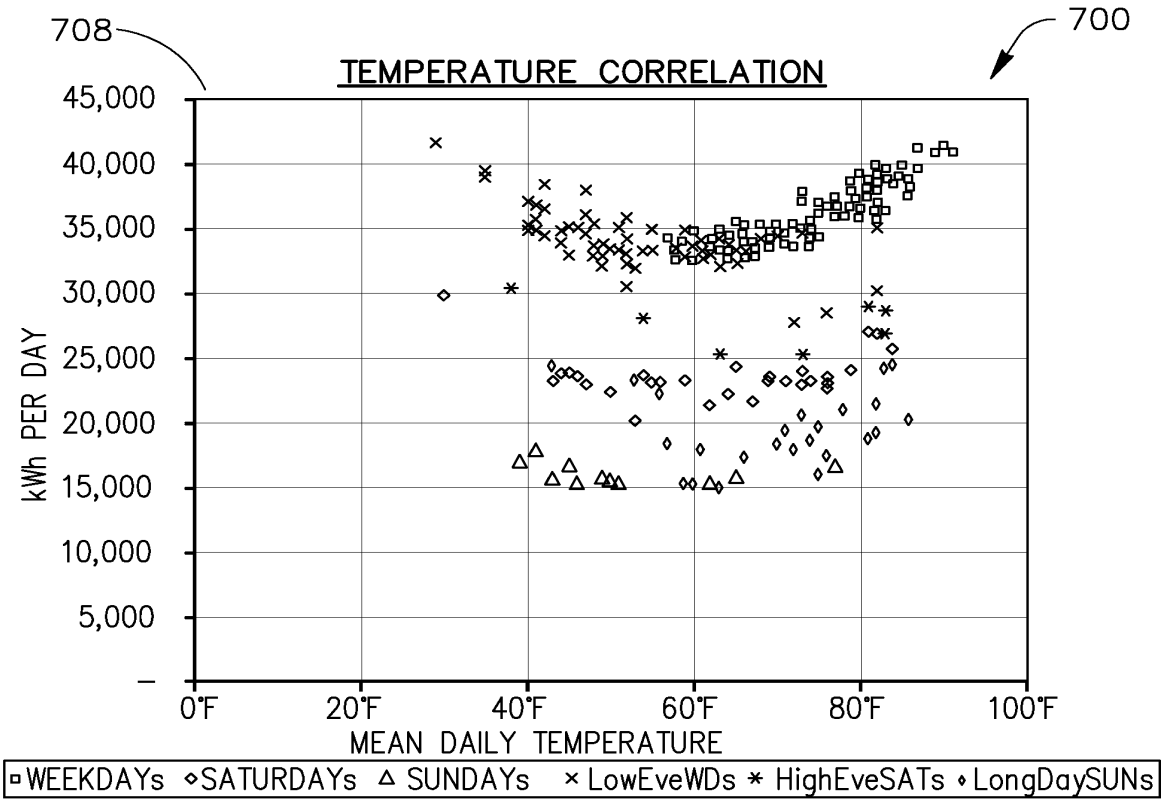


Figure 7A

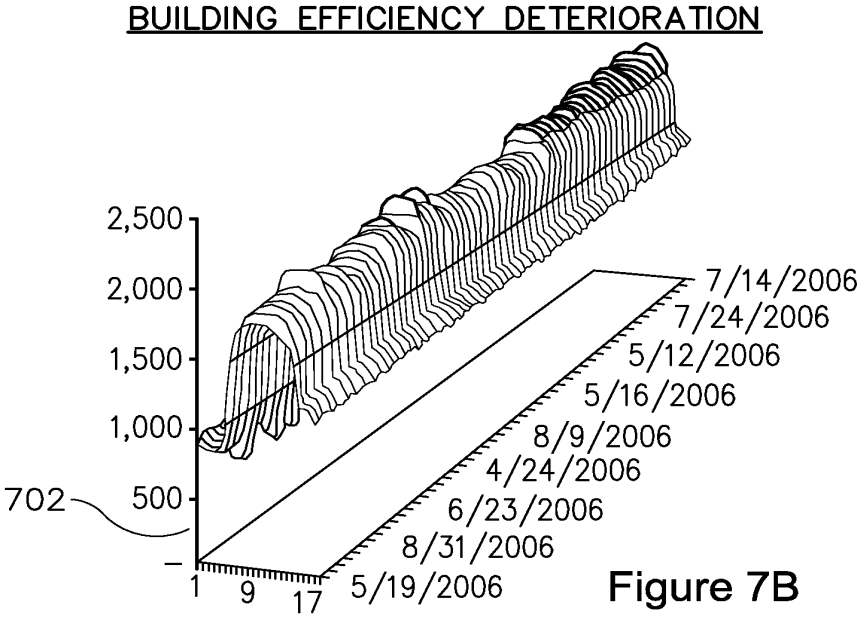


Figure 7B

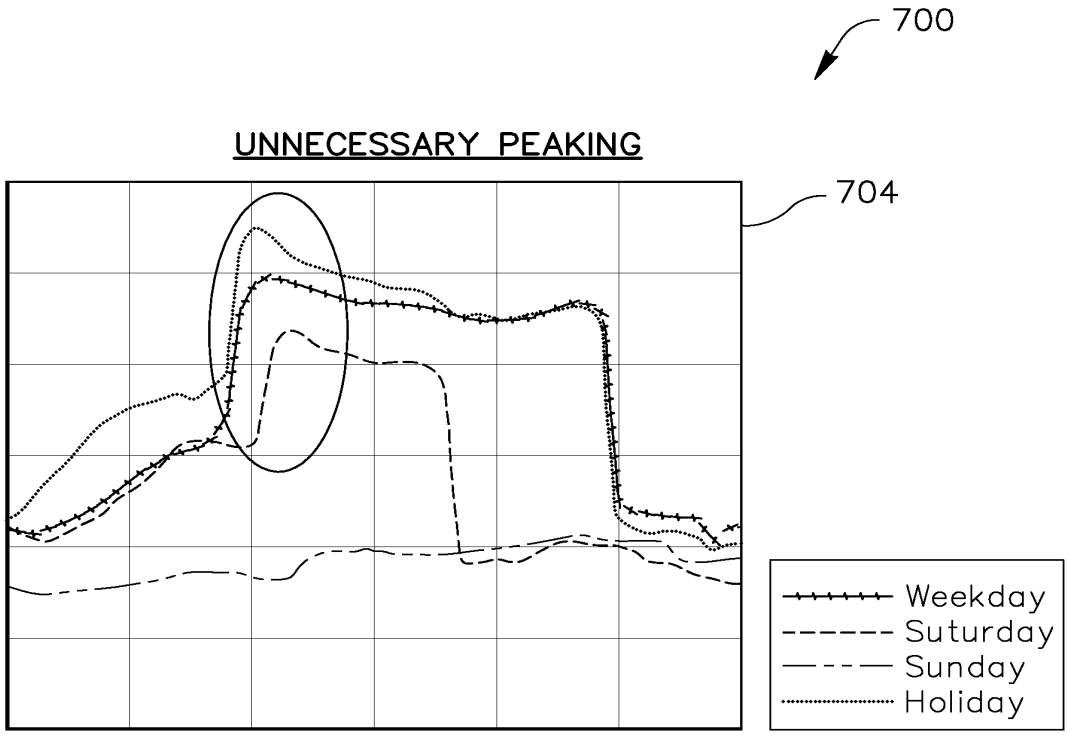


Figure 7C

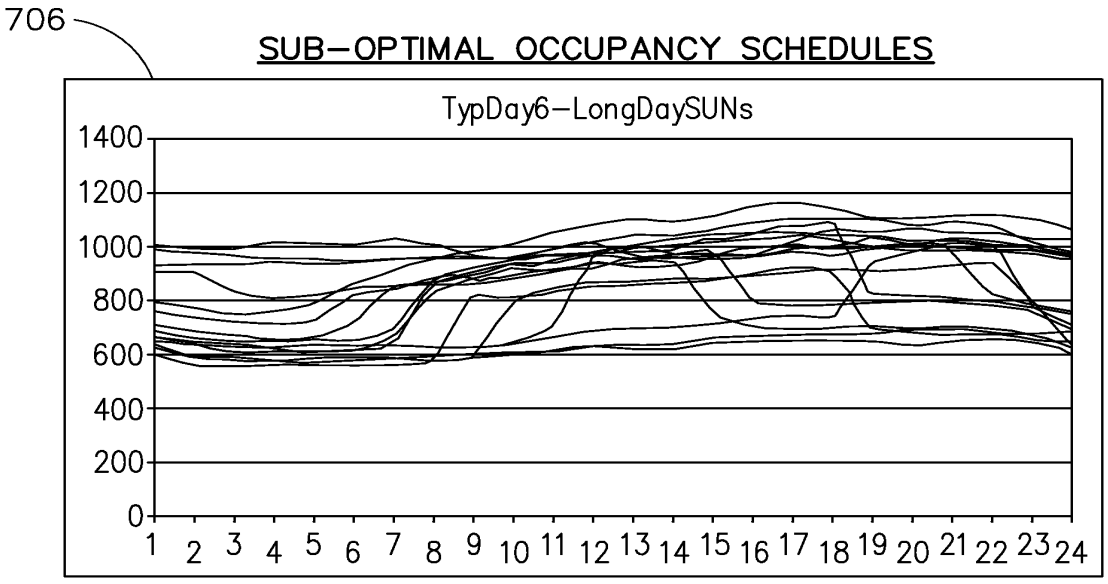
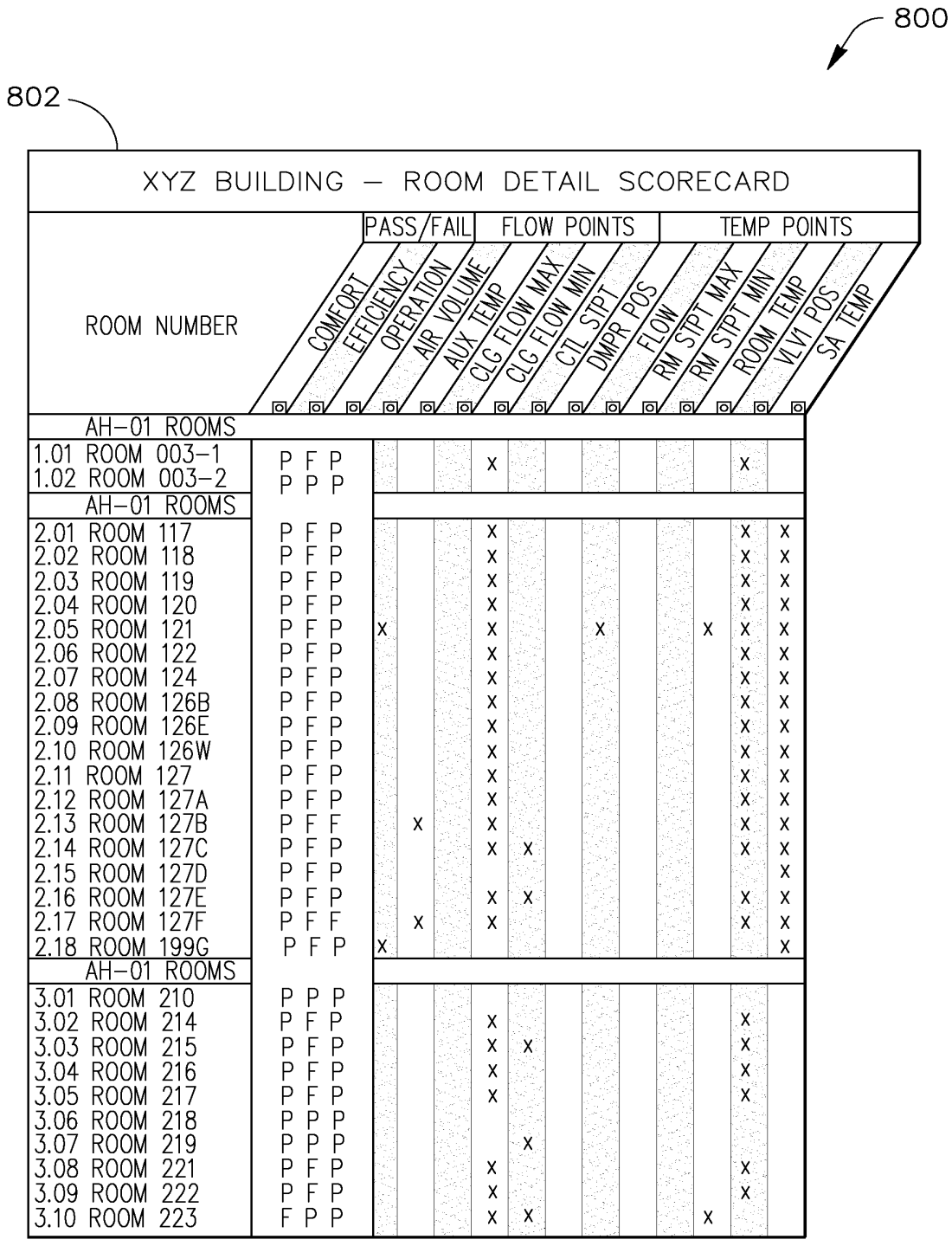


Figure 7D



XYZ BUILDING – ROOM DETAIL SCORECARD

ROOM NUMBER	PASS/FAIL	FLOW POINTS								TEMP POINTS			
	COMFORT	EFFICIENCY	OPERATION	AIR VOLUME	AUX TEMP	CLG FLOW MAX	CLG FLOW MIN	CTL STPT	DMPR POS	FLOW	RM STPT MAX	RM STPT MIN	ROOM TEMP	VLV1 POS	SA TEMP
AH–01 ROOMS															
1.01 ROOM 003–1	P	F	P				x						x		
1.02 ROOM 003–2	P	P	P												
AH–01 ROOMS															
2.01 ROOM 117	P	F	P				x						x	x	
2.02 ROOM 118	P	F	P				x						x	x	
2.03 ROOM 119	P	F	P				x						x	x	
2.04 ROOM 120	P	F	P				x						x	x	
2.05 ROOM 121	P	F	P	x			x			x		x	x	x	
2.06 ROOM 122	P	F	P				x						x	x	
2.07 ROOM 124	P	F	P				x						x	x	
2.08 ROOM 126B	P	F	P				x						x	x	
2.09 ROOM 126E	P	F	P				x						x	x	
2.10 ROOM 126W	P	F	P				x						x	x	
2.11 ROOM 127	P	F	P				x						x	x	
2.12 ROOM 127A	P	F	P				x						x	x	
2.13 ROOM 127B	P	F	F		x		x						x	x	
2.14 ROOM 127C	P	F	P				x	x					x	x	
2.15 ROOM 127D	P	F	P											x	
2.16 ROOM 127E	P	F	P				x	x					x	x	
2.17 ROOM 127F	P	F	F		x		x						x	x	
2.18 ROOM 199G	P	F	P	x										x	
AH–01 ROOMS															
3.01 ROOM 210	P	P	P												
3.02 ROOM 214	P	F	P				x						x		
3.03 ROOM 215	P	F	P				x	x					x		
3.04 ROOM 216	P	F	P				x						x		
3.05 ROOM 217	P	F	P				x						x		
3.06 ROOM 218	P	P	P												
3.07 ROOM 219	P	P	P					x							
3.08 ROOM 221	P	F	P				x						x		
3.09 ROOM 222	P	F	P				x						x		
3.10 ROOM 223	F	P	P				x	x				x			

Figure 8A

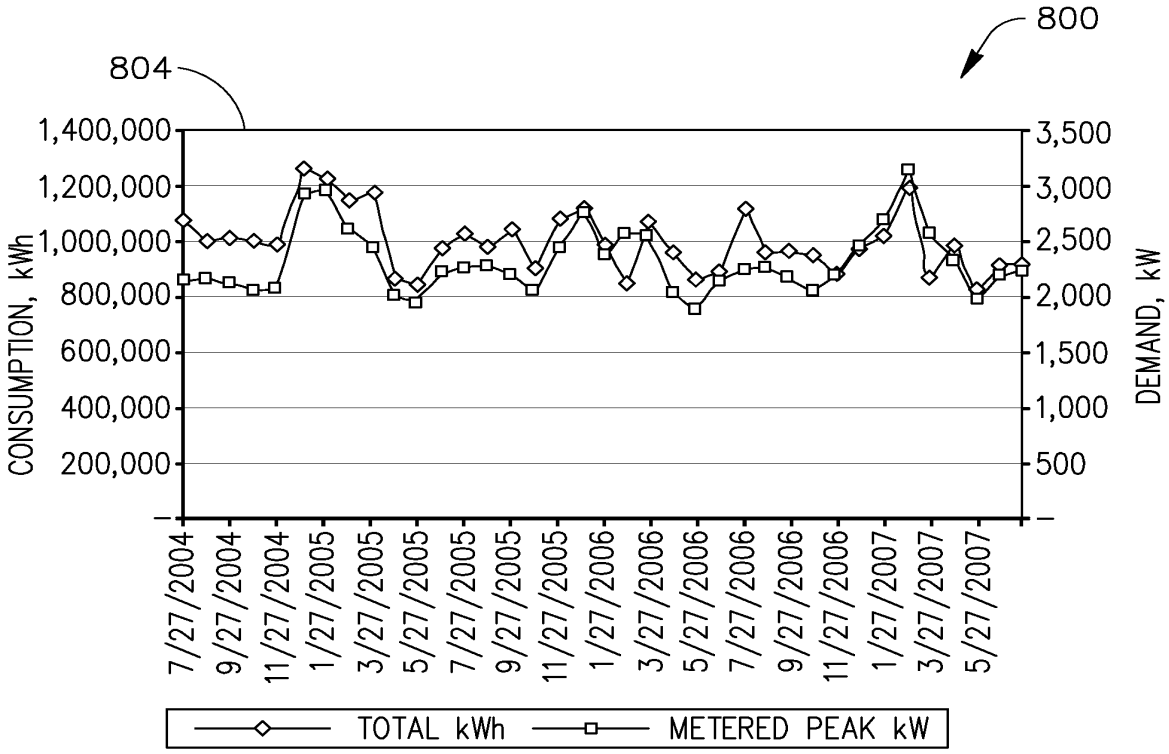


Figure 8B

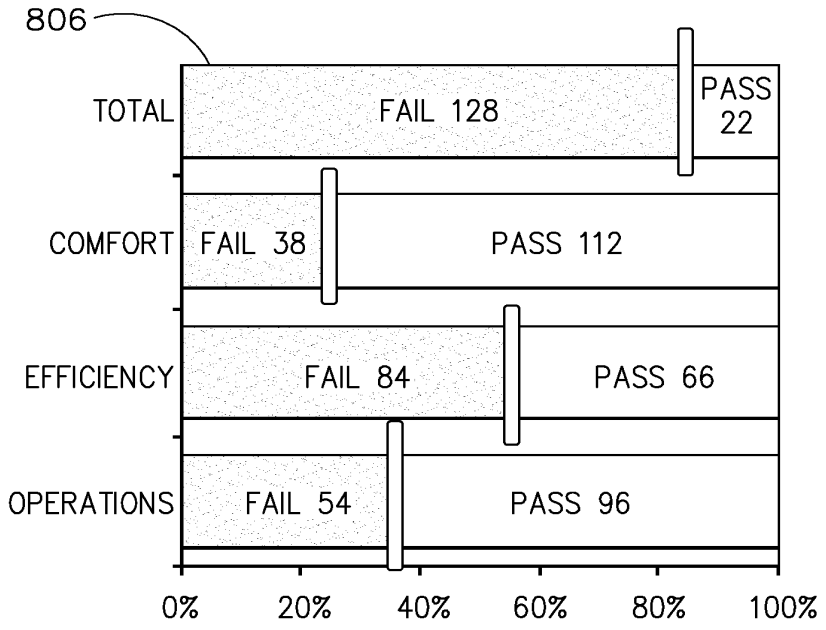
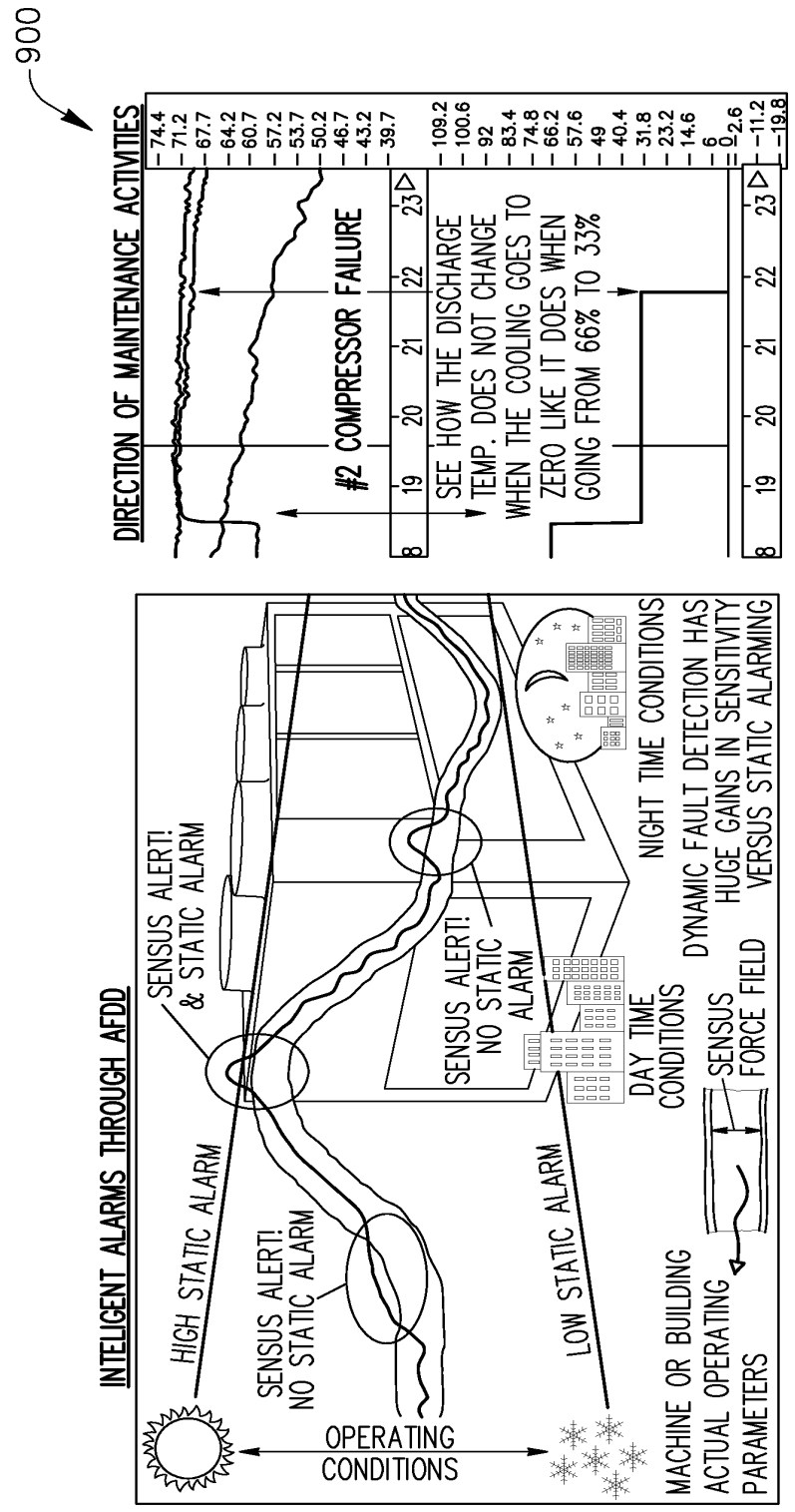


Figure 8C



01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
31	72	74	27	16	27	31	31	28	29	0	0	30	0	0	31	0	0	100	0	0	0

Figure 9

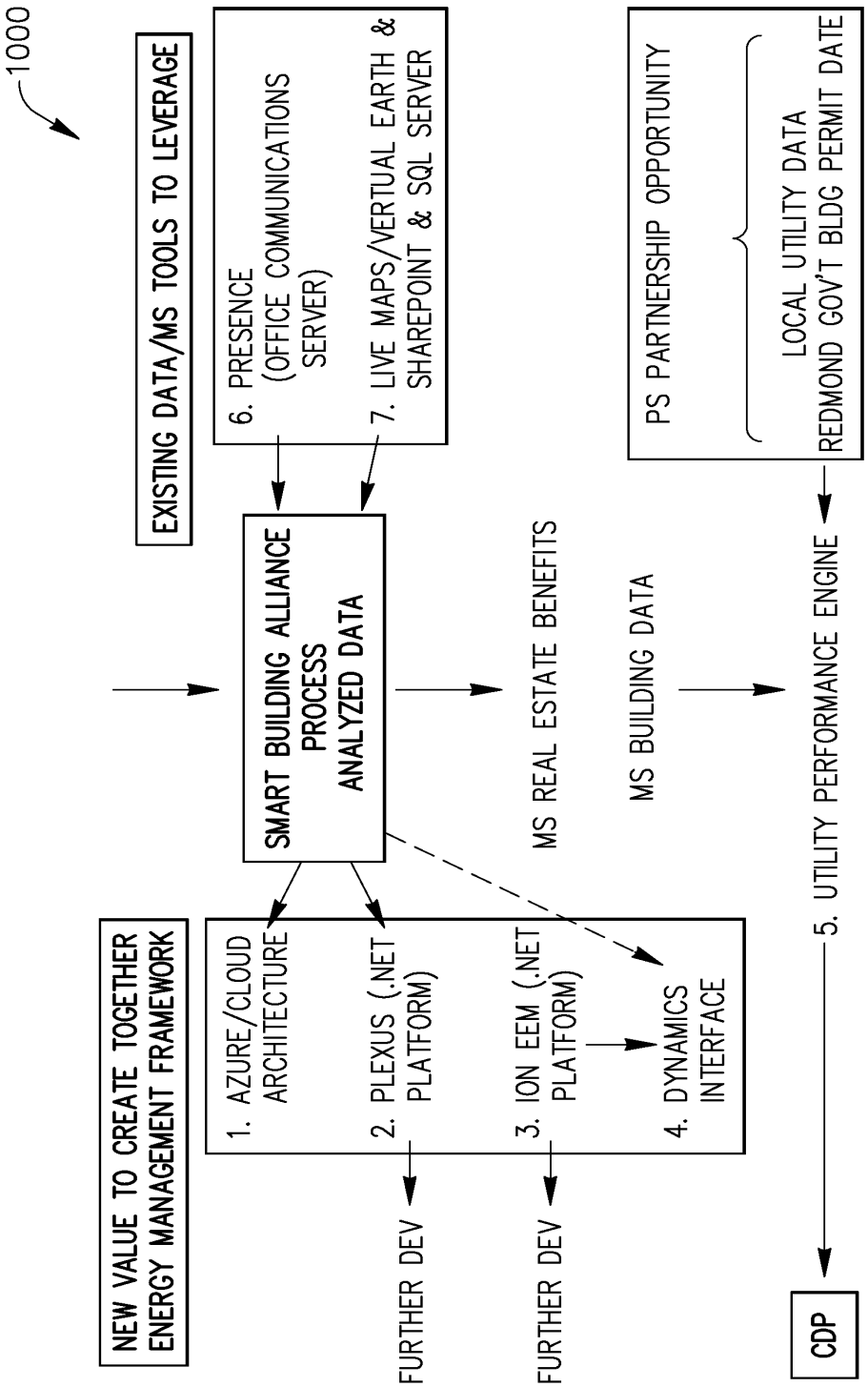

1000
EXISTING DATA/MS TOOLS TO LEVERAGE
6. PRESENCE (OFFICE COMMUNICATIONS SERVER)
7. LIVE MAPS/VERTUAL EARTH & SHAREPOINT & SQL SERVER
PS PARTNERSHIP OPPORTUNITY
LOCAL UTILITY DATA
REDMOND GOV'T BLDG PERMIT DATE
SMART BUILDING ALLIANCE PROCESS ANALYZED DATA
MS REAL ESTATE BENEFITS
MS BUILDING DATA
5. UTILITY PERFORMANCE ENGINE
NEW VALUE TO CREATE TOGETHER ENERGY MANAGEMENT FRAMEWORK
1. AZURE/CLOUD ARCHITECTURE
2. PLEXUS (.NET PLATFORM)
3. ION EEM (.NET PLATFORM)
4. DYNAMICS INTERFACE
FURTHER DEV
FURTHER DEV
CDP

Figure 10

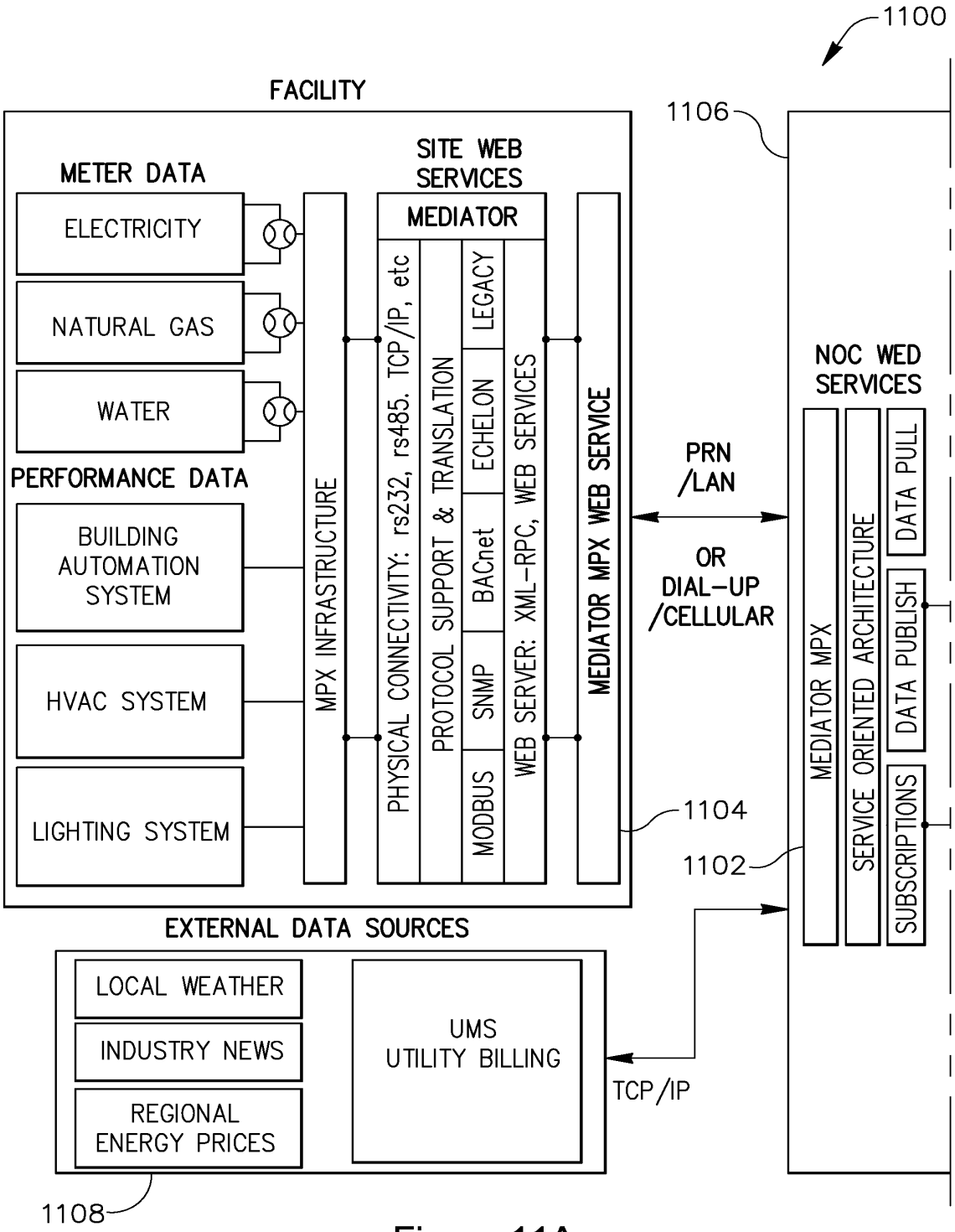

1100
FACILITY
1106
METER DATA
ELECTRICITY
NATURAL GAS
WATER
PERFORMANCE DATA
BUILDING AUTOMATION SYSTEM
HVAC SYSTEM
LIGHTING SYSTEM
MPX INFRASTRUCTURE
SITE WEB SERVICES
MEDIATOR
PHYSICAL CONNECTIVITY: rs232, rs485. TCP/IP, etc
PROTOCOL SUPPORT & TRANSLATION
MODBUS
SNMP
BACnet
ECHELON
LEGACY
WEB SERVER: XML-RPC, WEB SERVICES
MEDIATOR MPX WEB SERVICE
PRN /LAN
OR DIAL-UP /CELLULAR
NOC WED SERVICES
MEDIATOR MPX
SERVICE ORIENTED ARCHITECTURE
DATA PULL
DATA PUBLISH
SUBSCRIPTIONS
1104
1102
EXTERNAL DATA SOURCES
LOCAL WEATHER
INDUSTRY NEWS
REGIONAL ENERGY PRICES
UMS UTILITY BILLING
TCP/IP
1108

Figure 11A

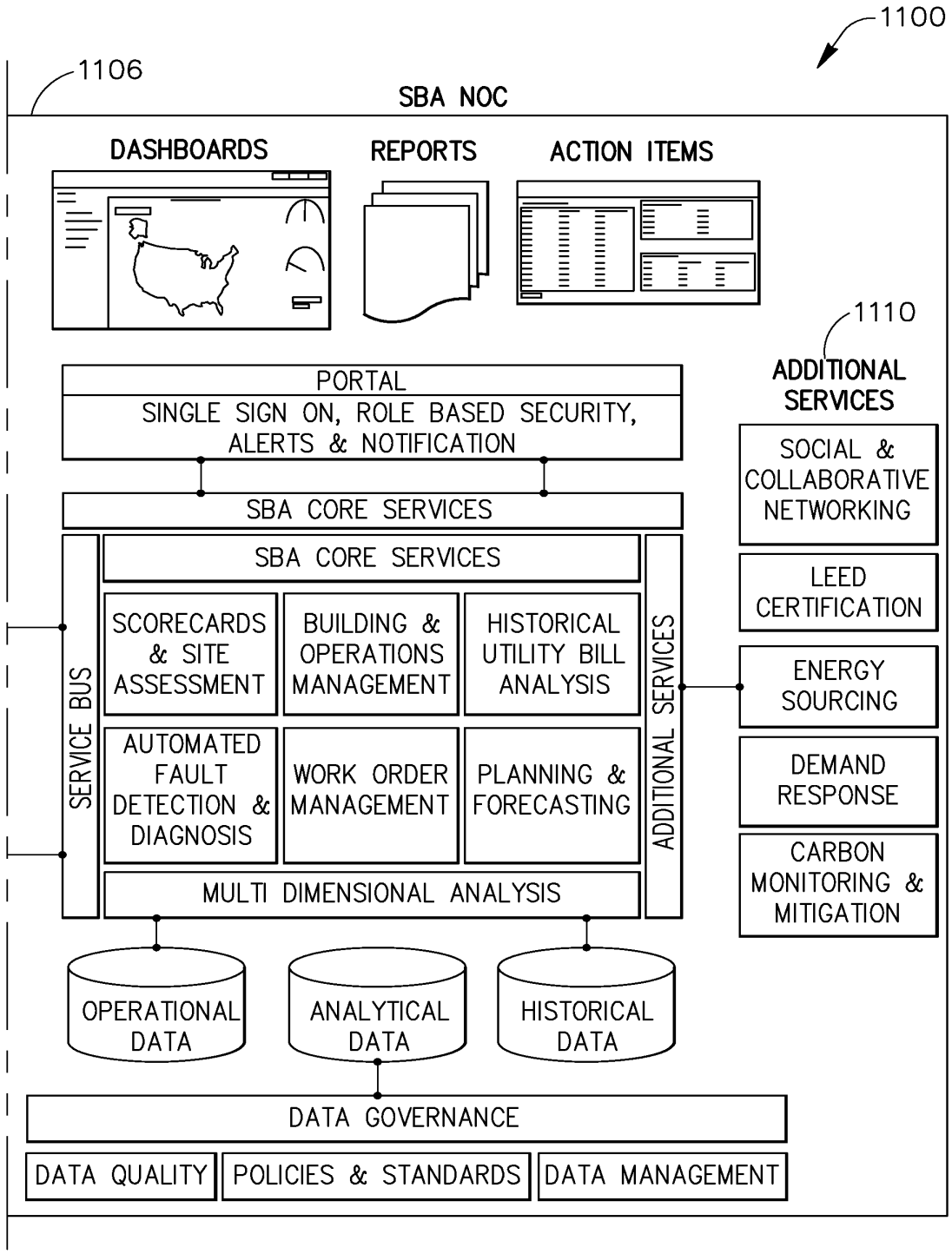

1100
1106
SBA NOC
DASHBOARDS
REPORTS
ACTION ITEMS
1110
ADDITIONAL SERVICES
PORTAL
SINGLE SIGN ON, ROLE BASED SECURITY, ALERTS & NOTIFICATION
SBA CORE SERVICES
SBA CORE SERVICES
SERVICE BUS
SCORECARDS & SITE ASSESSMENT
BUILDING & OPERATIONS MANAGEMENT
HISTORICAL UTILITY BILL ANALYSIS
AUTOMATED FAULT DETECTION & DIAGNOSIS
WORK ORDER MANAGEMENT
PLANNING & FORECASTING
MULTI DIMENSIONAL ANALYSIS
ADDITIONAL SERVICES
SOCIAL & COLLABORATIVE NETWORKING
LEED CERTIFICATION
ENERGY SOURCING
DEMAND RESPONSE
CARBON MONITORING & MITIGATION
OPERATIONAL DATA
ANALYTICAL DATA
HISTORICAL DATA
DATA GOVERNANCE
DATA QUALITY
POLICIES & STANDARDS
DATA MANAGEMENT

Figure 11B

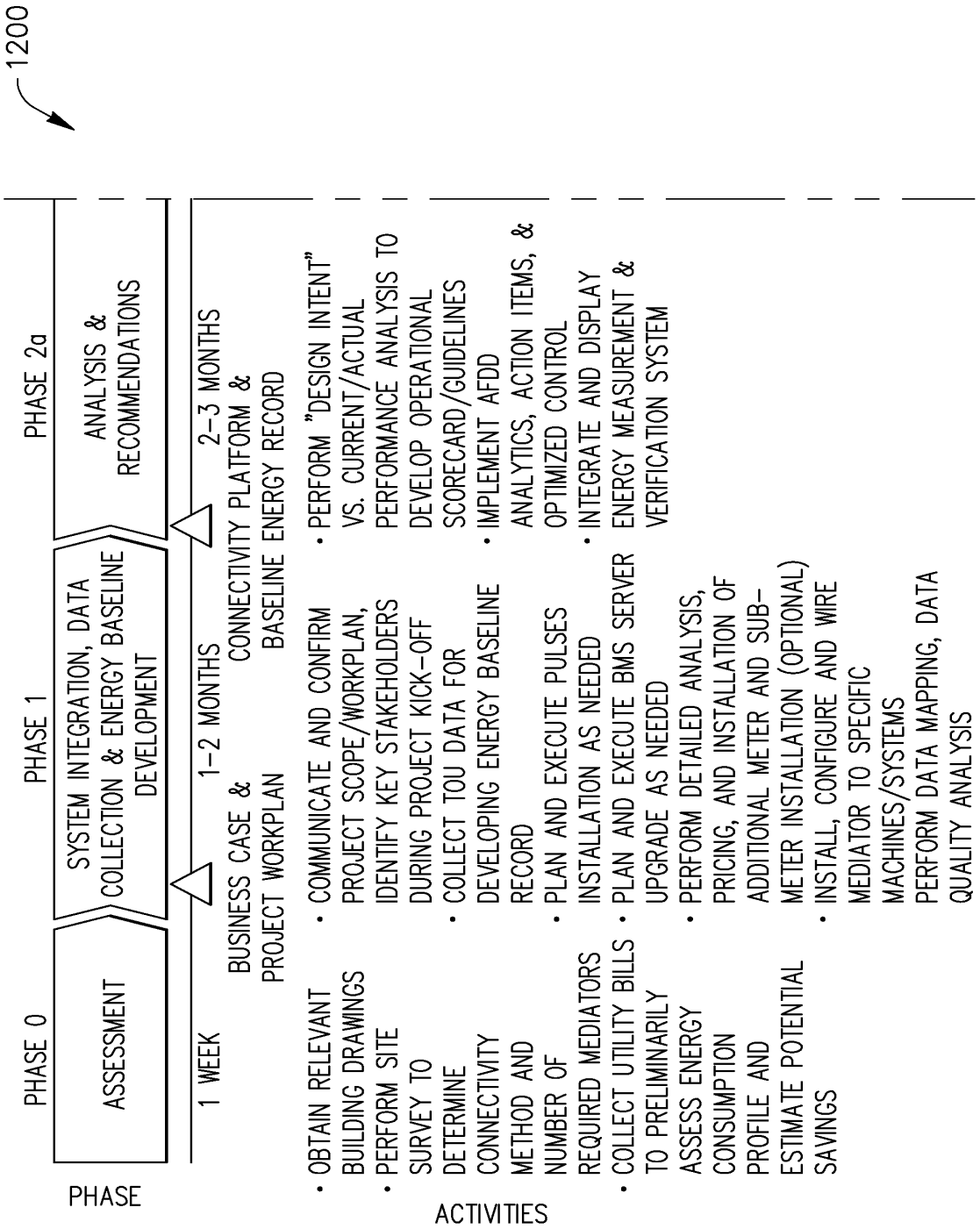

1200
PHASE 0
PHASE 1
PHASE 2a
ASSESSMENT
SYSTEM INTEGRATION, DATA COLLECTION & ENERGY BASELINE DEVELOPMENT
ANALYSIS & RECOMMENDATIONS
PHASE
1 WEEK
1–2 MONTHS
2–3 MONTHS
BUSINESS CASE & PROJECT WORKPLAN
CONNECTIVITY PLATFORM & BASELINE ENERGY RECORD
ACTIVITIES
• OBTAIN RELEVANT BUILDING DRAWINGS
• PERFORM SITE SURVEY TO DETERMINE CONNECTIVITY METHOD AND NUMBER OF REQUIRED MEDIATORS
• COLLECT UTILITY BILLS TO PRELIMINARILY ASSESS ENERGY CONSUMPTION PROFILE AND ESTIMATE POTENTIAL SAVINGS
• COMMUNICATE AND CONFIRM PROJECT SCOPE/WORKPLAN, IDENTIFY KEY STAKEHOLDERS DURING PROJECT KICK-OFF
• COLLECT TOU DATA FOR DEVELOPING ENERGY BASELINE RECORD
• PLAN AND EXECUTE PULSES INSTALLATION AS NEEDED
• PLAN AND EXECUTE BMS SERVER UPGRADE AS NEEDED
• PERFORM DETAILED ANALYSIS, PRICING, AND INSTALLATION OF ADDITIONAL METER AND SUB-METER INSTALLATION (OPTIONAL)
• INSTALL, CONFIGURE AND WIRE MEDIATOR TO SPECIFIC MACHINES/SYSTEMS
PERFORM DATA MAPPING, DATA QUALITY ANALYSIS
• PERFORM "DESIGN INTENT" VS. CURRENT/ACTUAL PERFORMANCE ANALYSIS TO DEVELOP OPERATIONAL SCORECARD/GUIDELINES
• IMPLEMENT AFDD ANALYTICS, ACTION ITEMS, & OPTIMIZED CONTROL
• INTEGRATE AND DISPLAY ENERGY MEASUREMENT & VERIFICATION SYSTEM

Figure 12A

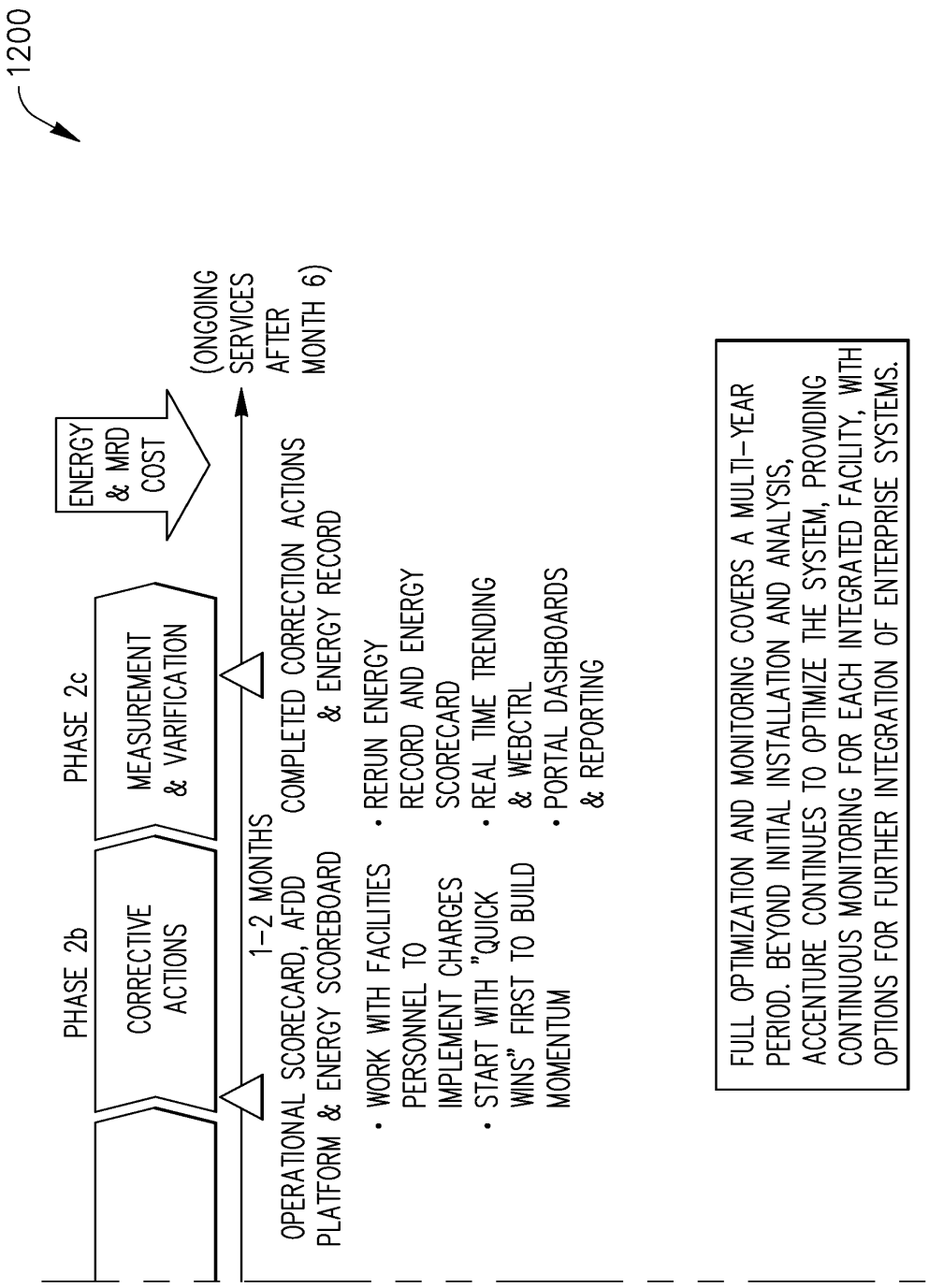

1200
PHASE 2b
CORRECTIVE ACTIONS
PHASE 2c
MEASUREMENT & VARIFICATION
ENERGY & MRD COST
(ONGOING SERVICES AFTER MONTH 6)
1–2 MONTHS
OPERATIONAL SCORECARD, AFDD PLATFORM & ENERGY SCOREBOARD
• WORK WITH FACILITIES PERSONNEL TO IMPLEMENT CHARGES
• START WITH "QUICK WINS" FIRST TO BUILD MOMENTUM
COMPLETED CORRECTION ACTIONS & ENERGY RECORD
• RERUN ENERGY RECORD AND ENERGY SCORECARD
• REAL TIME TRENDING & WEBCTRL
• PORTAL DASHBOARDS & REPORTING
FULL OPTIMIZATION AND MONITORING COVERS A MULTI–YEAR PERIOD. BEYOND INITIAL INSTALLATION AND ANALYSIS, ACCENTURE CONTINUES TO OPTIMIZE THE SYSTEM, PROVIDING CONTINUOUS MONITORING FOR EACH INTEGRATED FACILITY, WITH OPTIONS FOR FURTHER INTEGRATION OF ENTERPRISE SYSTEMS.

Figure 12B

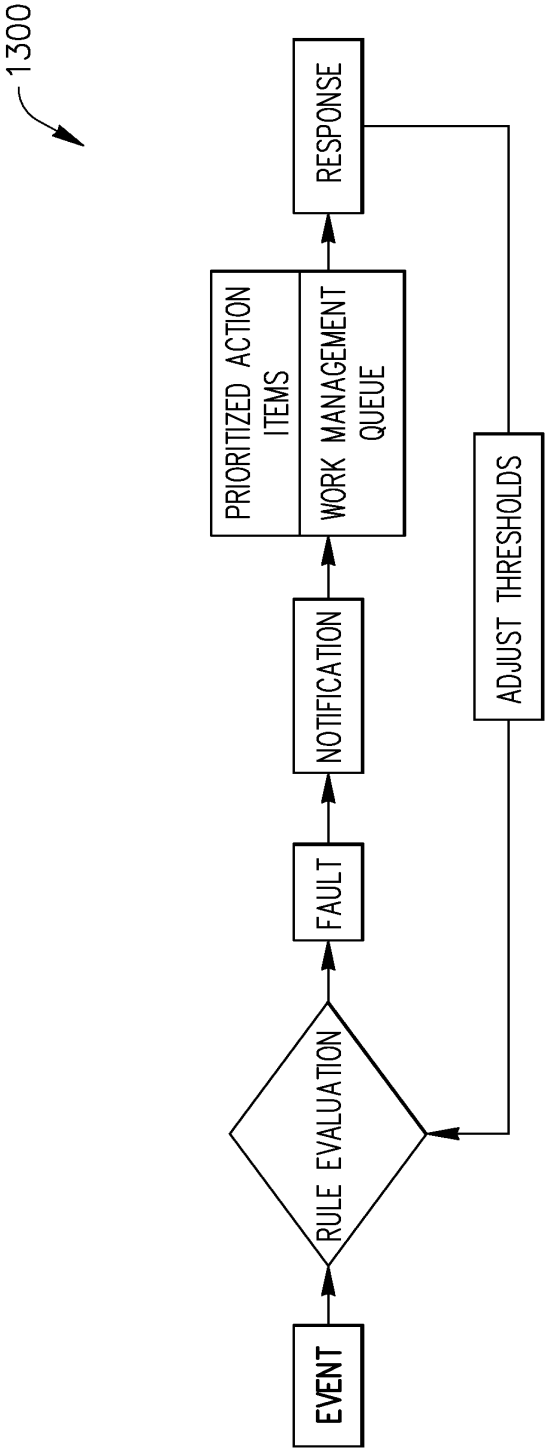

1300
EVENT
RULE EVALUATION
FAULT
NOTIFICATION
PRIORITIZED ACTION ITEMS
WORK MANAGEMENT QUEUE
RESPONSE
ADJUST THRESHOLDS

Figure 13

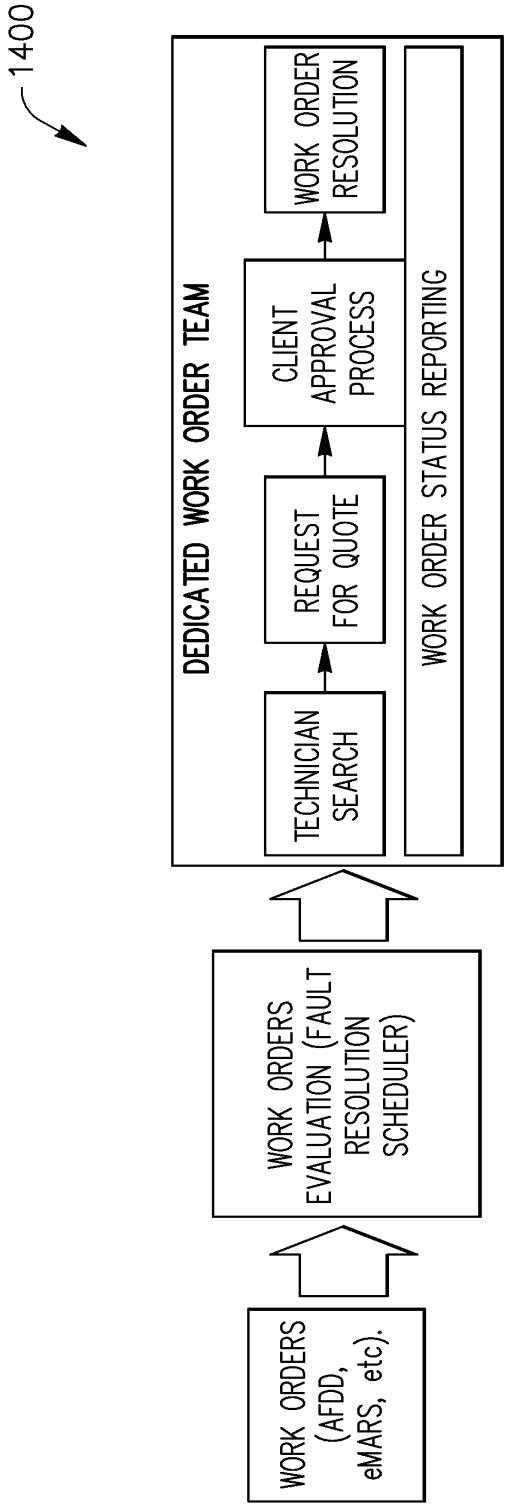

1400
WORK ORDERS (AFDD, eMARS, etc).
WORK ORDERS EVALUATION (FAULT RESOLUTION SCHEDULER)
DEDICATED WORK ORDER TEAM
TECHNICIAN SEARCH
REQUEST FOR QUOTE
CLIENT APPROVAL PROCESS
WORK ORDER RESOLUTION
WORK ORDER STATUS REPORTING

Figure 14

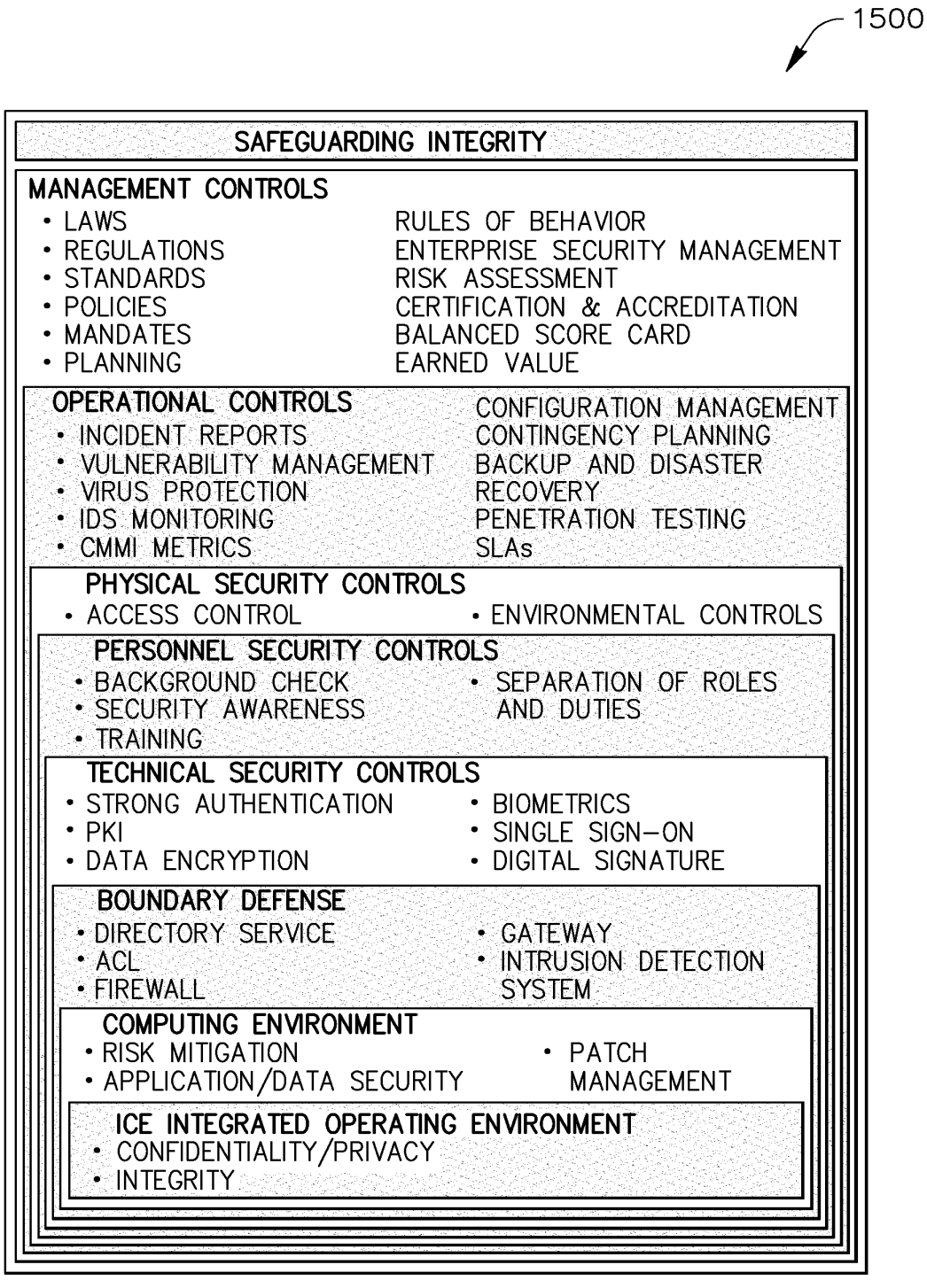

1500
SAFEGUARDING INTEGRITY
MANAGEMENT CONTROLS
• LAWS
• REGULATIONS
• STANDARDS
• POLICIES
• MANDATES
• PLANNING
RULES OF BEHAVIOR
ENTERPRISE SECURITY MANAGEMENT
RISK ASSESSMENT
CERTIFICATION & ACCREDITATION
BALANCED SCORE CARD
EARNED VALUE
OPERATIONAL CONTROLS
• INCIDENT REPORTS
• VULNERABILITY MANAGEMENT
• VIRUS PROTECTION
• IDS MONITORING
• CMMI METRICS
CONFIGURATION MANAGEMENT
CONTINGENCY PLANNING
BACKUP AND DISASTER RECOVERY
PENETRATION TESTING
SLAs
PHYSICAL SECURITY CONTROLS
• ACCESS CONTROL
• ENVIRONMENTAL CONTROLS
PERSONNEL SECURITY CONTROLS
• BACKGROUND CHECK
• SECURITY AWARENESS
• TRAINING
• SEPARATION OF ROLES AND DUTIES
TECHNICAL SECURITY CONTROLS
• STRONG AUTHENTICATION
• PKI
• DATA ENCRYPTION
• BIOMETRICS
• SINGLE SIGN-ON
• DIGITAL SIGNATURE
BOUNDARY DEFENSE
• DIRECTORY SERVICE
• ACL
• FIREWALL
• GATEWAY
• INTRUSION DETECTION SYSTEM
COMPUTING ENVIRONMENT
• RISK MITIGATION
• APPLICATION/DATA SECURITY
• PATCH MANAGEMENT
ICE INTEGRATED OPERATING ENVIRONMENT
• CONFIDENTIALITY/PRIVACY
• INTEGRITY

Figure 15

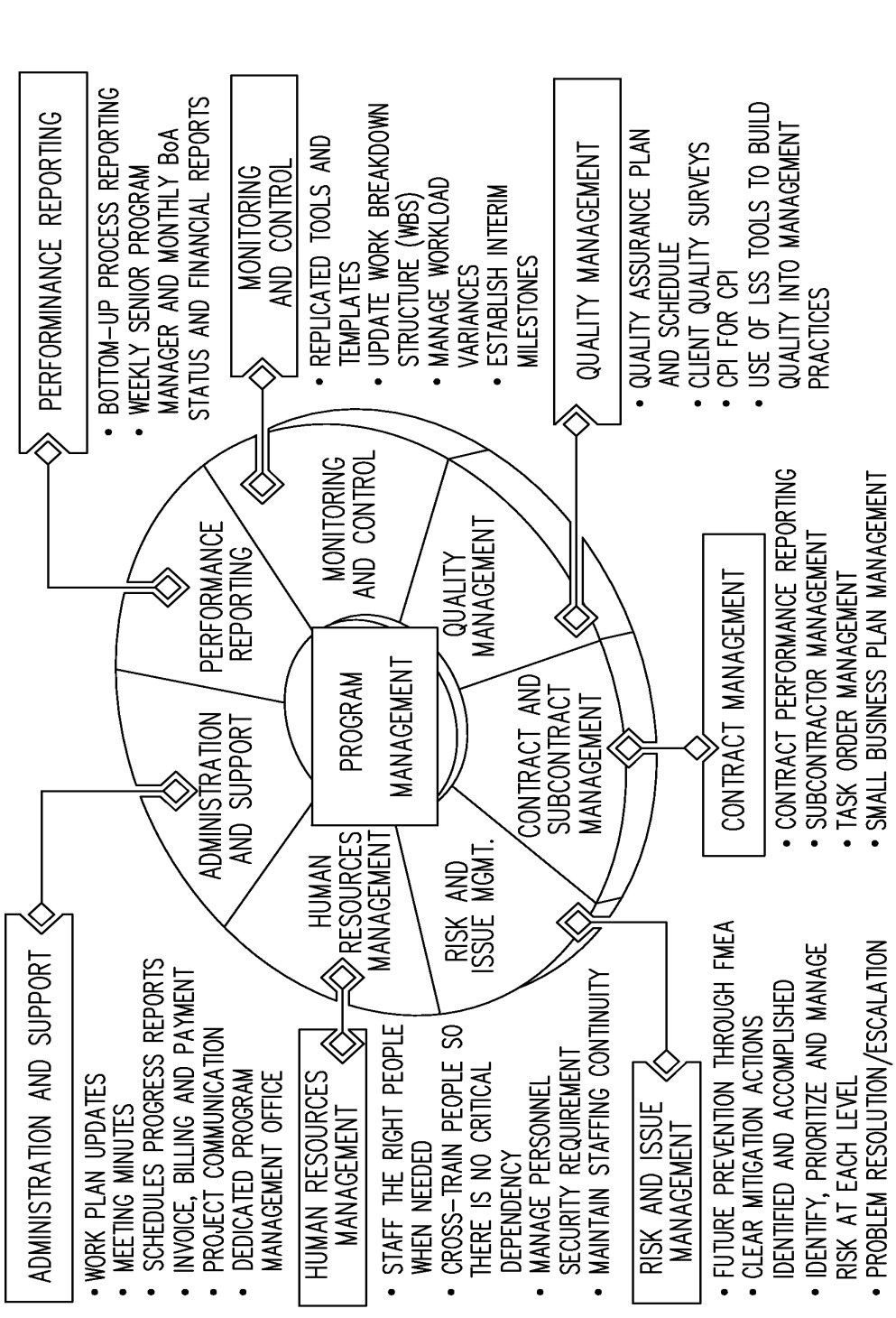

1600
PERFORMINANCE REPORTING
• BOTTOM–UP PROCESS REPORTING
• WEEKLY SENIOR PROGRAM MANAGER AND MONTHLY BoA STATUS AND FINANCIAL REPORTS
MONITORING AND CONTROL
• REPLICATED TOOLS AND TEMPLATES
• UPDATE WORK BREAKDOWN STRUCTURE (WBS)
• MANAGE WORKLOAD VARIANCES
• ESTABLISH INTERIM MILESTONES
QUALITY MANAGEMENT
• QUALITY ASSURANCE PLAN AND SCHEDULE
• CLIENT QUALITY SURVEYS
• CPI FOR CPI
• USE OF LSS TOOLS TO BUILD QUALITY INTO MANAGEMENT PRACTICES
CONTRACT MANAGEMENT
• CONTRACT PERFORMANCE REPORTING
• SUBCONTRACTOR MANAGEMENT
• TASK ORDER MANAGEMENT
• SMALL BUSINESS PLAN MANAGEMENT
RISK AND ISSUE MANAGEMENT
• FUTURE PREVENTION THROUGH FMEA
• CLEAR MITIGATION ACTIONS IDENTIFIED AND ACCOMPLISHED
• IDENTIFY, PRIORITIZE AND MANAGE RISK AT EACH LEVEL
• PROBLEM RESOLUTION/ESCALATION
HUMAN RESOURCES MANAGEMENT
• STAFF THE RIGHT PEOPLE WHEN NEEDED
• CROSS–TRAIN PEOPLE SO THERE IS NO CRITICAL DEPENDENCY
• MANAGE PERSONNEL SECURITY REQUIREMENT
• MAINTAIN STAFFING CONTINUITY
ADMINISTRATION AND SUPPORT
• WORK PLAN UPDATES
• MEETING MINUTES
• SCHEDULES PROGRESS REPORTS
• INVOICE, BILLING AND PAYMENT
• PROJECT COMMUNICATION
• DEDICATED PROGRAM MANAGEMENT OFFICE
PROGRAM MANAGEMENT
PERFORMANCE REPORTING
MONITORING AND CONTROL
QUALITY MANAGEMENT
CONTRACT AND SUBCONTRACT MANAGEMENT
RISK AND ISSUE MGMT.
HUMAN RESOURCES MANAGEMENT
ADMINISTRATION AND SUPPORT

Figure 16

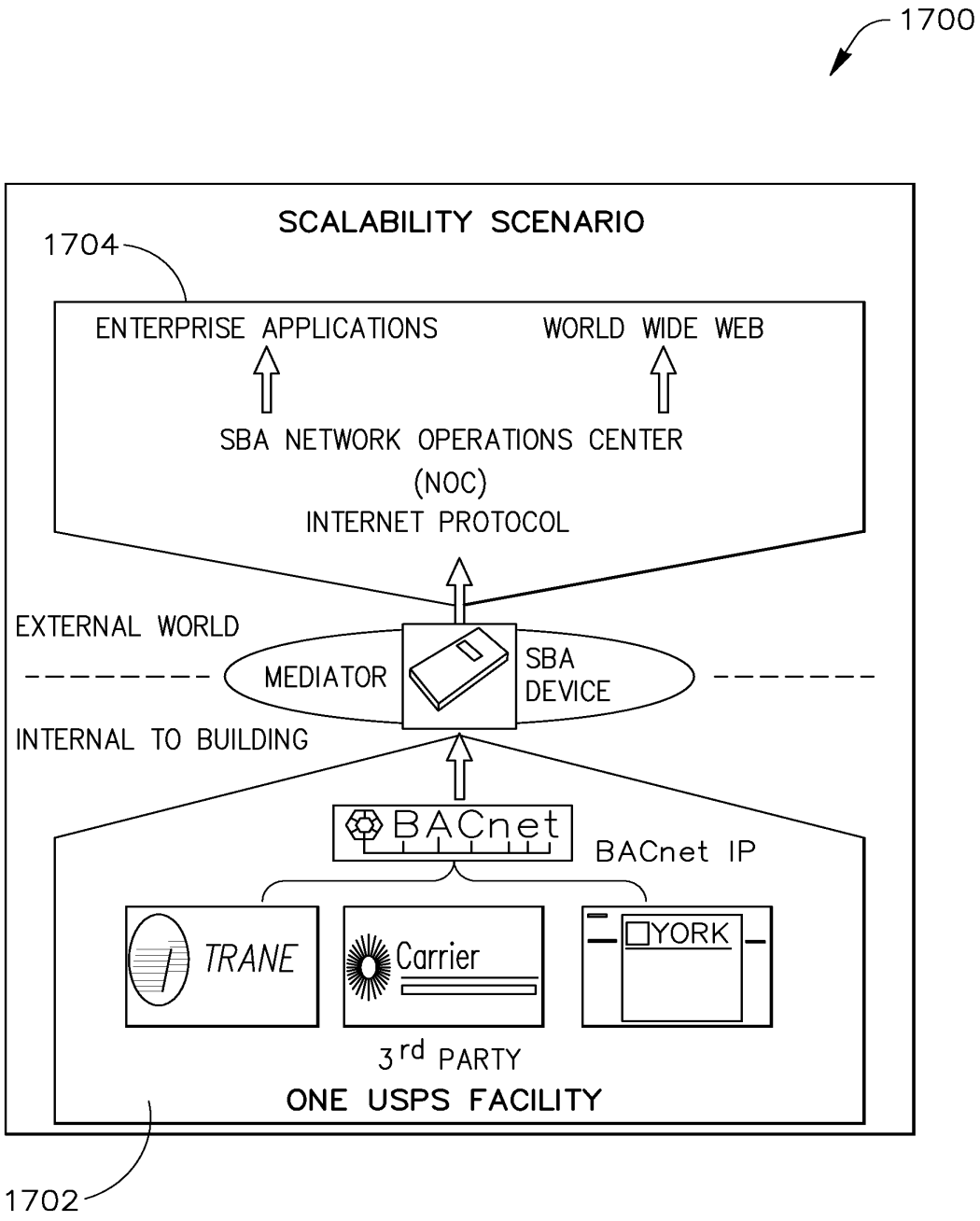

1700
SCALABILITY SCENARIO
1704
ENTERPRISE APPLICATIONS
WORLD WIDE WEB
SBA NETWORK OPERATIONS CENTER
(NOC)
INTERNET PROTOCOL
EXTERNAL WORLD
MEDIATOR
SBA
DEVICE
INTERNAL TO BUILDING
BACnet
BACnet IP
TRANE
Carrier
YORK
3rd PARTY
ONE USPS FACILITY
1702

Figure 17

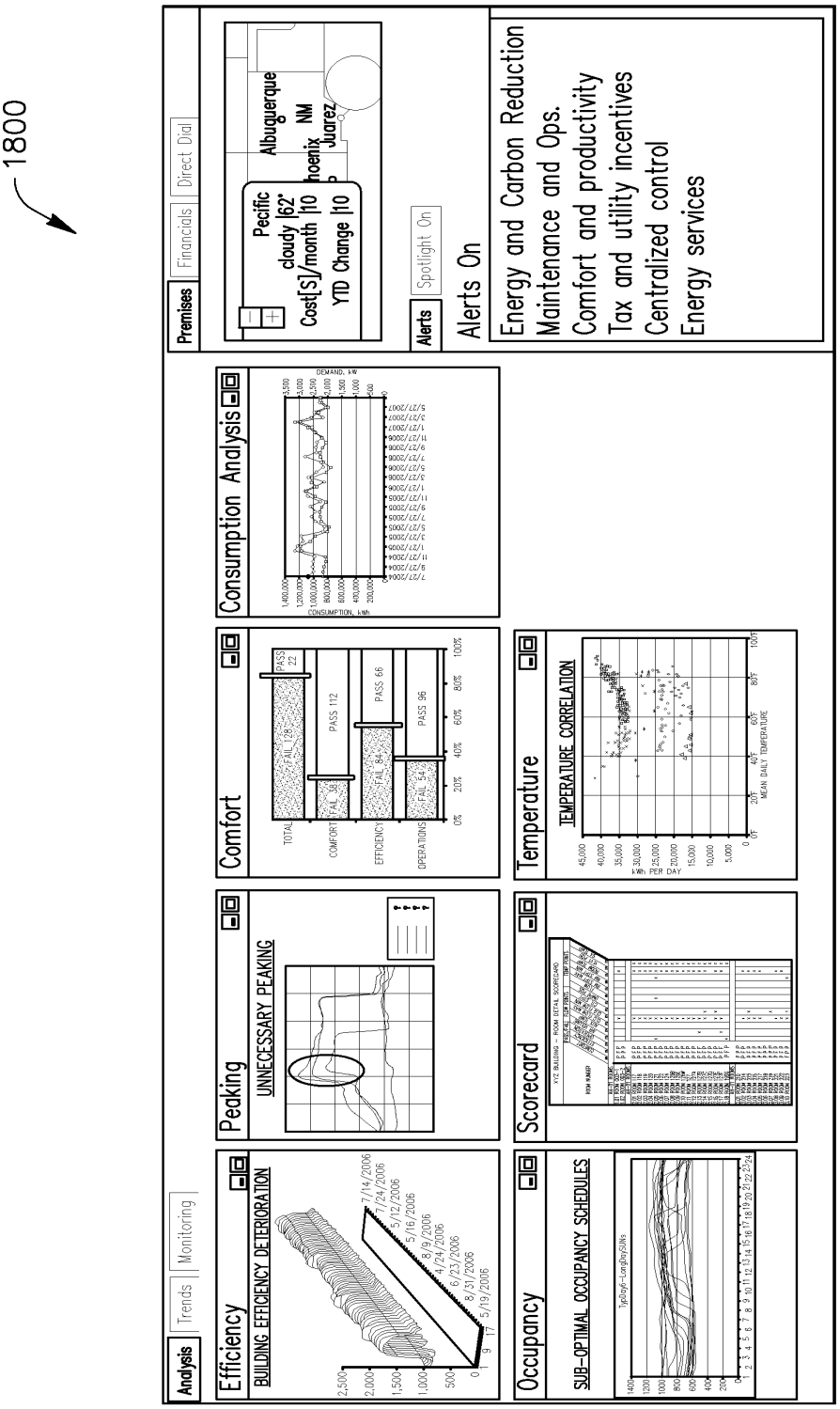

1800
Analysis
Trends
Monitoring
Efficiency
BUILDING EFFICIENCY DETERIORATION
Peaking
UNNECESSARY PEAKING
Comfort
Consumption Analysis
Occupancy
SUB-OPTIMAL OCCUPANCY SCHEDULES
Scorecard
Temperature
TEMPERATURE CORRELATION
Premises
Financials
Direct Dial
Albuquerque
Phoenix
Juarez
Alerts
Spotlight On
Alerts On
Energy and Carbon Reduction
Maintenance and Ops.
Comfort and productivity
Tax and utility incentives
Centralized control
Energy services

Figure 18

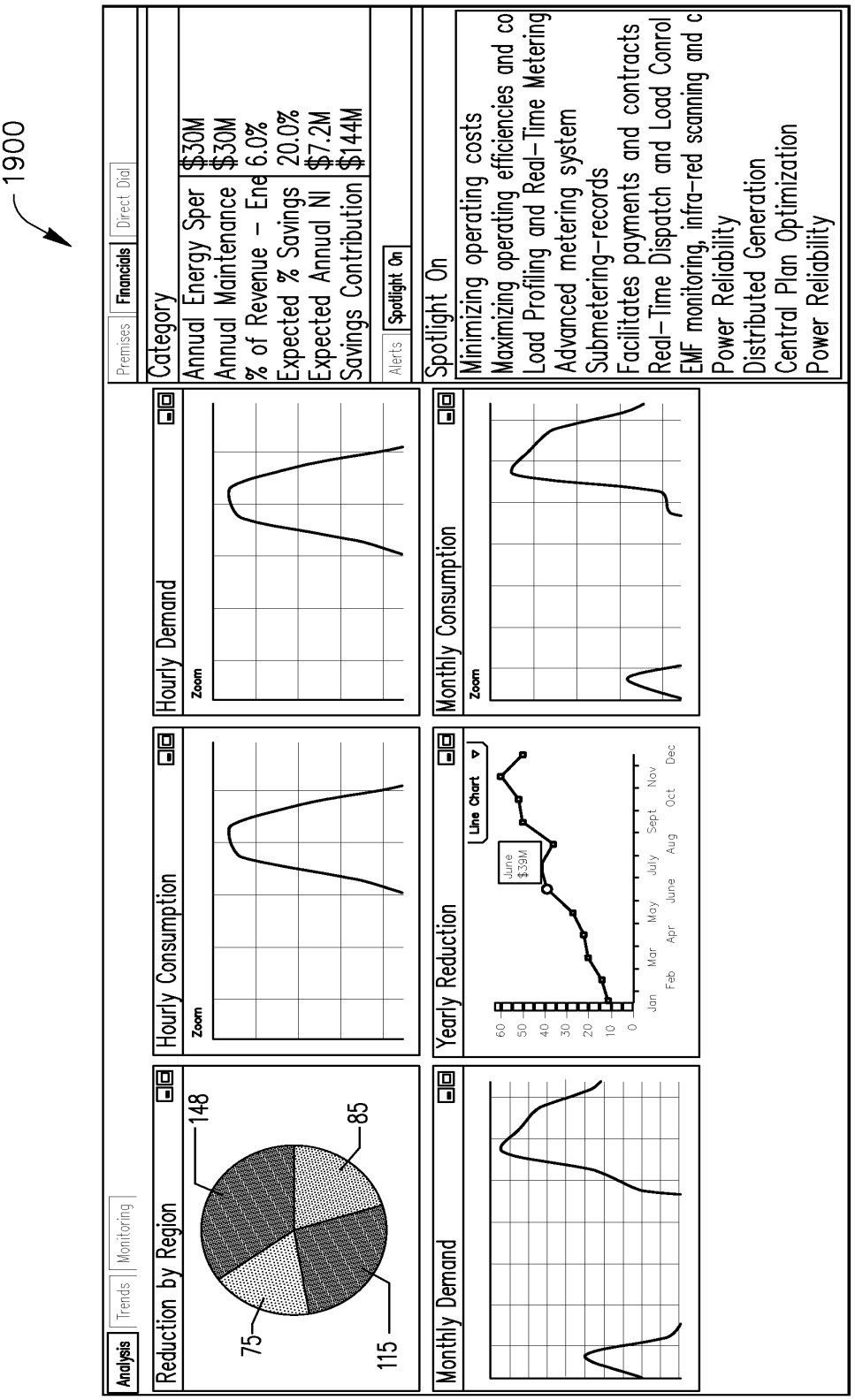

1900
Analysis
Trends
Monitoring
Premises
Financials
Direct Dial
Reduction by Region
148
85
75
115
Hourly Consumption
Zoom
Hourly Demand
Zoom
Category
Annual Energy Sper $30M
Annual Maintenance $30M
% of Revenue – Ene 6.0%
Expected % Savings 20.0%
Expected Annual NI $7.2M
Savings Contribution $144M
Alerts
Spotlight On
Monthly Demand
Yearly Reduction
Line Chart
June $39M
60
50
40
30
20
10
0
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
Oct
Nov
Dec
Monthly Consumption
Zoom
Spotlight On
Minimizing operating costs
Maximizing operating efficiencies and co
Load Profiling and Real–Time Metering
Advanced metering system
Submetering–records
Facilitates payments and contracts
Real–Time Dispatch and Load Conrol
EMF monitoring, infra–red scanning and c
Power Reliability
Distributed Generation
Central Plan Optimization
Power Reliability

Figure 19

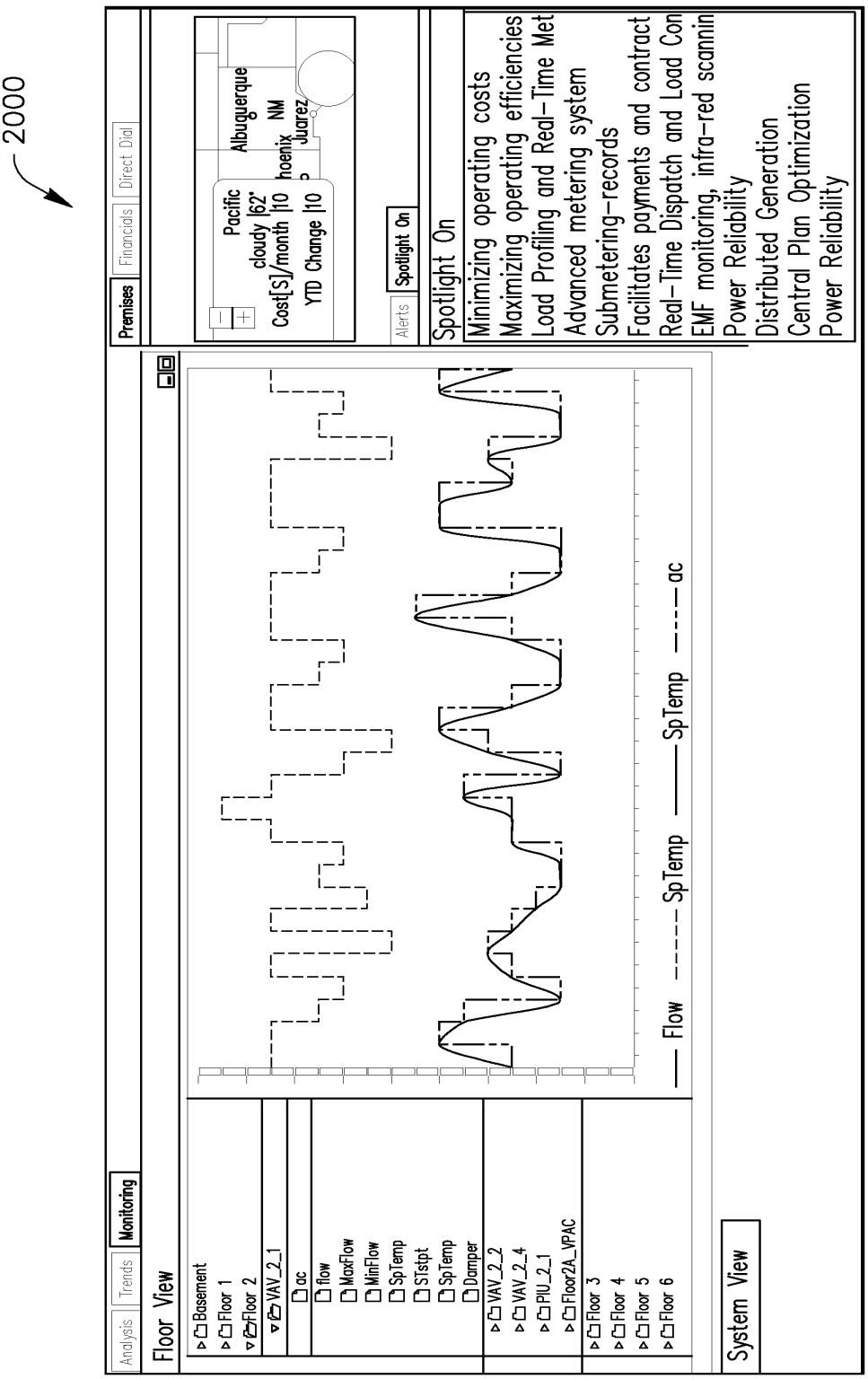

2000
Analysis
Trends
Monitoring
Floor View
Basement
Floor 1
Floor 2
VAV_2_1
ac
flow
MaxFlow
MinFlow
SpTemp
STstpt
SpTemp
Damper
VAV_2_2
VAV_2_4
PIU_2_1
Floor2A_VPAC
Floor 3
Floor 4
Floor 5
Floor 6
System View
Flow
SpTemp
SpTemp
ac
Premises
Financials
Direct Dial
Albuquerque
Pacific
cloudy 62°
Cost[$]/month 10
YTD Change 10
hoenix NM
Juarez
Alerts
Spotlight On
Spotlight On
Minimizing operating costs
Maximizing operating efficiencies
Load Profiling and Real-Time Met
Advanced metering system
Submetering-records
Facilitates payments and contract
Real-Time Dispatch and Load Con
EMF monitoring, infra-red scannin
Power Reliability
Distributed Generation
Central Plan Optimization
Power Reliability

Figure 20

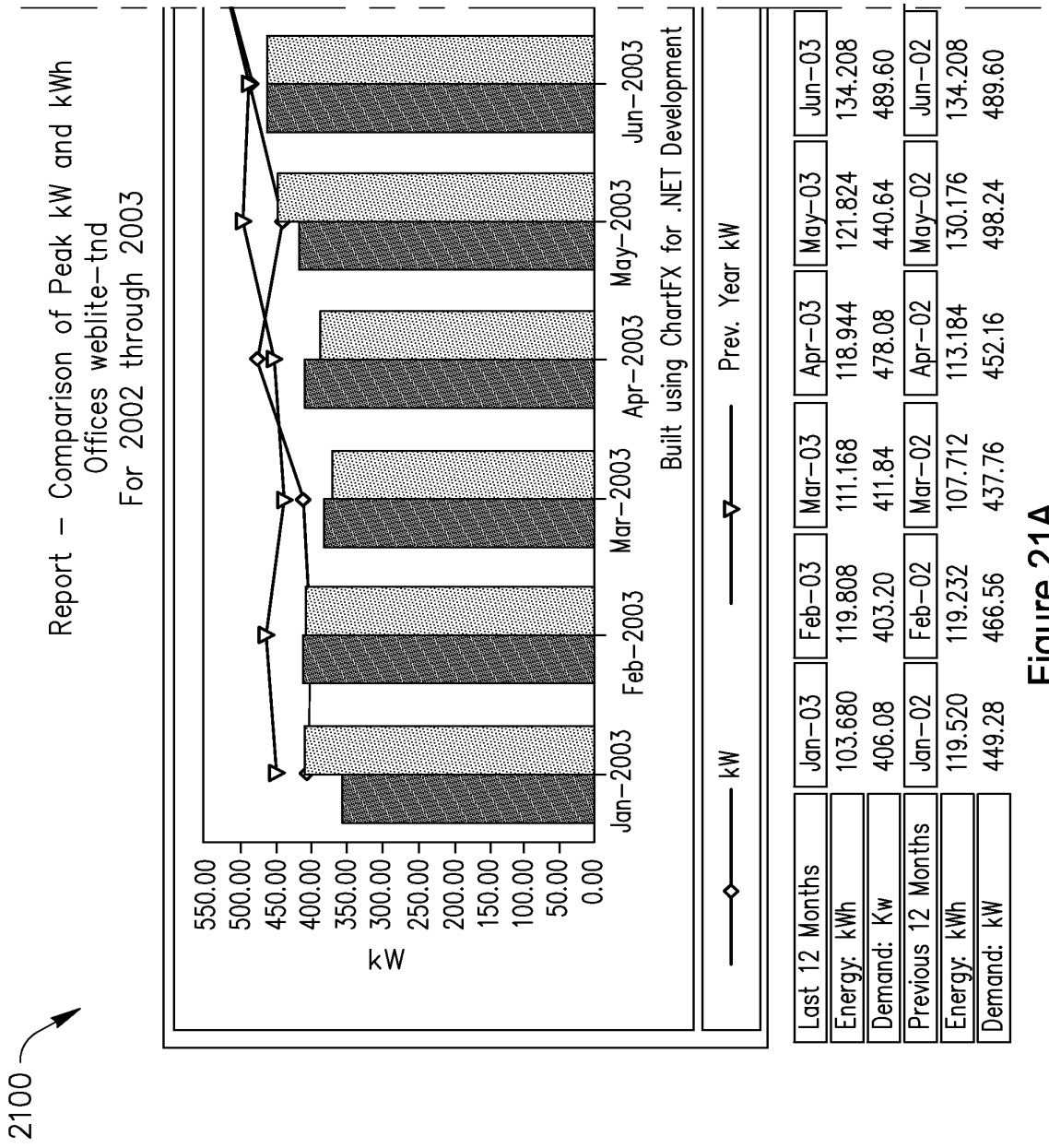
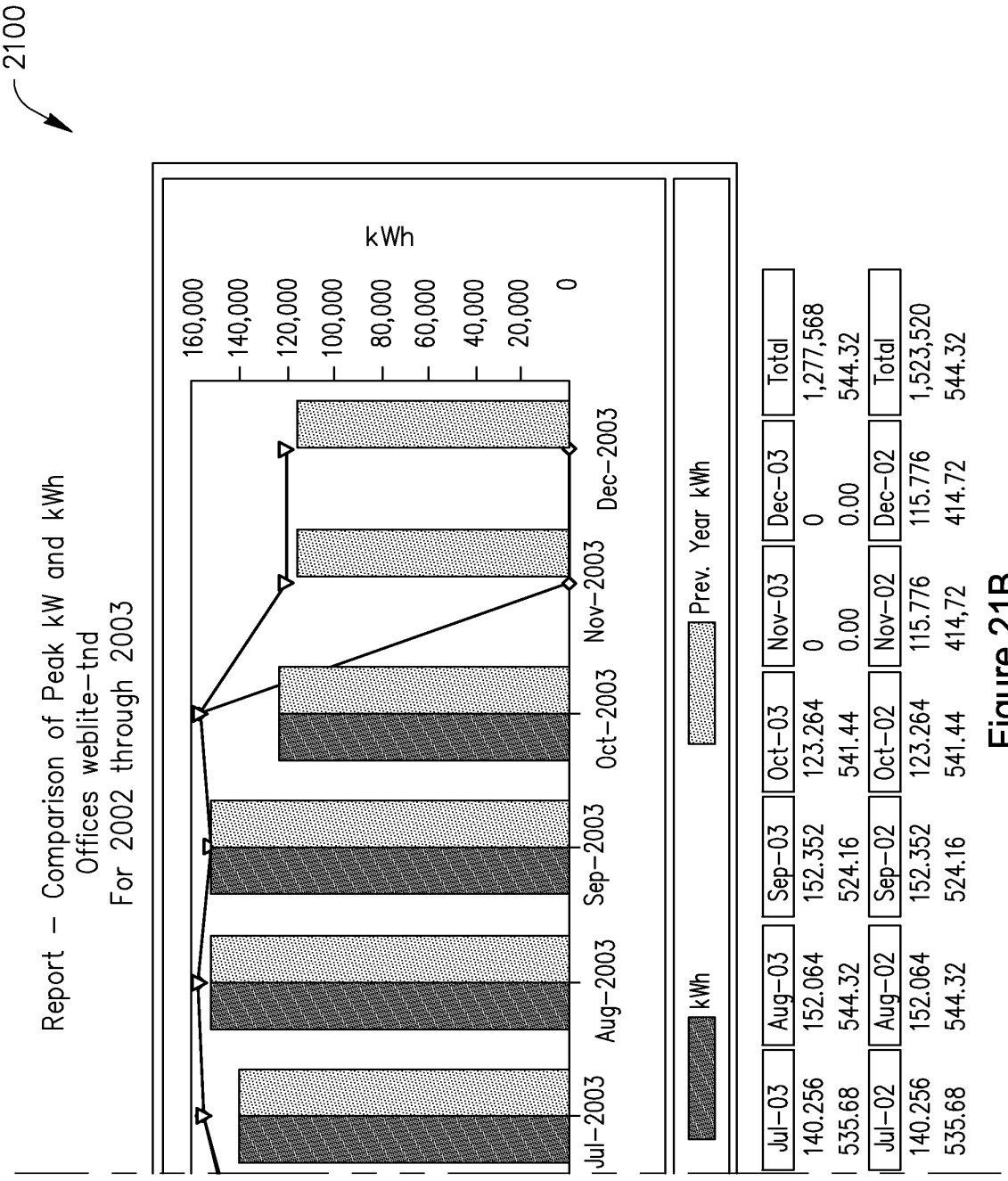

2100
Report - Comparison of Peak kW and kWh
Offices weblite-tnd
For 2002 through 2003
kW
550.00
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Jan-2003
Feb-2003
Mar-2003
Apr-2003
May-2003
Jun-2003
Built using ChartFX for .NET Development
kW
Prev. Year kW
Last 12 Months
Energy: kWh
Demand: Kw
Previous 12 Months
Energy: kWh
Demand: kW
Jan-03
Feb-03
Mar-03
Apr-03
May-03
Jun-03
103.680
119.808
111.168
118.944
121.824
134.208
406.08
403.20
411.84
478.08
440.64
489.60
Jan-02
Feb-02
Mar-02
Apr-02
May-02
Jun-02
119.520
119.232
107.712
113.184
130.176
134.208
449.28
466.56
437.76
452.16
498.24
489.60

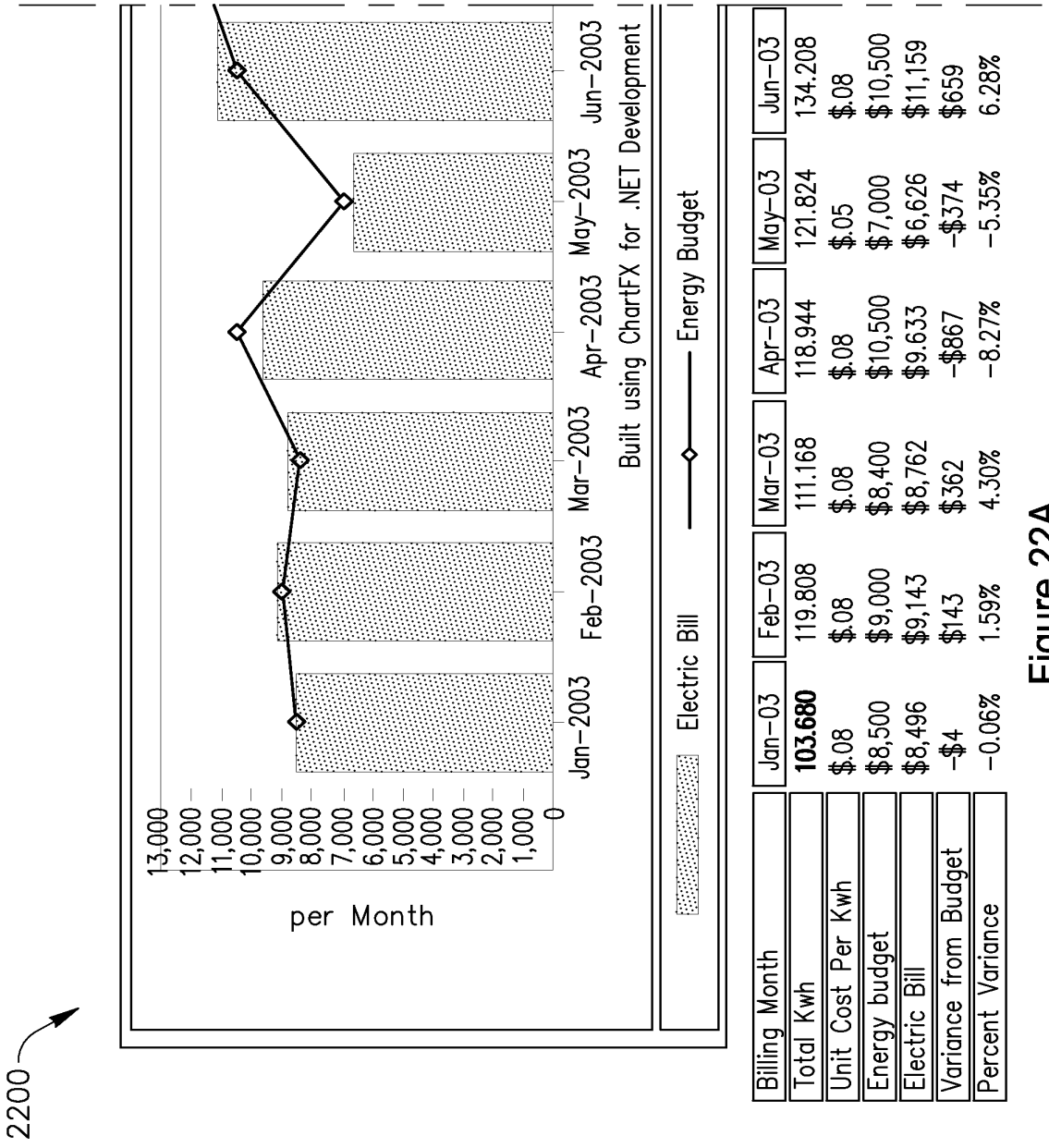
Figure 21A



Jul–03	Aug–03	Sep–03	Oct–03	Nov–03	Dec–03	Total
140.256	152.064	152.352	123.264	0	0	1,277,568
535.68	544.32	524.16	541.44	0.00	0.00	544.32

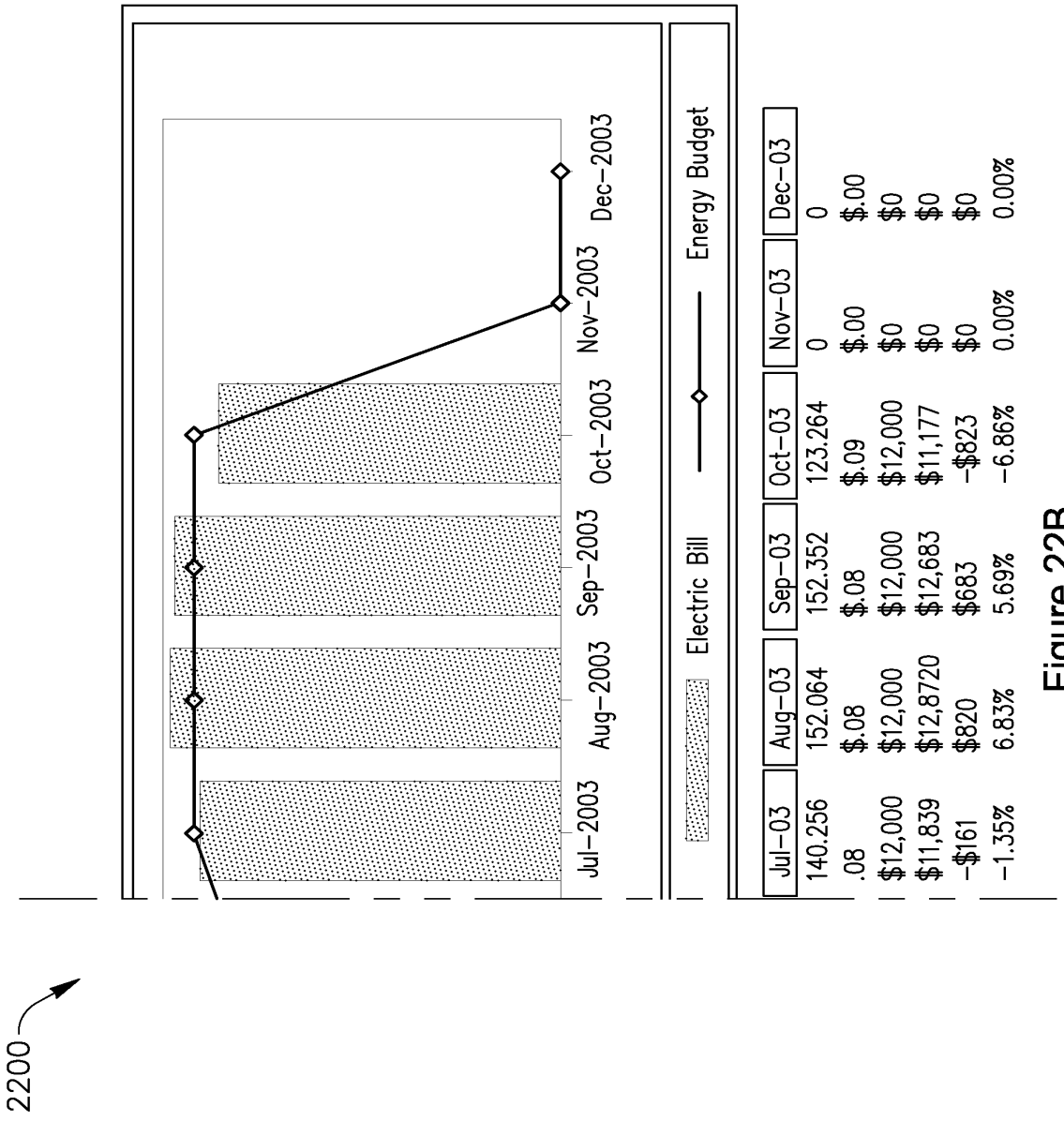
Jul–02	Aug–02	Sep–02	Oct–02	Nov–02	Dec–02	Total
140.256	152.064	152.352	123.264	115.776	115.776	1,523,520
535.68	544.32	524.16	541.44	414.72	414.72	544.32

Figure 21B



Billing Month	Jan–03	Feb–03	Mar–03	Apr–03	May–03	Jun–03
Total Kwh	**103.680**	119.808	111.168	118.944	121.824	134.208
Unit Cost Per Kwh	$.08	$.08	$.08	$.08	$.05	$.08
Energy budget	$8,500	$9,000	$8,400	$10,500	$7,000	$10,500
Electric Bill	$8,496	$9,143	$8,762	$9.633	$6,626	$11,159
Variance from Budget	-$4	$143	$362	-$867	-$374	$659
Percent Variance	-0.06%	1.59%	4.30%	-8.27%	-5.35%	6.28%

Figure 22A



	Jul–03	Aug–03	Sep–03	Oct–03	Nov–03	Dec–03
Electric Bill	140.256	152.064	152.352	123.264	0	0
Energy Budget	.08	$.08	$.08	$.09	$.00	$.00
	$12,000	$12,000	$12,000	$12,000	$0	$0
	$11,839	$12,8720	$12,683	$11,177	$0	$0
	-$161	$820	$683	-$823	$0	$0
	-1.35%	6.83%	5.69%	-6.86%	0.00%	0.00%

Figure 22B

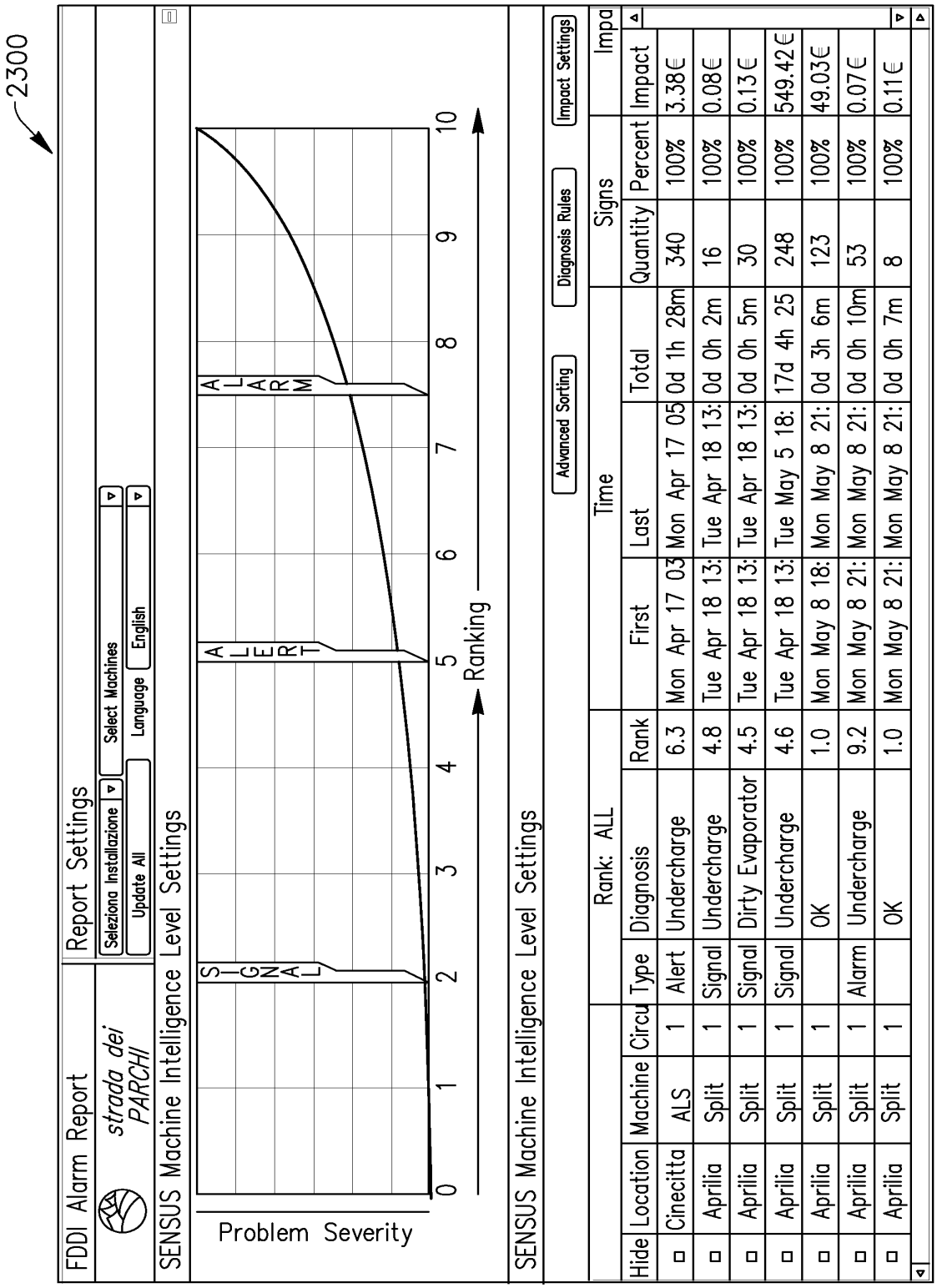

2300
FDDI Alarm Report
strada dei PARCHI
Report Settings
Seleziona Installazione
Select Machines
Update All
Language
English
SENSUS Machine Intelligence Level Settings
Problem Severity
SIGNAL
ALERT
ALARM
0 1 2 3 4 5 6 7 8 9 10
Ranking
SENSUS Machine Intelligence Level Settings
Advanced Sorting
Diagnosis Rules
Impact Settings
Rank: ALL
Time
Signs
Impa
Hide Location Machine Circu Type Diagnosis Rank First Last Total Quantity Percent Impact
Cinecitta ALS 1 Alert Undercharge 6.3 Mon Apr 17 03 Mon Apr 17 05 0d 1h 28m 340 100% 3.38€
Aprilia Split 1 Signal Undercharge 4.8 Tue Apr 18 13: Tue Apr 18 13: 0d 0h 2m 16 100% 0.08€
Aprilia Split 1 Signal Dirty Evaporator 4.5 Tue Apr 18 13: Tue Apr 18 13: 0d 0h 5m 30 100% 0.13€
Aprilia Split 1 Signal Undercharge 4.6 Tue Apr 18 13: Tue May 5 18: 17d 4h 25 248 100% 549.42€
Aprilia Split 1 OK 1.0 Mon May 8 18: Mon May 8 21: 0d 3h 6m 123 100% 49.03€
Aprilia Split 1 Alarm Undercharge 9.2 Mon May 8 21: Mon May 8 21: 0d 0h 10m 53 100% 0.07€
Aprilia Split 1 OK 1.0 Mon May 8 21: Mon May 8 21: 0d 0h 7m 8 100% 0.11€

Figure 23

2400

AH-06	AH-04	AH-03	AH-02	AH-01	Air Handler	
F	F	F	F	F	Comfort	Pass/Fail
P	P	P	P	P	Efficiency	
F	F	F	F	F	Operation	
					CCO	CC-HC
					OLG Valve	
			X	X	PCO	
		X			Pre-Heat Damper	
X					Pre-Heat Valve	
					EXH Damper Stat	Exhaust All
					Exhaust Fan	
X	X	X	X	X	EXH Fan Speed	
					Mixed Air Damper	MAD, RACO2
					Min OA SETPT	
					Mad Output	
X					CO2 Sensor	
	X		X	X	Static Pressure	Static Pressure
	X		X	X	SA Static SETPT	
					SA Fan SPD Output	
					AVG Space Temp.	Temperature
X					Mixer Air Temp.	
X	X	X	X	X	AVG Space Temp.	
					Max Space Temp.	
			X		Min Space Temp.	
					NGT DLG SETPT	
					NGT HTG SETPT	
					VRT OA Temp.	
X					Return Air Temp.	
			X	X	SA Temp.	
				X	SA Temp. SETPT	
					Warm up SETPT	
X					RA Humidity	

Figure 24

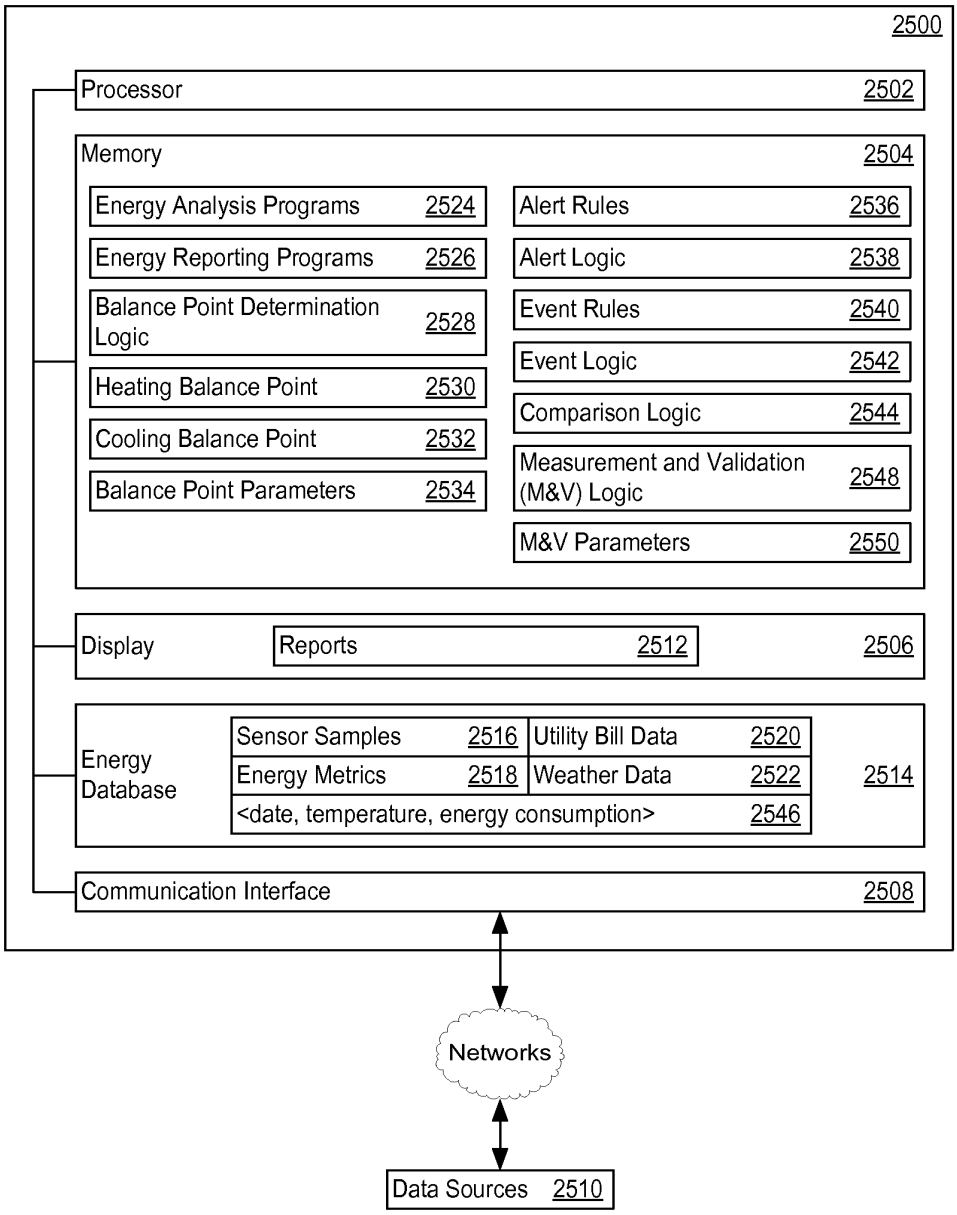

2500
Processor 2502
Memory 2504
Energy Analysis Programs 2524
Energy Reporting Programs 2526
Balance Point Determination Logic 2528
Heating Balance Point 2530
Cooling Balance Point 2532
Balance Point Parameters 2534
Alert Rules 2536
Alert Logic 2538
Event Rules 2540
Event Logic 2542
Comparison Logic 2544
Measurement and Validation (M&V) Logic 2548
M&V Parameters 2550
Display
Reports 2512
2506
Energy Database
Sensor Samples 2516
Utility Bill Data 2520
Energy Metrics 2518
Weather Data 2522
<date, temperature, energy consumption> 2546
2514
Communication Interface 2508
Networks
Data Sources 2510

Figure 25

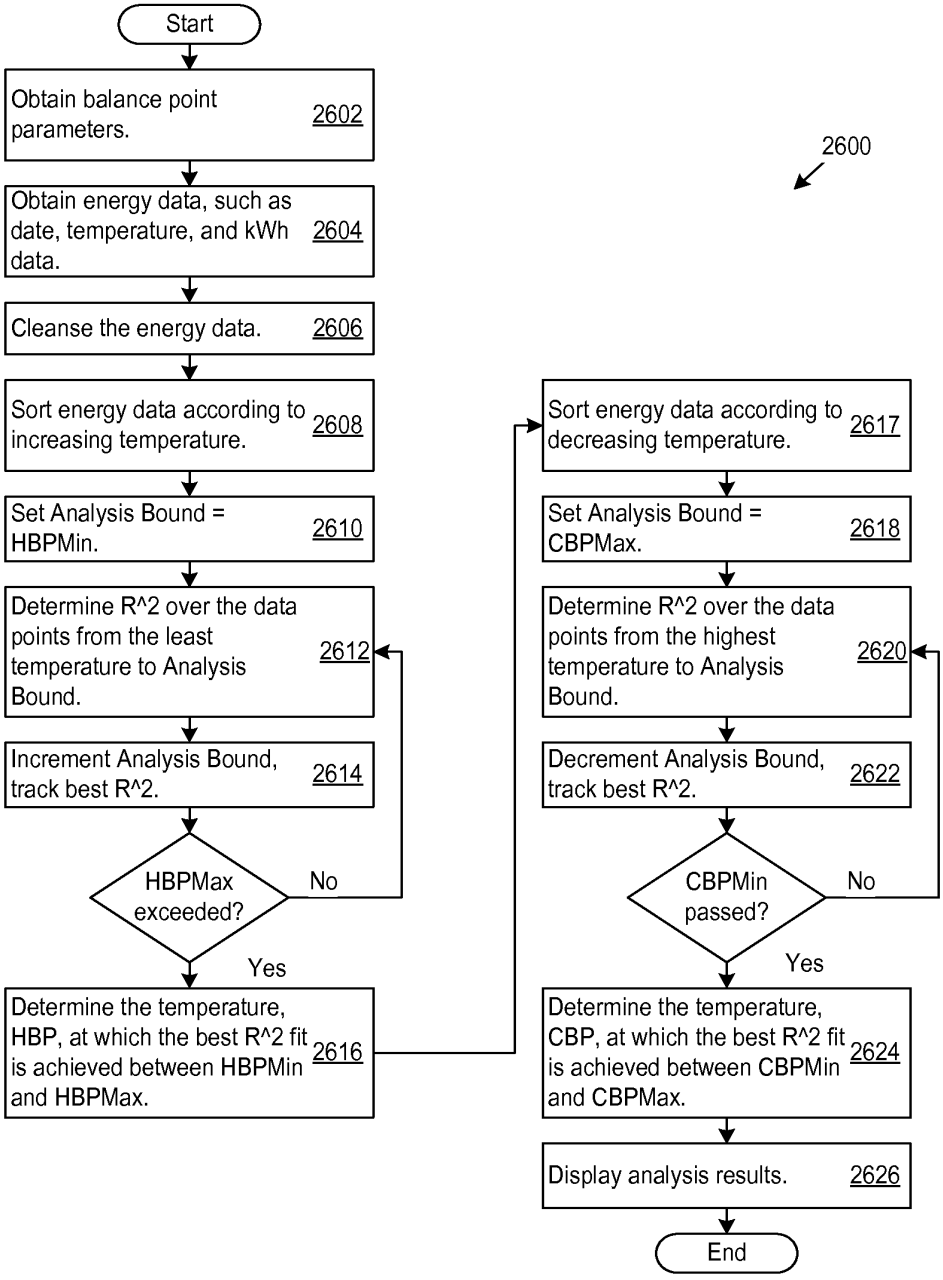

Start
Obtain balance point parameters. 2602
Obtain energy data, such as date, temperature, and kWh data. 2604
Cleanse the energy data. 2606
Sort energy data according to increasing temperature. 2608
Set Analysis Bound = HBPMin. 2610
Determine R^2 over the data points from the least temperature to Analysis Bound. 2612
Increment Analysis Bound, track best R^2. 2614
HBPMax exceeded?
No
Yes
Determine the temperature, HBP, at which the best R^2 fit is achieved between HBPMin and HBPMax. 2616
2600
Sort energy data according to decreasing temperature. 2617
Set Analysis Bound = CBPMax. 2618
Determine R^2 over the data points from the highest temperature to Analysis Bound. 2620
Decrement Analysis Bound, track best R^2. 2622
CBPMin passed?
No
Yes
Determine the temperature, CBP, at which the best R^2 fit is achieved between CBPMin and CBPMax. 2624
Display analysis results. 2626
End

Figure 26

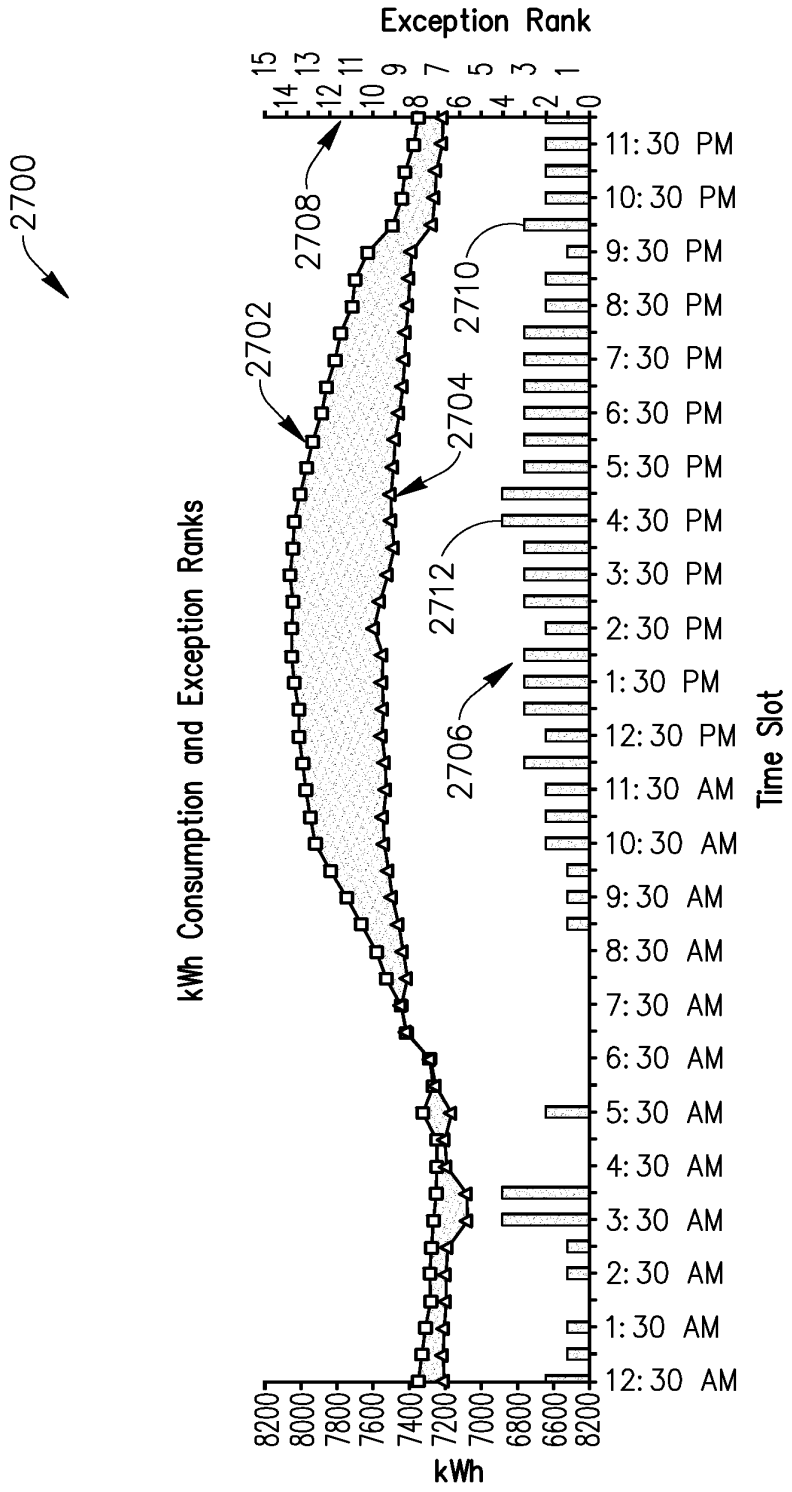

2700
Exception Rank
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
2708
2702
2710
2704
2712
2706
11:30 PM
10:30 PM
9:30 PM
8:30 PM
7:30 PM
6:30 PM
5:30 PM
4:30 PM
3:30 PM
2:30 PM
1:30 PM
12:30 PM
11:30 AM
10:30 AM
9:30 AM
8:30 AM
7:30 AM
6:30 AM
5:30 AM
4:30 AM
3:30 AM
2:30 AM
1:30 AM
12:30 AM
Time Slot
kWh Consumption and Exception Ranks
8200
8000
7800
7600
7400
7200
7000
6800
6600
8200
kWh

Figure 27

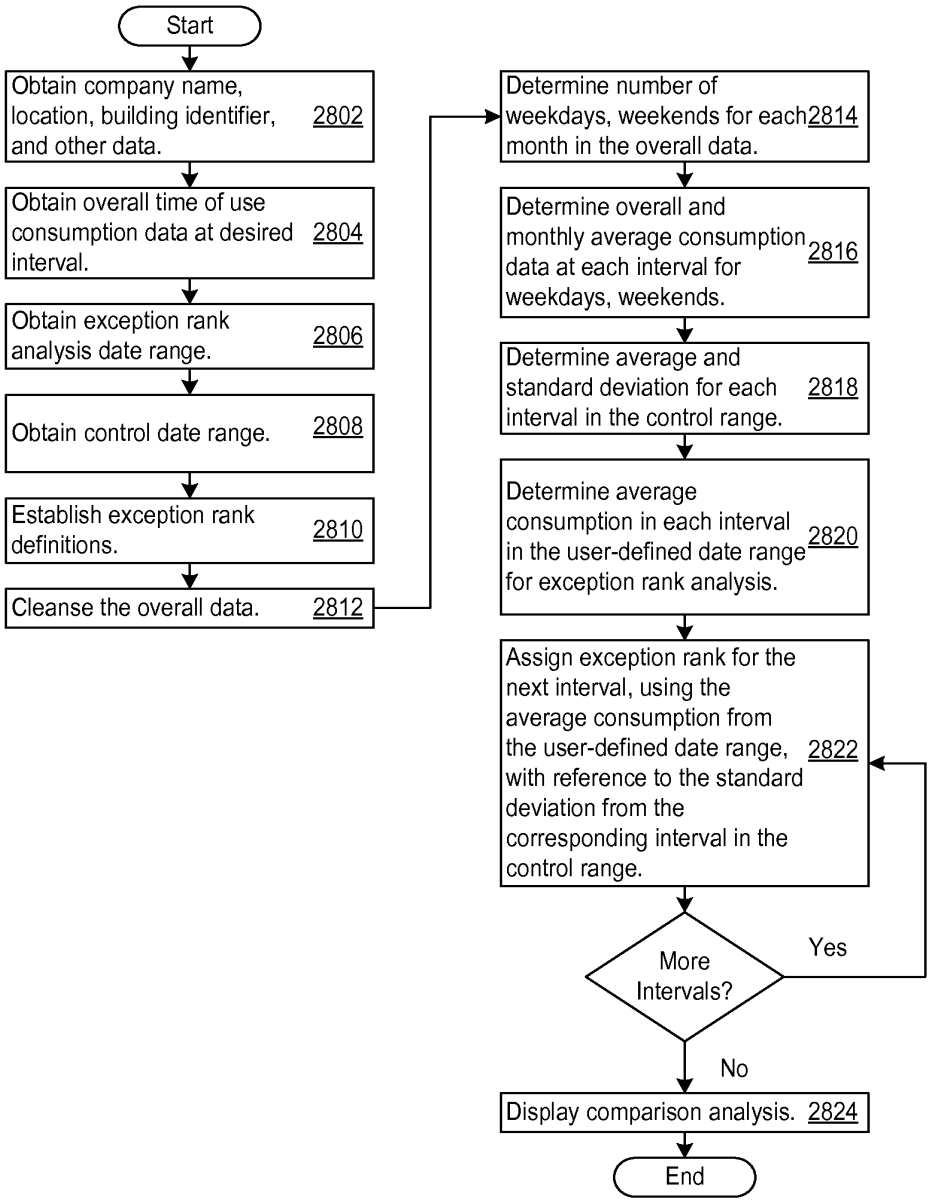

Start
Obtain company name, location, building identifier, and other data. 2802
Obtain overall time of use consumption data at desired interval. 2804
Obtain exception rank analysis date range. 2806
Obtain control date range. 2808
Establish exception rank definitions. 2810
Cleanse the overall data. 2812
Determine number of weekdays, weekends for each month in the overall data. 2814
Determine overall and monthly average consumption data at each interval for weekdays, weekends. 2816
Determine average and standard deviation for each interval in the control range. 2818
Determine average consumption in each interval in the user-defined date range for exception rank analysis. 2820
Assign exception rank for the next interval, using the average consumption from the user-defined date range, with reference to the standard deviation from the corresponding interval in the control range. 2822
More Intervals?
Yes
No
Display comparison analysis. 2824
End

Figure 28

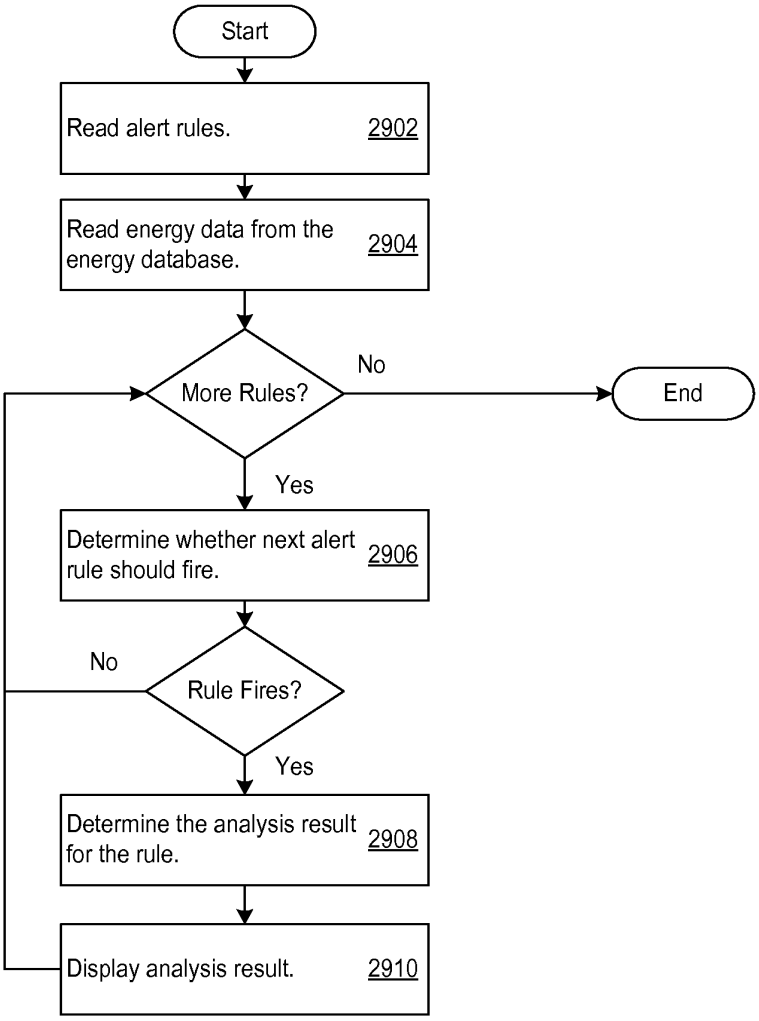

Start
Read alert rules. 2902
Read energy data from the energy database. 2904
More Rules?
No
End
Yes
Determine whether next alert rule should fire. 2906
Rule Fires?
No
Yes
Determine the analysis result for the rule. 2908
Display analysis result. 2910

Figure 29

Electronic Acknowledgement Receipt

EFS ID:	8507357
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	John F. Nethery/Magdalena Pieczonka
Filer Authorized By:	John F. Nethery
Attorney Docket Number:	10022/1726
Receipt Date:	27-SEP-2010
Filing Date:	07-MAY-2010
Time Stamp:	17:16:19
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10022-1726_PreliminaryAm_SubofReplacementDrawings.pdf	127895 e19ae88b1e4f7b5f665621b62eb398119e0cc44b	yes	4

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Miscellaneous Incoming Letter	1	1
	Preliminary Amendment	2	2
	Specification	3	3
	Applicant Arguments/Remarks Made in an Amendment	4	4

Warnings:					
Information:					
2	Drawings-only black and white line drawings	10022-1726_ReplacementDrawings.pdf	3290935 f29dc18fb1b3d595b35b015775eafe34d7b4df16	no	35
Warnings:					
Information:					
		Total Files Size (in bytes):	3418830		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

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Date: September 27, 2010 Name: John F. Nethery, Reg. No. 42,928 Signature:

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay E. Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Not yet assigned
Filed:	May 7, 2010	Art Unit:	2882
For:	Building Energy Consumption Analysis System	Conf. No.:	1676

Attorney Docket No.: 10022/1726

TRANSMITTAL

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Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Transmittal Cover Letter (1p.); Preliminary Amendment (3pp.); Replacement Drawing (35 Sheets, Figures 1- 29).

Fee calculation:

☒ No additional fee is required.

☐ Small Entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR § 1.17(_____).

☐ An additional filing fee has been calculated as shown below:

						Small Entity			Not a Small Entity	
	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra		Rate	Add'l Fee	OR	Rate	Add'l Fee
Total		Minus				x $26=			x $52=	
Indep.		Minus				x 110=			x $220=	
First Presentation of Multiple Dep. Claim						+$195=			+ $390=	
						Total	$		Total	$

Fee payment:

☐ Please charge Deposit Account No. 23-1925 in the amount of $_____ for _____.

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☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

September 27, 2010
Date

John F. Nethery (Reg. No. 42,928)

BRINKS HOFER GILSON & LIONE
NBC Tower – Suite 3600, 455 N. Cityfront Plaza Drive, Chicago, IL 60611-5599

BRINKS HOFER GILSON &LIONE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/776,159	05/07/2010	Jay Hedley	10022/1726

CONFIRMATION NO. 1676

28164
ACCENTURE CHICAGO 28164
BRINKS HOFER GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

PUBLICATION NOTICE



Title:BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Publication No.US-2010-0286937-A1
Publication Date:11/11/2010

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

FORM PTO-1449		SERIAL NO. 12/776,159	CASE NO. 10022/1726
LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT		FILING DATE May 7, 2010	GROUP ART UNIT 2882
(use several sheets if necessary)	APPLICANT(S): Jay Hedley et al.		CONFIRMATION NO. 1676

REFERENCE DESIGNATION **U.S. PATENT DOCUMENTS**

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	NAME	CLASS/ SUBCLASS	FILING DATE
	C1	6,785,592	08/31/2004	Smith et al.		
	C2	6,816,811	11/09/2004	Seem		
	C3	US 2004/0239494 A1	12/02/2004	Kennedy et al.		
	C4	7,228,234	06/05/2007	McNally et al.		
	C5	US 2008/0177423 A1	07/24/2008	Brickfield et al.		
	C6	7,778,734	08/17/2010	Oswald et al.		
	C7	US 2010/0211222	08/19/2010	Ghosn		
	C8	7,966,104	06/21/2011	Srivastava et al.		

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	COUNTRY	CLASS/ SUBCLASS	TRANSLATION YES OR NO
	C9	EP 0924949	06/23/1999	EP		Abstract
	C10	WO 2007/118128	10/18/2007	WO		
	C11	JP 2009070339	04/02/2009	JP		Abstract

EXAMINER INITIAL		OTHER ART – NON PATENT LITERATURE DOCUMENTS (Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date page(s), volume-issue number(s), publisher, city and/or country where published.)
	C12	SENSUS – Machine Intelligence, "Energy Monitoring and Reporting" web page, 1p., dated: copyright 2006, obtained from: http://www.sensusmi.com/en/index.php?option=com_content&task=view&id=50&Itemid=82
	C13	Brian Thompson, "Simple Fault Detection, Diagnosis & Impact Results," 4pp., dated: May 2006, obtained from: http://www.automatedbuildings.com/news/may06/articles/sensus/060427120550sensus.htm
	C14	Brian Thompson, "Service Contractors Profit from the HEAT with Emerging Connectivity and FDDI Analysis," 5pp., dated: September 2006, obtained from: http://www.automatedbuildings.com/news/sep06/articles/sensus/060816105808sensus.htm
	C15	Tridium, Inc., Technical Document, VES Niagara^{AX} User Guide, 164pp., May 28, 2008, obtained from: http://www.hvacc.net/pdf/tridium/docs_3.5.25/VES/VES_AX_UserGuide.pdf

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

FORM PTO-1449	SERIAL NO. 12/776,159	CASE NO. 10022/1726
LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT	FILING DATE May 7, 2010	GROUP ART UNIT 1676
(use several sheets if necessary)	APPLICANT(S): Jay Hedley et al.	

EXAMINER INITIAL	OTHER ART – NON PATENT LITERATURE DOCUMENTS (Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date page(s), volume-issue number(s), publisher, city and/or country where published.	
	C16	M. R. Brambley et al., "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," 162 pp., dated: April 2005, obtained from: http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/pnnl-15149_market_assessment.pdf
	C17	Unknown Author, "Modelling building energy systems - Outdoor environment," 5pp., printed June 29, 2011, obtained from: http://www.esru.strath.ac.uk/Courseware/Building_modelling/sim_theory/out_env.htm
	C18	Hal Levin, "Systematic Evaluation And Assessment Of Building Environmental Performance (SEABEP), ", 8pp., Submitted for presentation at "Building and Environment," Paris, dated: June 9-12, 1997, obtained from: http://www.buildingecology.net/index_files/publications/SystemicEvaluationandAssessmentSEABEP.pdf
	C19	R. K. Pletzer, et al., "Energy Savings Resulting From Shading Devices On Single-Family Residences In Austin, Texas," 10pp., Proceedings of the Fourth Symposium on Improving Building Systems in Hot and Humid Climates, dated: September 15 - 16, 1987, obtained from: http://repository.tamu.edu/bitstream/handle/1969.1/6484/ESL-HH-87-09-15.pdf?sequence=3

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Espacenet

Bibliographic data: EP 0924949 (A1)

Computer supported system for data retrieval, analysis and communication for users of a building

Publication date:	1999-06-23	
Inventor(s):	GIERTH ROBERT-CHRISTIAN [DE] +	
Applicant(s):	GIERTH ROBERT CHRISTIAN [DE] +	
Classification:	**- international:**	***G05B23/00; G05B23/02; G06F13/00; G06F17/40; H04L29/08; H04M11/00; H04Q9/00;*** (IPC1-7): G06F13/00; H04Q9/00
	- European:	G05B23/02; H04L29/08A7; H04L29/08N11M; H04L29/08N1A; H04M11/00A
Application number:	EP19980119616 19981016	
Priority number(s):	DE19971056556 19971218	
Also published as:	• EP 0924949 (B1) • DE 19756556 (A1) • AT 341916 (T)	
Cited documents:	US5561825 (A) US4982185 (A) US5101495 (A) EP0834849 (A1) View all	

Abstract of EP 0924949 (A1)

The services in a building, e.g. water, gas, electricity, are monitored by sensors (12b,14b etc) This allows such as the energy consumption in the building to be monitored. The sensor outputs are fed to a control computer (30) that connects via the internet with a central data processing system. The personal computer system (50) of the building occupier may also access the central system.

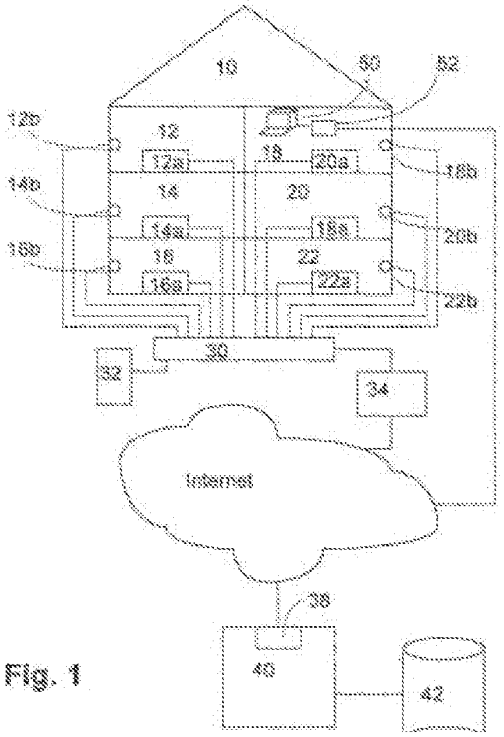


Fig. 1

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 924 949 A1

(12) EUROPÄISCHE PATENTANMELDUNG

(43) Veröffentlichungstag:
23.06.1999 Patentblatt 1999/25

(51) Int. Cl.[6]: **H04Q 9/00**, G06F 13/00

(21) Anmeldenummer: **98119616.5**

(22) Anmeldetag: **16.10.1998**

(84) Benannte Vertragsstaaten:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
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AL LT LV MK RO SI

(30) Priorität: **18.12.1997 DE 19756556**

(71) Anmelder:
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(72) Erfinder:
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14193 Berlin (DE)

(74) Vertreter:
Schmidt, Steffen J., Dipl.-Ing.
Wuesthoff & Wuesthoff,
Patent- und Rechtsanwälte,
Schweigerstrasse 2
81541 München (DE)

(54) Rechnergestütztes Datenerfassungs-, Datenauswertungs- und Kommunikationssystem für Nutzer einer Liegenschaft

(57) Ein rechnergestütztes Datenerfassungs-, Datenauswertungs-, und Kommunikationssystem für Nutzer einer Liegenschaft, in dem einer Liegenschaft wenigstens einer Meßstelle zugeordnet ist, die dazu eingerichtet ist, einen die Liegenschaft betreffenden charakteristischen Verbrauchswert zu erfassen. Mittels einer dazu eingerichteten Datenübertragungseinrichtung (34) wird ein den jeweiligen Verbrauchswert wiedergebendes Signal von der Meßstelle (12b,14b,16b,18b,20b,22b) an eine zentrale Rechnereinheit (40) übermittelt. In einer Datenbasis (42) ist ein die Liegenschaft betreffender Datensatz geführt, wobei der Datensatz zumindest den übermittelten aktuellen Verbrauchswert und einen mit diesen in Beziehung setzbaren, vorherbestimmten Erwartungswert enthält. Ein Benutzer des Systems hat Zugriff auf den Datensatz, um den aktuellen Stand des Verbrauchswertes und ein Verhältnis zwischen dem aktuellen Verbrauchswert und dem vorherbestimmten Erwartungswert zu erhalten.

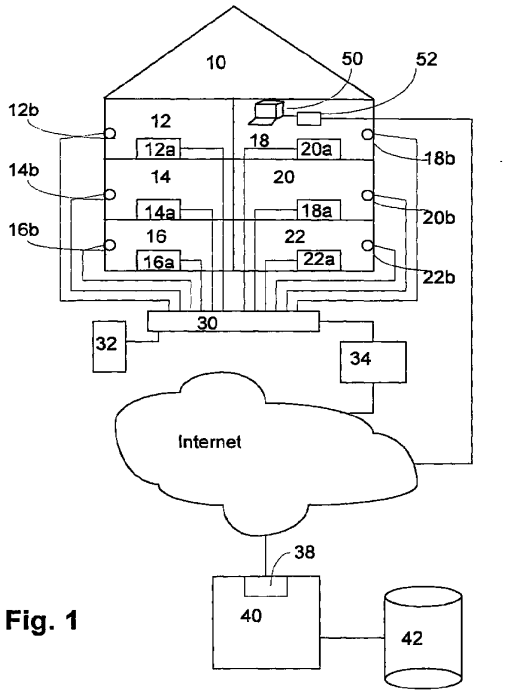


Fig. 1

EP 0 924 949 A1

WILLOW TECH. EX. 1005
Page 301

Beschreibung

[0001] Die vorliegende Erfindung betrifft ein rechnergestütztes Datenerfassungs-, Datenauswertungs-, und Kommunikationssystem für Nutzer einer Liegenschaft. Unter "Liegenschaft" ist hier eine Wohnung, eine Gewerbe-Immobilie, wie ein Büro oder eine Werkstatt oder eine Produktionsstätte, oder auch ein Gebäude oder ein Gebäudekomplex mit mehreren Wohneinheiten (Hotel oder Ferienwohnungen) oder Gewerbe-Immobilieneinheiten zu verstehen.

[0002] Unter Nutzer der Liegenschaft ist sowohl der Mieter/Pächter oder dergl. zu verstehen, als auch der Eigentümer, die vom Eigentümer beauftragte Hausverwaltung oder andere Personen, die mit dieser Liegenschaft betraut sind.

[0003] Üblicherweise werden im Stand der Technik Verbrauchswerte in Wohnungen oder gewerblich genutzten Räumen mittels Zählern oder dergl. gemessen, die einmal jährlich abgelesen werden. Die abgelesenen Werte werden ausgewertet und die Benutzer der Wohnungen oder der gewerblich genutzten Räume erhalten mit erheblicher zeitlicher Verzögerung eine Verbrauchsaufstellung und Abrechnung ihrer Strom-, Gas-, oder (Ab-)Wasser- oder Heizkosten.

[0004] In geringem Umfang sind auch Systeme im Einsatz, bei denen der Strom-, Gas-, oder Wasser- oder Heizmittelverbrauch in einzelnen Liegenschaften bereits elektronisch erfaßt wird. Aber auch hier findet in der Regel eine Akkumulierung und Speicherung der Werte in oder bei der jeweiligen Liegenschaft (ggf. für mehrere Liegenschaften eines Gebäudes) in einem elektronischen Speichergerät statt, das einmal jährlich ausgelesen wird. Die ausgelesenen Werte werden zentral ausgewertet und die Verbrauchsaufstellungen und Abrechnungen der Strom-, Gas-, oder (Ab-)Wasser- oder Heizkosten erfolgen dementsprechend mit erheblicher zeitlicher Verzögerung.

[0005] Dies hat zur Folge, daß zumindest für die überwiegende Mehrzahl von Mietern oder Eigentümern von Liegenschaften eine erhebliche Ungewißheit über zwischen zwei Abrechnungszeitpunkten entstandenen Verbrauch bzw. angefallene Kosten besteht.

[0006] Insbesondere für Gebäude mit mehreren (Wohn- oder Büro-) Einheiten besteht auch das Problem, daß z.B. Heizkosten nach einem Verteilungsschlüssel den einzelnen Einheiten zugeordnet werden, der sowohl vom Verbrauch der jeweiligen Einheit, als auch vom Verbrauch der anderen Einheiten abhängt. Somit wäre das unmittelbare Ablesen von Verbrauchszählern zwischen zwei Abrechnungszeitpunkten in der jeweiligen Einheit auch nur ein sehr ungenauer, grober Anhaltspunkt für den tatsächlichen bis dahin angefallenen Verbrauch und auch für die tatsächlichen, am Ende des Abrechnungszeitraumes veranschlagten Kosten.

[0007] Zur Lösung dieses Problems lehrt die Erfindung ein System, in dem einer Liegenschaft wenigstens einer Meßstelle zugeordnet ist, die dazu eingerichtet ist, einen die Liegenschaft betreffenden charakteristischen Verbrauchswert zu erfassen. Mittels einer dazu eingerichteten Datenübertragungseinrichtung wird ein den jeweiligen Verbrauchswert wiedergebendes Signal von der Meßstelle an eine zentrale Rechnereinheit übermittelt. In einer Datenbasis ist ein die Liegenschaft betreffender Datensatz geführt, wobei der Datensatz zumindest den übermittelten aktuellen Verbrauchswert und einen mit diesen in Beziehung setzbaren, vorherbestimmten Erwartungswert enthält. Ein Benutzer des Systems hat Zugriff auf den Datensatz, um den aktuellen Stand des Verbrauchswertes und ein Verhältnis zwischen dem aktuellen Verbrauchswert und dem vorherbestimmten Erwartungswert zu erhalten.

[0008] Der Benutzer des Systems kann sich also stets einen zeitnahen, wenn nicht sogar momentan aktuellen Überblick über den Stand der Verbrauchswerte verschaffen, ohne auf eine erst in mehreren Monaten zugängliche Aufstellung und Abrechnung warten zu müssen. Dies ist auch z.B. für Heizwerte möglich, da in der zentralen Rechnereinheit auch die Verbrauchswerte der anderen Wohnungen/Büros verfügbar sind, aus denen der jeweilige Erwartungswert bzw. der zugehörige Verbrauchsanteil unter Zugrundelegung des Verteilungsschlüssels ermittelbar ist.

[0009] Insbesondere kann der Benutzer mit dem erfindungsgemäßen System auch jederzeit sehen, ob er derzeit einen Verbrauch hat, der sich im Rahmen des vorbestimmten Erwartungswertes bewegt. Sollte dies nicht der Fall sein, besteht die Möglichkeit, unmittelbar Abhilfe zu schaffen. Dabei ist sowohl der Fall berücksichtigt, daß der Benutzer seine Verbrauchsgewohnheiten ggf. ändert, als auch der Fall, daß der Verbrauch aufgrund eines technischen Defektes (z.B. eines Lecks in einer Wasserleitung) als zu hoch erkannt wird und dieser Defekt behoben werden kann.

[0010] Ein entscheidender Unterschied zu bisher bekannten Systemen besteht darin, daß bei der Erfindung in der Liegenschaft erfaßte Daten mit Werten verglichen werden, die sowohl technische Vorgaben, als auch administrative Vorgaben darstellen. In Abhängigkeit von diesem Vergleich kann dann eine Einflußnahme auf die Verbraucher in der Liegenschaft genommen werden.

[0011] Die administrativen Vorgaben können sich unabhängig von den technisch bedingten Vorgaben ändern und so den Erwartungswert beeinflussen. Wenn sich z.B. der Verteilungsschlüssel der Anteile an den Heizkosten ändert, oder aufgrund von Leerständen einzelner Wohnungen in einem Gebäude andere Wohnungen stärker zu heizen sind, kann dies auf den Vorgabe- oder Erwartungswert einen Einfluß haben. Bei bisherigen Systemen wurde dies dem Benutzer am Ende der Verbrauchs- oder Abrechnungsperiode mehr oder weniger klar aufgeschlüsselt und dargestellt.

[0012] Mit dem erfindungsgemäßen System ist eine derart zeitnahe Information des Benutzers und eine Einflußnahme auf die Verbraucher möglich, daß eine Vielzahl von derzeitigen Problemen vermieden wird.

[0013] Insbesondere die unmittelbare Ermittlung von Verbrauchswerten und der damit verbundenen Kosten, die auch von Nutzern anderen, zum gleichen Gebäude gehörenden Liegenschaften beeinflußt werden, ist mit diesem System

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möglich. Dazu muß lediglich nach jeder (oder einigen) Aktualisierung(en) der Verbrauchswerte in der Datenbasis der zentralen Rechnereinheit ein momentaner Abrechnungslauf durchgeführt werden. Die dabei ermittelten Daten werden dann in die jeweiligen Datensätze eingeschrieben und den Benutzern zugänglich gemacht.

[0014] Außerdem können daraus resultierende Unstimmigkeiten oder Abnormalitäten im Verbrauch festgestellt und behoben werden.

[0015] Bei einer derzeit bevorzugten Ausführungsform der Erfindung ist die Meßstelle dazu eingerichtet, einen Strom-, (Ab-) Wasser, und/oder Gas-Verbrauchswert, oder einen Wärmemengenwert oder einen Heizmengenwert zu erfassen, wobei der jeweilige Verbrauchswert sich auf die ganze Liegenschaft oder auf einen Teil bezieht. Damit läßt sich einerseits der gerätetechnische Aufwand in Grenzen halten.

[0016] Andererseits ist z.B. in Gewerbe-Immobilien durch eine Verbrauchserfassung für jeden Einzelraum der Heizung oder des Stromverbrauchs auch eine klare Kostenstellenanalyse oder im Falle einer Fluktation der Nutzer des jeweiligen Raums eine klare Kostentrennung ohne nennenswerten Aufwand möglich. Bisher mußte hierfür eine zusätzlichen Aufwand und in der Regel Kosten verusachende Zwischenablesung gesorgt werden.

[0017] In Abhängigkeit davon, welchen Aufwand ein Systembetreiber bereit ist, bei der Übertragung der Daten zu treiben, ist die Datenübertragungseinrichtung entweder dazu eingerichtet, erfaßte Meßwerte unmittelbar nach oder bei deren Erfassung an die zentrale Rechnereinheit weiterzuleiten, oder mehrere Meßwerte, ggf. auch von unterschiedlichen Meßstellen zusammengefaßt an die zentrale Rechnereinheit weiterzuleiten.

[0018] Insbesondere, wenn ein Gebäude mit mehreren Wohn- oder Büroeinheiten mit dem erfindungsgemäßen System ausgestattet werden soll, bietet sich eine auf das Gebäude bezogene zentrale Erfassung der Meßwerte in einem Steuerrechner an, der dann (z.B.) bei Nacht eine Übertragung der Meßwerte an die zentrale Rechnereinheit ausführt.

[0019] Dies läßt sich beispielsweise mittels einer Nachrichtenübertragung realisieren, bei der automatisiert Nachrichten mit den gemessenen Werten und den zugehörigen Verbrauchsstellen gemäß vorbestimmten Protokollen (z.B. HTTP, MIME, FTP, SMTP, NNTP etc.) erstellt werden, die dann z.B. über das Internet an die zentrale Rechnereinheit übertragen werden. Es ist jedoch auch möglich, anstelle einer Übertragung über das Internet oder einer direkten Datenfernleitung über Modem-Verbindungen die Daten mittels an sich bekannter Bus-Protokolle (M-Bus, Profibus etc.) zwischen der zentralen Rechnereinheit und Steuerrechner hin- und her zu übermitteln.

[0020] Erfindungsgemaß enthält die Datenbasis neben dem die Liegenschaft betreffenden Datensatz für Benutzer weitere Informationen, die direkt oder indirekt mit der jeweiligen Liegenschaft oder einer Gruppe von Liegenschaften in Verbindung stehen.

[0021] Dabei kann es sich um allgemeine Informationen zu dem jeweiligen Gebäude (Urkunden, Eigentümer, Mieter, Wirtschaftspläne, Verträge mit Handwerkern, Hausmeister etc., Hausordnung, Eigentümerversammlungsprotokolle, Begehungsberichte mit zugehörigen Bildern, etc.), spezielle Informationen zu den einzelnen Liegenschaften (Adresse des Mieters, Eigentümers, Bankverbindungen, Mietzins, Nebenkosten, Einzelabrechnungen, prognostizierte Einzelverbrauchsdaten, Statistik von Einzelverbrauchsdaten aus der Vergangenheit, Mietverträge, Schriftwechsel mit Mieter und/oder Eigentümer etc.), dem Gebäude zuordenbare Serviceleistungen (Formulare für Adressenänderungen, oder Mängelmeldungen etc., Schwarze-Brett-Funktionen für Eigentümer und/oder Mieter des Gebäudes mit aktuellen Informationen, Datenbanken zum Mietrecht, Wohnungseigentumsgesetz, etc., Wohnungs-, Fenster-, oder Teppichreinigungsdienste, Pflanzen- oder Haustierpflegedienste, Babysitterdienste etc.,) oder allgemeine Serviceleistungen (Online Shopping, Online Banking, Essenlieferservice, Reisebürodienste, etc.) handeln.

[0022] Um Anforderungen des Datenschutzes gerecht zu werden, aber auch aus allgemeinen Akzeptanzgründen der Benutzer erhält erfindungsgemäß ein Benutzer des Systems auf den Datensatz oder auf andere Bereiche der Datenbasis oder anderer Vorstehend beschriebener Dienste erst nach einer Überprüfung seiner Zugangsberechtigung Zugriff auf die Datenbasis oder von Teilen davon.

[0023] Bei einer bevorzugten Ausführungsform des erfindungsgemäßen Systems ist ein einer Meßstelle zugeordneter Verbraucher bei Überschreiten eines vorherbestimmten Verbrauchswertes durch ein von der zentralen Rechnereinheit erzeugten Steuersignals abschaltbar, wobei das Steuersignal mittels einer Datenübertragungseinrichtung an den Verbraucher übermittelbar ist. Auch hierbei kann eine automatisiert erstellte Nachricht mit einer Kennung des jeweiligen Verbrauchers gemäß vorbestimmten Protokollen (z.B. HTTP, MIME, FTP, SMTP, NNTP etc.) in der zentralen Rechnereinheit erstellt werden, dann z.B. über das Internet an den Steuerrechner in dem jeweiligen Gebäude übertragen werden. Auch hier ist es möglich, anstelle einer Übertragung über das Internet oder einer direkten Datenfernleitung über Modem-Verbindungen die Daten mittels an sich bekannter Bus-Protokolle (M-Bus, Profibus etc.) zwischen der zentralen Rechnereinheit und Steuerrechner hin- und her zu übermitteln.

[0024] Mittels entsprechender Gebäudeleittechnik oder anderer Fernwirkeinrichtungen kann dann von dem jeweiligen Steuerrechner der entsprechende Verbraucher ausgeschaltet oder in seiner Leistungsaufnahme oder Durchflußmenge begrenzt werden.

[0025] Insbesondere wenn die vorstehend beschriebene automatisierte Verbraucherabschaltung realisiert ist, wird zusätzlich von der zentralen Rechnereinheit einem Nutzer bei Überschreiten eines vorherbestimmten Verbrauchswer-

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tes eine Warnmitteilung über Überschreiten des jeweiligen vorherbestimmten Verbrauchswertes übermittelt. Alternativ dazu kann aber auch nur die (in der zentralen Rechnereinheit automatisiert erstellte) Warnmitteilung an den Nutzer gesendet werden, damit dieser die Möglichkeit hat, unabhängig davon, ob er die Datenbasis mit den entsprechenden Daten selbst einsieht, entsprechende Maßnahmen nach dieser Mitteilung bzw. Aufforderung zu ergreifen.

[0026] Erfindungsgemäß wird der jeweilige vorherbestimmte Erwartungswert aus einem Vergleich mit entsprechenden Verbrauchswerten anderer Liegenschaften und/oder mit Verbrauchswerten der jeweiligen Liegenschaft aus der Vergangenheit bestimmt. Dabei können sowohl akkumulierte Erwartungswerte (bezogen auf den erwarteten Gesamtverbrauch bis zum heutigen Tag, zur laufenden Woche oder zum laufenden Monat, aber auch punktuelle Erwartungswerte (z.B. laufender oder vergangener Monat) verwendet werden. Insbesondere, wenn dabei auch Erfahrungswerte aus vergleichbaren Liegenschaften z.B. des gleichen Gebäudes einbezogen werden, kann eine hohe Genauigkeit erzielt werden.

[0027] So kann der Benutzer z.B. sehr schnell erkennen, wenn während einer Woche oder eines Monats der Heizperiode seine Heizung erheblich mehr verbraucht, als in entsprechenden Zeiträumen in der Vergangenheit. Dabei kann auch von dem Steuerechner des jeweiligen Gebäudes an die zentrale Rechnereinheit eine Übermittlung aktueller Temperaturverläufe erfolgen, so daß Temperaturschwankungen von einem Jahr zum anderen bei der Bestimmung der Erwartungswerte berücksichtigt, bzw. Herausgerechnet werden können.

[0028] Je nach dem, wie oft Meßwerte von der Meßstelle an die zentrale Rechnereinheit übermittelt werden, dies kann z.B. täglich, wöchentlich oder monatlich geschehen, wird auch eine entsprechende Aktualisierung des jeweiligen Datensatzes vorgenommen. Sobald sich eine signifikante Änderung ergeben hat, oder nach einer vorbestimmten Anzahl von Aktualisierungen des jeweiligen Datensatzes der Liegenschaft wird dann von der zentralen Rechnereinheit einem Nutzer eine entsprechende Mitteilung übermittelt. Eine derartige Mitteilung kann z.B. in Form einer automatisiert erstellten (e-mail) Mitteilung erfolgen, die an den Nutzer geschickt wird. Damit wird unnötig häufiger Datenaustausch vermieden.

[0029] Ein wesentlicher Unterschied zu bekannten derartigen Systemen besteht darin, daß alle in der zentralen Rechnereinheit für die Benutzer vorgehaltenen oder erstellten technischen und administrativen Daten und Informationen, aber auch alle anderen dem Benutzer angebotenen Serviceleistungen in einer einheitlichen Darstellungsweise (z.B. als HTML-Seiten) für den Benutzer aufbereitet und zum Abruf bereitgehalten werden. Diese gleichmäßige und einheitliche Darbietung der Daten und Informationen verbunden mit der Aktualität der abrufbaren Daten und Informationen und der damit vorhandenen Möglichkeit, auf Veränderungen sofort reagieren zu können, stellt einen bisher im Bereich der Haustechnik nicht gekannten Komfort für die Benutzer dar.

[0030] Außerdem erleichtert die einheitliche Darbietung der Daten und Informationen eimen Benutzer der Zugang und das Verständnis der angebotenen Inhalte, so daß auch technisch nicht versierte Benutzer des Systems dieses mit Gewinn in Anspruch nehmen können.

[0031] Weitere Merkmale, Eigenschaften, Vorteile und Abwandlungs- oder Ergänzungsmöglichkeiten des erfindungsgemäßen Systems werden anhand der nachstehenden Beschreibung der Zeichnung erläutert.

Fig. 1 zeigt eine erste Ausführungsform des erfindungsgemäßen Datenerfassungs-, Datenauswertungs-, und Kommunikationssystems für Nutzer einer Liegenschaft.

Fig. 2 zeigt eine zweite Ausführungsform des erfindungsgemäßen Datenerfassungs-, Datenauswertungs-, und Kommunikationssystems für Nutzer einer Liegenschaft.

Fig. 3 zeigt eine Darstellung der dem Nutzer einer Liegenschaft mittels des erfindungsgemäßen Systems angebotenen Funktionen und Dienstleistungen.

Fig. 4 zeigt eine Darstellung der graphischen Wiedergabe aktueller Verbrauchswerte im Vergleich zu Vorjahreswerten.

[0032] In der in Fig. 1 gezeigten Ausführungsform der Erfindung sind in einem Gebäude 10 mehrere Wohn- oder Büroeinheiten 12, 14, 16, 18, 20, und 22 mit Verbrauchern ausgestattet. Als Beispiel ist hier in jeder Wohn- oder Büroeinheit 12, 14, 16, 18, 20, und 22 jeweils eine Elektroheizung 12a, 14a, 16a, 18a, 20a, und 22a gezeigt. Es können jedoch auch andere Verbrauchsstellen, wie z.B. Stromanschlüsse, Gasherde oder Gasheizungen, Wasserverbraucher oder Heizungen vorhanden sein, die in das erfindungsgemäße System eingebunden sind. Den Elektroheizungen 12a, 14a, 16a, 18a, 20a, und 22a ist jeweils eine Meßstelle 12b, 14b, 16b, 18b, 20b, und 22b in Form eines Sensors zugeordnet, mit dem der betreffende charakteristische Verbrauchswert zu erfassen ist.

[0033] Die Sensoren sind über entsprechende Leitungen mit einem Steuerrechner 30 verbunden, der die Signale der Sensoren 12b, 14b, 16b, 18b, 20b, und 22b empfängt. Der Steuerrechner 30 ist mit einer Speichereinheit 32 ausgestattet, in der ein Steuerprogramm zum Auslesen der Sensoren 12b, 14b, 16b, 18b, 20b, und 22b und zum Steuern einer

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Datenübertragungseinrichtung 34 in Form eines Modems oder eines ISDN-Interface abgelegt ist. Falls die Kommunikation zwischen dem Steuerrechner 30 und der zentralen Rechnereinheit 40 über eine M-Bus-Verbindung, eine Profi-Bus-Verbindung oder dergl. abgewickelt wird, sind in dem Steuerrechner 30 und in der zentralen Rechnereinheit 40 entsprechende Interface-Karten vorzusehen.

[0034] Außerdem werden in der Speichereinheit 32 den empfangenen Signalen entsprechende Werte zusammen mit Kennungen der jeweiligen Wohn- oder Büroeinheiten vor ihrer Versendung zwischengespeichert. Es ist jedoch zur Vereinfachung der Datenorganisation auch möglich, die erfaßten Meßwerte unmittelbar nach oder bei deren Erfassung an die zentrale Rechnereinheit weiterzuleiten, anstatt mehrere Meßwerte, ggf. auch von unterschiedlichen Meßstellen zusammengefaßt an die zentrale Rechnereinheit weiterzuleiten.

[0035] Die Versendung oder Übermittlung der den jeweiligen Verbrauchswert wiedergebendes Signale von den Meßstellen 12b, 14b, 16b, 18b, 20b, und 22b an eine zentrale Rechnereinheit 40, die ebenfalls ein Modern bzw. ein ISDN-Interface 38 aufweist, erfolgt im vorliegenden Beispiel über einen Internet-Zugang. Dazu wählt sich der Steuerrechner 30 über das Modem 34 einmal am Tag oder einmal pro Woche (oder pro Monat) in das Internet ein und sendet eine Nachricht an die zentrale Rechnereinheit 40, in der für jede Verbrauchsstelle 12a ... 22a der jeweilige Meßwert aus dem zugehörigen Sensor 12b ... 22b enthalten ist. Anstelle der Kommunikation zwischen dem Steuerrechner 30 und der zentralen Rechnereinheit 40 über Internet, kann der Datenaustausch auch über eine M-Bus-Verbindung, eine Profi-Bus-Verbindung oder dergl. abgewickelt werden. Anstelle der vorstehend beschriebenen Übertragungswege (Internet, M-Bus, Profi-Bus) kann auch eine Direkt-Wählverbindung über das terrestrische Mobilfunk-Netz eingesetzt werden, über die eine Datei mit den entsprechenden Daten angefordert und ausgesendet wird.

[0036] Der zentralen Rechnereinheit 40 ist eine Datenbasis 42 zugeordnet, in der ein die Liegenschaft betreffender Datensatz geführt ist.

[0037] Falls die Verbrauchsmessung mittels Sensoren 12b ... 22b erfolgt, die ihre Signale an einen Erfassungsrechner 48 eines Energieversorgungsunternehmens oder eines Energie-Verbrauchsableseunternehmens senden, können die in diesem Erfassungsrechner 48 aufbereiteten Daten auch von dort durch die zentrale Rechnereinheit 40 abgerufen werden, bzw. durch den Erfassungsrechner 48 an die zentrale Rechnereinheit 40 gesendet werden. Diese Ausführungsform der Erfindung ist in Fig. 2 veranschaulicht, wobei gegenüber Fig. 1 unveränderte Komponenten die gleichen Bezugszeichen wie in Fig. 1 haben und nicht nochmals erläutert sind.

[0038] Nachstehend ist ein Beispiel eines Datensatzes veranschaulicht, wie er in dem erfindungsgemäßen System verwendet wird. Es versteht sich dabei, daß dieser Beispiel-Datensatz nicht alle möglichen Einträge und Erweiterungsmöglichkeiten enthält. Hier sind lediglich einige Einträge aufgeführt, die zum Verständnis der Erfindung und ihrer Funktion dienlich sind.

[0039] Hier ist am Beispiel der monatlichen erwarteten Heizleistungen und der tatsächlichen Heizleistungen für die jeweiligen Monate gezeigt, wie ein Benutzer des Systems bei einem Zugriff auf den Datensatz, den aktuellen Stand des Verbrauchswertes und ein Verhältnis zwischen dem aktuellen Verbrauchswert und dem vorherbestimmten Erwartungswert erhalten kann. Das Verhältnis zwischen dem aktuellen Verbrauchswert und dem vorherbestimmten Erwartungswert wird jeweils beim Eintrag des empfangenen aktuellen Verbrauchswertes bestimmt. Wenn z.B. der aktuelle Verbrauchswert wöchentlich aktualisiert wird, kann ein Benutzer auch während des laufenden Monats (durch Extrapolation) annähernd feststellen, ob er bereits im laufenden Monat seinen Erwartungswert überschreiten wird oder nicht. Wenn z.B. in der Monatsmitte ein erheblich größerer Anteil als 50% des Erwartungswertes verbraucht ist, besteht eine hohe Wahrscheinlichkeit bei gleichbleibendem Verbrauchsverhalten den Erwartungswert zu überschreiten.

Datenfeld	Inhalt	Verhältnis
Liegenschafts-Nummer	**2345**	
Anschrift	**Badstr. 5**	
Ort	**88888 Dorfen**	
Eigentümer	**Muster, Max**	
Anschrift	**Langstr. 3**	
Ort	**99999 Hausen**	
Liegenschaftsfläche	**125 gm**	
erwartete Heizleistung Jan	**50 kWh**	
erwartete Heizleistung Feb	**55 kWh**	

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(fortgesetzt)

Datenfeld	Inhalt	Verhältnis
erwartete Heizleistung Mär	**40 kWh**	
erwartete Heizleistung Apr	**30 kWh**	
erwartete Heizleistung Mai	**20 kWh**	
erwartete Heizleistung Jun	**10 kWh**	
erwartete Heizleistung Jul	**5 kWh**	
erwartete Heizleistung Aug	**2 kWh**	
erwartete Heizleistung Sep	**10 kWh**	
erwartete Heizleistung Okt	**25 kWh**	
erwartete Heizleistung Nov	**35 kWh**	
erwartete Heizleistung Dez	**45 kWh**	
tatsächliche Heizleistung Jan	**55 kWh**	**+10%**
tatsächliche Heizleistung Feb	**65 kWh**	**+18%**
tatsächliche Heizleistung Mär	**30 kWh**	**-25%**
tatsächliche Heizleistung Apr	**25 kWh**	**-17%**
tatsächliche Heizleistung Mai	**20 kWh**	**+/-0%**
tatsächliche Heizleistung Jun		
tatsächliche Heizleistung Jul		
tatsächliche Heizleistung Aug		
tatsächliche Heizleistung Sep		
tatsächliche Heizleistung Okt		
tatsächliche Heizleistung Nov		
tatsächliche Heizleistung Dez		

[0040] Da in der zentralen Rechnereinheit 40 sämtliche Wohnungen/Büros eines Gebäudes mit derartigen Datensätzen geführt sind, kann auch dann eine gegenwartsnahe Information und auch Prognose für einen Benutzer bereitgestellt werden, wenn z.B. die einer Liegenschaft zuzuordnenden Heizkosten auch teilweise vom Verbrauch anderer Liegenschaften des Gebäudes abhängen.

[0041] Ein Benutzer kann mittels eines Terminals 50 in Form eines PC, einer Set-Top-Box für das Fernsehgerät, eines Bildschirms mit abgesetzter oder integrierter Tastatur (Touch-screen) oder dergl., das mit einem Modem 52 ausgestattet ist, über das Internet auf die zentrale Rechnereinheit 40 zugreifen, um Einblick in seinen Datensatz zu nehmen.

[0042] Die zentrale Rechnereinheit 40 kann auch über eine direkte Datenverbindung anstatt über eine Internetverbindung mit einem, mehreren oder allen Terminals 50 in einer Liegenschaft kommunizieren. Dazu ist zum Beispiel die zentrale Rechnereinheit 40 im gleichen Gebäude oder nahe bei dem Gebäude untergebracht, in dem sich die Liegenschaften befinden. Die Datenbasis 42 wird zu Zeiten niedrigen Zugriffsverkehrs (zum Beispiel nachts) von außen (durch den Rechner der Hausverwaltung) aktualisiert. Dies hat den Vorteil, daß die Internetkosten (Provider, Telefongesellschaft etc.) wegfallen und die Kommunikation zwischen den Terminals 50 und der zentralen Rechnereinheit 40 erheblich schneller abgewickelt werden kann. Außerdem erhöht sich die Sicherheit gegenüber unbefugten Dritten.

[0043] Die Datenbasis enthält neben dem die Liegenschaft betreffenden Datensatz weitere Informationen für Benutzer, die direkt oder indirekt mit der jeweiligen Liegenschaft oder einer Gruppe von Liegenschaften zusammenhängen. Z.B. kann aus der Gesamtheit aller Datensätze für die Liegenschaften eines Gebäudes eine Verbrauchsstatistik bezogen auf das Gebäude ermittelt werden. Damit können z.B. ungünstig zu beheizende oder schlecht isolierte Liegenschaften eines Gebäudes ermittelt werden.

[0044] Außerdem können Gebäudestammdaten und Dienstleistungsangebote geführt werden, wie z.B. - Flächenaufstellungen aller Liegenschaften des Gebäudes,

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- Aufstellungen aller Eigentümer des Gebäudes und deren Eigentumsanteile,
- Mietzinsübersichten und Mietstaffelübersichten aller Liegenschaften des Gebäudes,
- Mieterlisten aller Liegenschaften des Gebäudes,
- Wohngeldübersichten aller Liegenschaften des Gebäudes,
- Verwaltungsdaten der Mieter und Eigentümer aller Liegenschaften des Gebäudes (Adressen, Bankverbindungen, Mietkonten, Wohngeldkonten etc.)
- Nebenkostenabrechnungen bezogen auf alle oder einzelne Liegenschaften und deren aktueller Stand,
- Betriebskostabrechnungen bezogen auf alle oder einzelne Liegenschaften und deren aktueller Stand,
- Verbrauchsabrechnungen bezogen auf alle oder einzelne Liegenschaften und deren aktueller Stand,
- Wirtschaftspläne bezogen auf alle oder einzelne Liegenschaften und deren aktueller Stand,
- Vertragsunterlagen (z.B. Verwaltervertrag, Hausmeistervertrag, Teilungserklärung und Nachtrage dazu, Bewirtschaftungsverträge, Hausordnung, aktuelle und frühere Aushänge, etc.),
- Schriftverkehr mit Eigentümern und/oder Mietern bezogen auf alle oder einzelne Liegenschaften,
- Formulare für Adressenänderungen oder Bankverbindungsänderungen, Mängelmeldungen etc.
- elektronische führbares Haushaltsbuch, in dem die Verbrauchskosten automatisch schon eingetragen sind.
- Cluster-Telefonie (Telefonieren mit allen Nutzern im Ge bäude ohne Einschaltung einer Telefongesellschaft.
- Elektronische Steuerung der elektrischen Verbraucher in einer Liegenschaft (Waschmaschine, Spülmaschine Rolladensteuerung, Beleuchtung im Abwesenheitsfall des Nutzers etc.)
- Alarm- Sicherheitstechnik (Brand- Einbruchsmelder)
- Notrufmelder (betreutes Wohnen für Senioren)
- Automatische Störmeldungen an Handwerker (Heizung, Wasser) sowie Fernwartungsdienste.

[0045] Diese einzelnen Funktionen oder Dienstleistungen können als Baum strukturiert dem Benutzer dargeboten werden, um einen möglichst einfachen Zugang zu erlauben. Zum Beispiel kann auch ein Nutzer in der Datenbasis 42 bereitgehaltene Formulare aufrufen und sich in sein Terminal 50 übertragen lassen, diese Formulare in seinem Terminal 50 ergänzen bzw. ausfüllen und dann an die Rechnereinheit 40 zurücksenden. In der Rechnereinheit 40 werden in Verbindung mit den Daten aus der Datenbasis 42 diese Angaben ausgewertet und ggf. Entsprechende Aktionen eingeleitet (Änderung der Kontoverbindung, Bestellung einen Dienstleistung oder dergl.).

[0046] Es versteht sich, daß ein Benutzer des Systems auf den Datensatz oder die vorstehend aufgeführten Details erst nach einer Überprüfung seiner Zugangsberechtigung Zugriff erhält. Auch wenn eine Zugriffsberechtigung eines Benutzers vorliegt, werden nur solche Funktionen oder Dienstleistungen von der Rechnereinheit 40 bzw. Datenbasis 42 an sein Terminal 50 gesendet und dort angezeigt, die für ihn relevant und auch freigegeben sind. Damit erfährt ein Nutzer gar nicht, daß ggf. auch noch weitere Funktionen in dem System vorhanden sind, die jedoch Nutzern mit weitergehender Zugangs-Berechtigung vorbehalten sind.

[0047] Zusätzlich oder anstatt eines durch den Benutzer initiierten zugriffs auf die Datenbasis kann auch die zentrale Rechnereinheit den jeweiligen Benutzer oder eine bestimmte Benutzergruppe von sich aus bei Vorliegen bestimmter Ereignisse oder Kriterien benachrichtigen. Z.B. kann von der zentralen Rechnereinheit einem Nutzer nach einer vorbestimmten Anzahl von Aktualisierungen des jeweiligen Datensatzes der Liegenschaft eine entsprechende Mitteilung übermittelt werden.

[0048] Alternativ oder zusätzlich dazu kann von der zentralen Rechnereinheit einem Nutzer eine entsprechende Mitteilung (an dessen Terminal oder PC 50 über das Internet) übermittelt werden wenn z.B. ein einer Meßstelle zugeordneter Verbraucher einen vorherbestimmten Verbrauchswert überschreitet. Außerdem kann in diesem Fall durch ein von der zentralen Rechnereinheit erzeugtes Steuersignal der jeweilige Verbraucher durch eine Nachricht an den Steuerrechner 30 über das Internet abgeschaltet oder in seiner Leistungsaufnahme begrenzt werden. Damit kann ein Benutzer zu einem frühen Zeitpunkt einer Überschreitung seines Energiebudgets entgegenwirken.

[0049] In der vorstehend beschriebenen Ausführungsform der Erfindung befindet sich das/die Terminal/s 50 innerhalb der jeweiligen Liegenschaft, damit der Mieter/Pächter oder dergl. direkt die für ihn freigegebenen Daten des Datensatzes der Liegenschaft und andere Informationen abrufen oder an sein Terminal 50 gesendet bekommen kann. Alternativ oder zusätzlich dazu kann das Terminal 50 auch an einem beliebigen, entfernten Ort sich befinden, so daß zum Beispiel der Eigentümer, der Hausverwalter oder eine abwesender Mieter die Daten und Informationen einsehen kann.

[0050] Die vorliegende Erfindung erlaubt die Integration unterschiedlicher Angebote (Fernsehen, Hörfunk, Internet, Homebanking, Gebäudeleittechnik, Verbrauchserfassung, Alarmanlage etc.) in eine gemeinsame dem Benutzer dargebotene Bedienoberfläche. Dazu dient das Terminal 50, das über das Internet, LAN- oder WAN-Verbindungen, Profibus oder dergl. mit der Rechnereinheit 40 kommuniziert um die Daten und Informationen von der Rechnereinheit 40 zu dem jeweiligen Terminal 50 und in die entgegengesetzte Richtung zu senden. Daneben sind die einzelnen Sensoren in der jeweiligen Liegenschaft ebenfalls über entsprechende Leitungen oder über drahtlose Verbindungen und Kommunikationsprotokolle mit der Rechnereinheit 40 oder dem Erfassungsrechner 48 verbunden. Das Terminal 50 kann ggf. auch mit den Sensoren verbunden sein und als Konzentrator der erfaßten Signale vor deren Übermittlung an die Rechner-

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einheit 40 oder den Erfassungsrechner 48 dienen. Insbesondere wenn neben den Verbrauchssensoren auch noch mit der Rechnereinheit 40 verbundene Sensoren an den Fenstern und/oder Türen vorhanden sind, kann die Rechnereinheit 40 erkennen, daß zum einen ein Sicherheitsproblem existieren kann; damit ist eine Alarmanlagenfunktion realisierbar. Zum anderen kann der Nutzer darauf aufmerksam gemacht werden, daß in einem Raum sowohl das Fenster geöffnet ist, als auch die Heizung eingeschaltet ist. Mit einer entsprechenden Rück-Kanaltechnik kann bei geöffnetem Fenster auch die Heizung des betreffenden Raumes durch die Rechnereinheit 40 gesteuert abgeschaltet oder zurückgefahren werden.

[0051] Ein entscheidender Vorteil der vorliegenden Erfindung besteht darin, daß Bewohner oder Nutzer einer Liegenschaft, die mit der Erfindung ausgestattet ist, erheblich besser informiert sein oder werden kann, als ein Bewohner oder Nutzer einer Liegenschaft ohne die Erfindung. Dabei wird der Benutzer über ein einziges, einheitliches Medium über Vorgänge informiert, die sowohl auf dem technischen, als auch auf dem administrativen Bereich liegen können. Darüber hinaus wird dem Benutzer eine einfache Verbindung zu technischen und administrativen Daten oder Sachverhalten bereitgestellt, die ihm sonst nicht zugänglich sind. Dabei werden alle Daten und Informationen in einem einheitlichen Format dargeboten, um auch weniger versierten Benutzern einen einfachen und schnellen Zugang zu ermöglichen.

[0052] Außerdem kann neben dem erfindungsgemäßen System auch noch eine Vielzahl anderer Dienstleistungen (online-banking, online-shopping oder andere oben genannte Dienste) über das einmal installierte erfindungsgemäße System für den Benutzer der jeweiligen Liegenschaft zugänglich gemacht werden.

Patentansprüche

1. Ein rechnergestütztes Datenerfassungs-, Datenauswertungs-, und Kommunikationssystem für Nutzer einer Liegenschaft (10), mit

   - wenigstens einer Meßstelle (12b, 14b, 16b, 18b, 20b, 22b), die dazu eingerichtet ist, einen die Liegenschaft (10) betreffenden charakteristischen Verbrauchswert zu erfassen,
   - einer Datenübertragungseinrichtung (30, 34), die dazu eingerichtet ist, ein den jeweiligen Verbrauchswert wiedergebendes Signal von der Meßstelle (12b, 14b, 16b, 18b, 20b, 22b) an eine zentrale Rechnereinheit (38, 40) zu übermitteln,
   - einer Datenbasis (42), in der ein die Liegenschaft (10) betreffenden Datensatz geführt ist, wobei

     -- der Datensatz den übermittelten aktuellen Verbrauchswert und einen mit diesen in Beziehung setzbaren, vorherbestimmten Erwartungswert enthält, und wobei

   - ein Benutzer des Systems Zugriff auf den Datensatz hat, um den aktuellen Stand des Verbrauchswertes und ein Verhältnis zwischen dem aktuellen Verbrauchswert und dem vorherbestimmten Erwartungswert zu erhalten.

2. Datenerfassungs-, Datenauswertungs-, und Kommunikationssystem nach Anspruch 1, wobei

   - die Meßstelle (12b, 14b, 16b, 18b, 20b, 22b) dazu eingerichtet ist, einen Strom-, Wasser, und/oder Gas-Verbrauchswert, oder einen Heizmengenwert zu erfassen, wobei der jeweilige Verbrauchswert sich auf die ganze Liegenschaft (12, 14, 16, 18, 20, 22) oder auf einen Teil bezieht.

3. Datenerfassungs-, Datenauswertungs-, und Kommunikationssystem nach Anspruch 1 oder 2, wobei

   - die Datenübertragungseinrichtung (30, 34) dazu eingerichtet ist, erfaßte Meßwerte unmittelbar nach oder bei deren Erfassung an die zentrale Rechnereinheit (38, 40) weiterzuleiten, oder mehrere Meßwerte, ggf. auch von unterschiedlichen Meßstellen (12b, 14b, 16b, 18b, 20b, 22b) zusammengefaßt an die zentrale Rechnereinheit (38, 40) weiterzuleiten.

4. Datenerfassungs-, Datenauswertungs-, und Kommunikationssystem nach einem der vorhergehenden Ansprüche, wobei

   - die Datenbasis (42) neben dem die Liegenschaft betreffenden Datensatz für Benutzer weitere Informationen enthält, die direkt oder indirekt mit der jeweiligen Liegenschaft oder einer Gruppe von Liegenschaften in Verbindung stehen.

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5. Datenerfassungs-, Datenauswertungs-, und Kommunikationssystem nach einem der vorhergehenden Ansprüche, wobei

   - ein Benutzer des Systems auf den Datensatz erst nach einer Überprüfung seiner Zugangsberechtigung Zugriff auf die Datenbasis (42) oder Teile davon erhält.

6. Datenerfassungs-, Datenauswertungs-, und Kommunikationssystem nach einem der vorhergehenden Ansprüche, wobei

   - einer Meßstelle (12b, 14b, 16b, 18b, 20b, 22b) zugeordnete Verbraucher (12a, 14a, 16a, 18a, 20a, 22a) bei Überschreiten eines vorherbestimmten Verbrauchswertes durch ein von der zentralen Rechnereinheit (38, 40) erzeugten Steuersignals abschaltbar sind, wobei das Steuersignal mittels einer Datenübertragungseinrichtung an den jeweiligen Verbraucher (12a, 14a, 16a, 18a, 20a, 22a) übermittelbar ist.

7. Datenerfassungs-, Datenauswertungs-, und Kommunikationssystem nach einem der vorhergehenden Ansprüche, wobei

   - von der zentralen Rechnereinheit (40) einem Nutzer bei Überschreiten eines vorherbestimmten Verbrauchswertes eine Warnmitteilung über Überschreiten des jeweiligen vorherbestimmten Verbrauchswertes übermittelt wird.

8. Datenerfassungs-, Datenauswertungs-, und Kommunikationssystem nach einem der vorhergehenden Ansprüche, wobei

   - der jeweilige vorherbestimmte Erwartungswert aus einem Vergleich mit entsprechenden Verbrauchswerten anderer Liegenschaften und/oder mit Verbrauchswerten der jeweiligen Liegenschaft aus der Vergangenheit bestimmt wird.

9. Datenerfassungs-, Datenauswertungs-, und Kommunikationssystem nach einem der vorhergehenden Ansprüche, wobei

   - von der zentralen Rechnereinheit (40) einem Nutzer einer vorbestimmten Anzahl von Aktualisierungen des jeweiligen Datensatzes der Liegenschaft eine entsprechende Mitteilung übermittelt wird.

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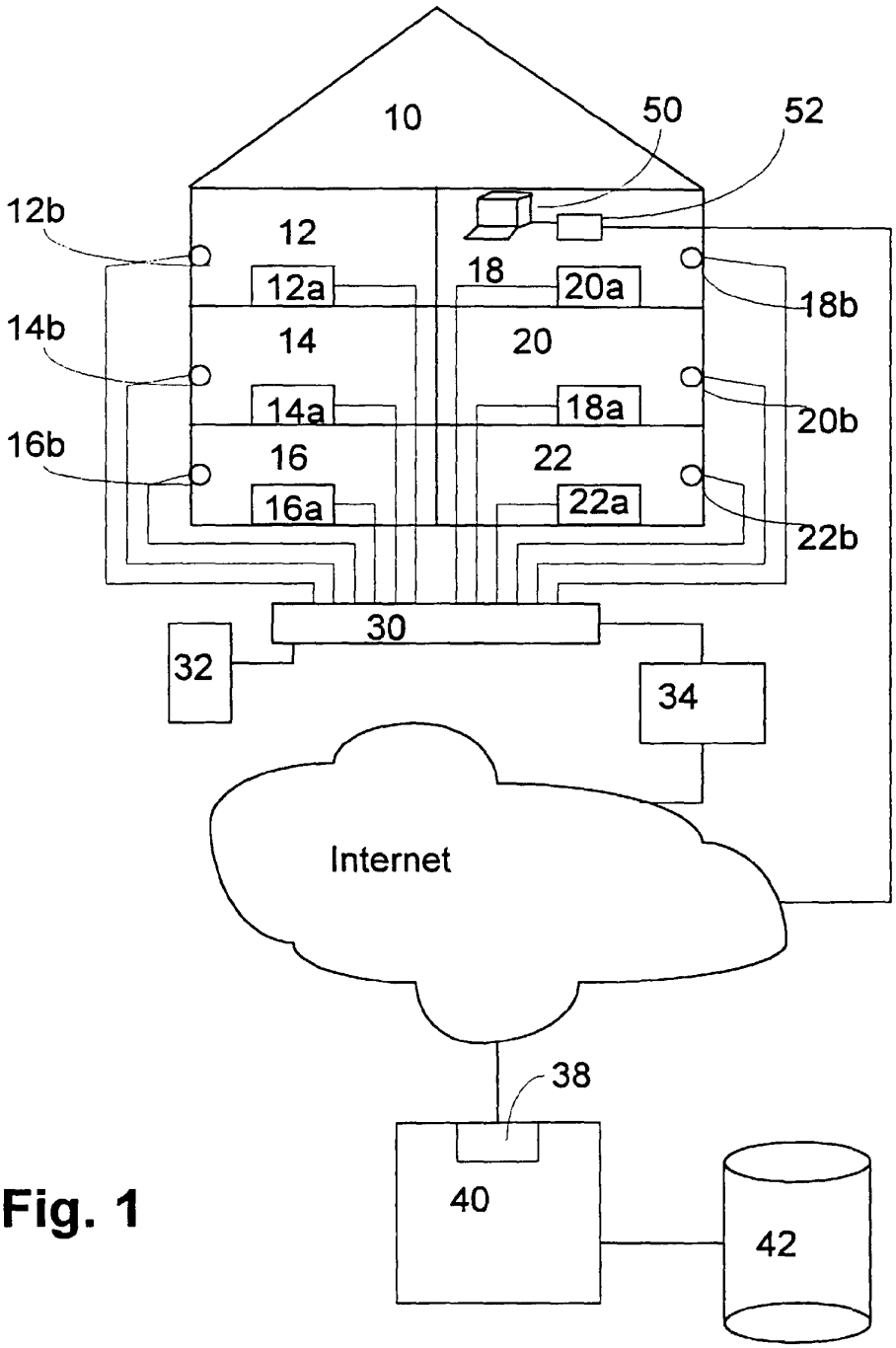


Fig. 1

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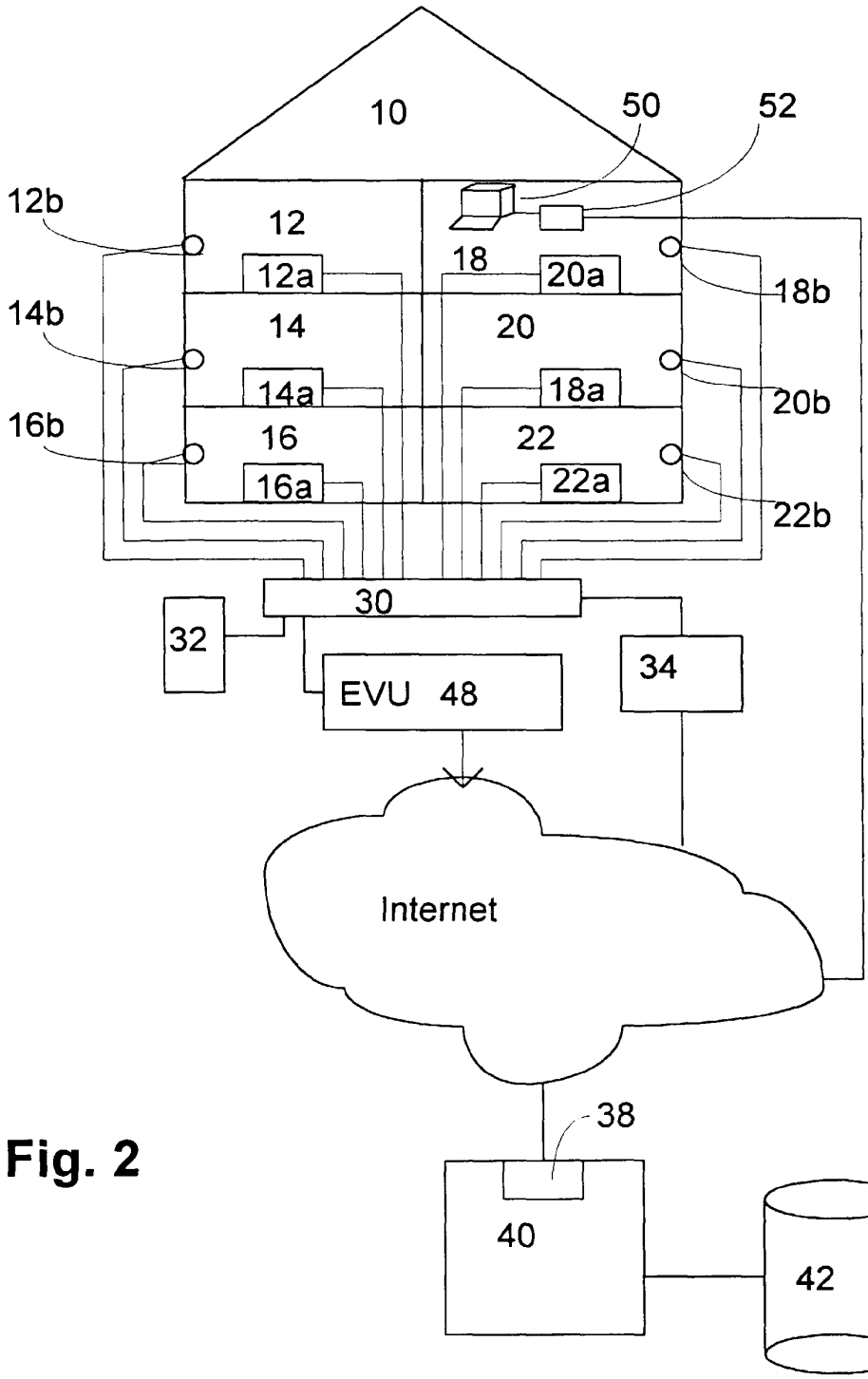


Fig. 2

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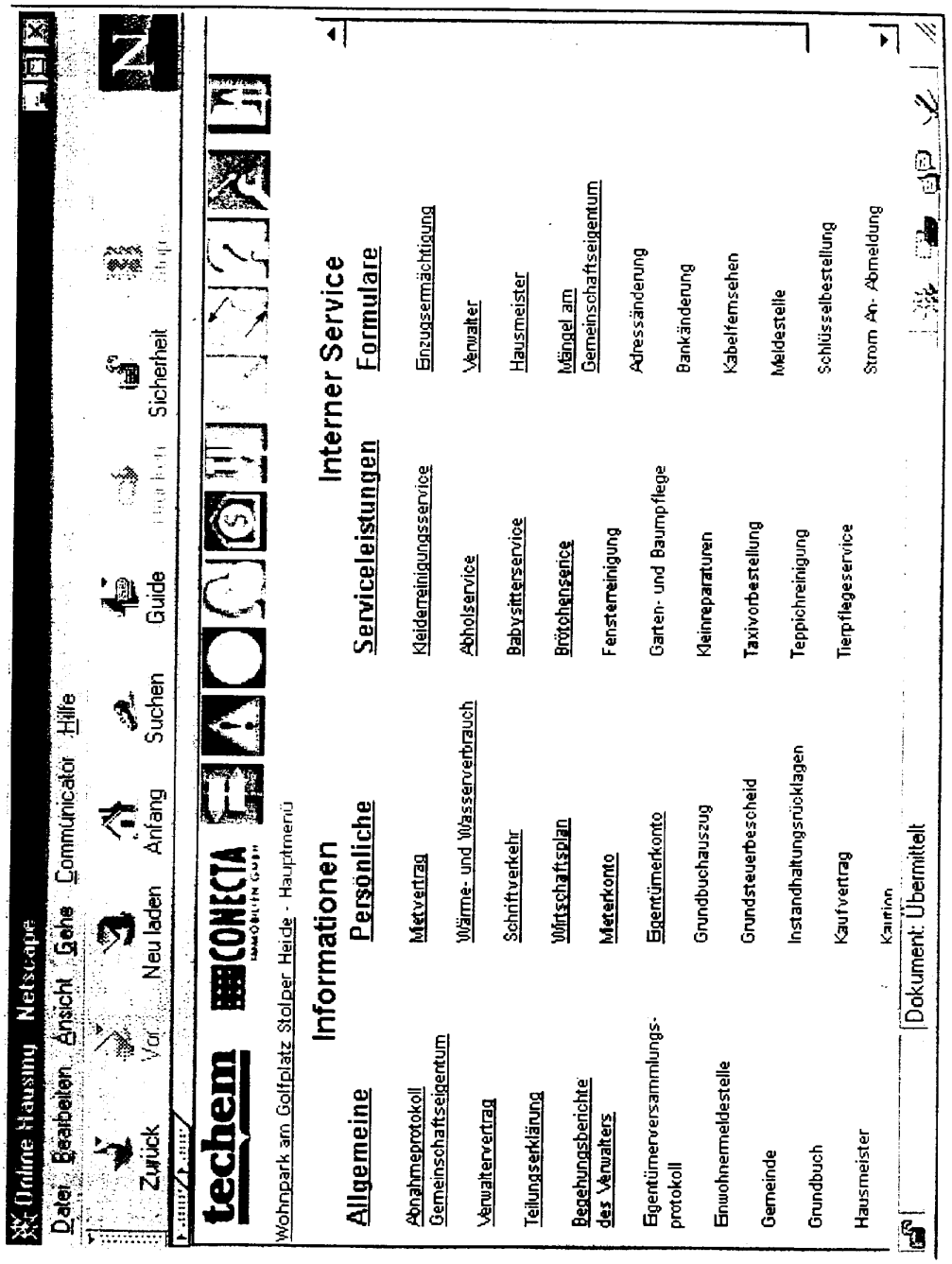


Fig. 3

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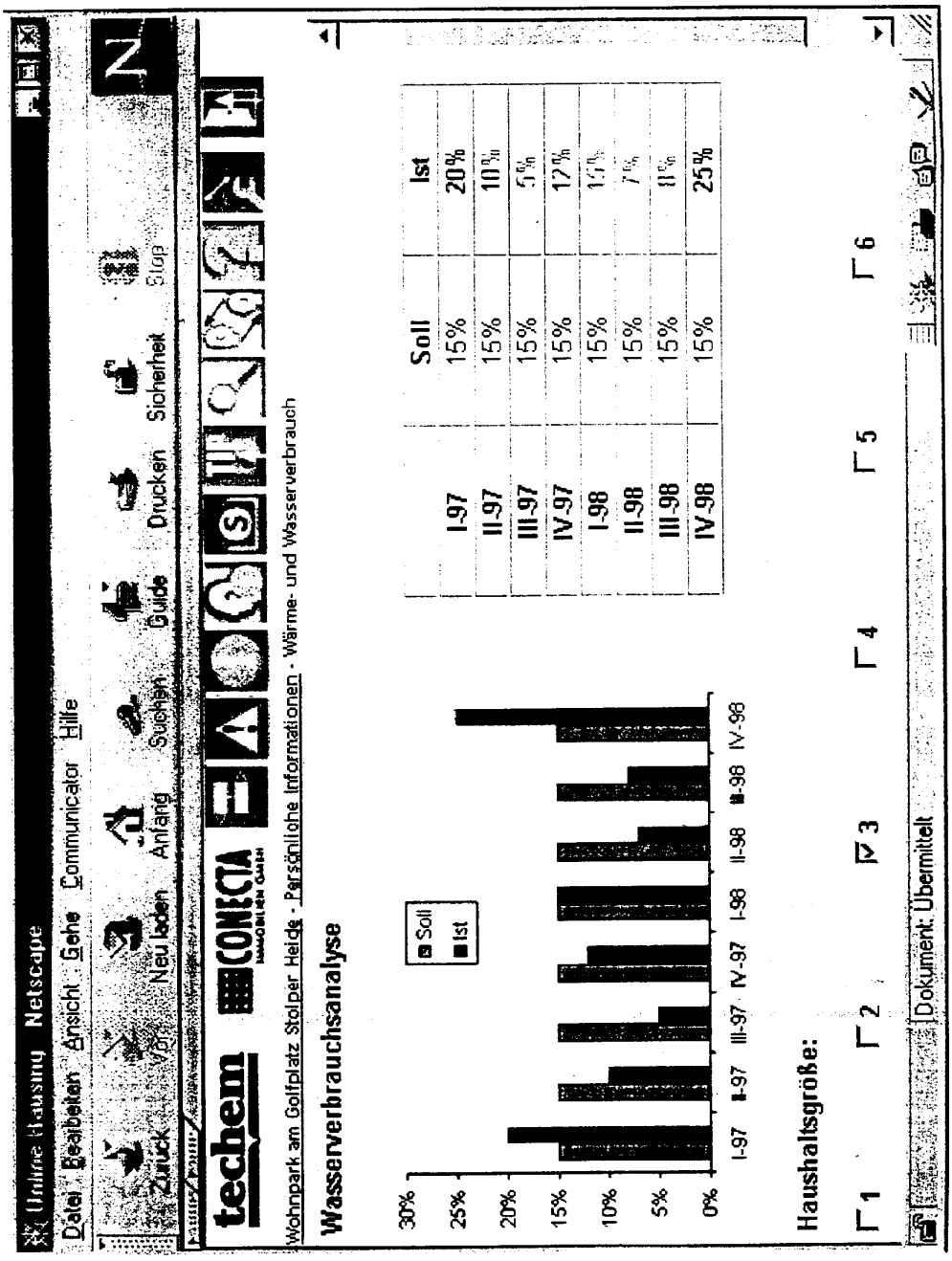


Fig. 4

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Europäisches Patentamt

EUROPÄISCHER RECHERCHENBERICHT

Nummer der Anmeldung
EP 98 11 9616

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Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (Int.Cl.6)
A	US 5 561 825 A (YAMAGAMI ET AL.) 1. Oktober 1996 * Zusammenfassung * * Spalte 1, Zeile 5 - Spalte 3, Zeile 50; Anspruch 1; Abbildung 1 * ---	1	H04Q9/00 G06F13/00
A	US 4 982 185 A (HOLMBERG ET AL.) 1. Januar 1991 * Zusammenfassung * * Spalte 1, Zeile 5 - Spalte 7, Zeile 13; Anspruch 1; Abbildung 1 * ---	1	
A	US 5 101 495 A (YUKAWA) 31. März 1992 -----		

RECHERCHIERTE SACHGEBIETE (Int.Cl.6)

H04Q
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Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt

Recherchenort	Abschlußdatum der Recherche	Prüfer
WIEN	29. Januar 1999	GRÖSSING

KATEGORIE DER GENANNTEN DOKUMENTE

X : von besonderer Bedeutung allein betrachtet
Y : von besonderer Bedeutung in Verbindung mit einer anderen Veröffentlichung derselben Kategorie
A : technologischer Hintergrund
O : nichtschriftliche Offenbarung
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T : der Erfindung zugrunde liegende Theorien oder Grundsätze
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ANHANG ZUM EUROPÄISCHEN RECHERCHENBERICHT ÜBER DIE EUROPÄISCHE PATENTANMELDUNG NR. EP 98 11 9616

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten europäischen Recherchenbericht angeführten Patentdokumente angegeben.
Die Angaben über die Familienmitglieder entsprechen dem Stand der Datei des Europäischen Patentamts am
Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

29-01-1999

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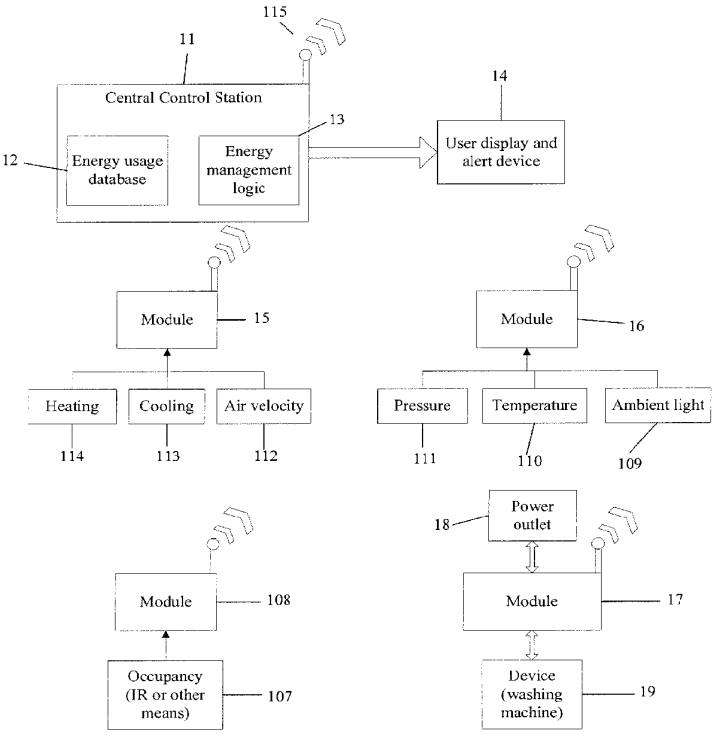
(74) Agents: **DARROW, Justin** et al.; Heller Ehrman LLP, 1717 Rhode Island Avenue, NW, Washington, D.C. 20036 (US).

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[Continued on next page]

(54) Title: ARTIFICIAL-INTELLIGENCE-BASED ENERGY AUDITING, MONITORING AND CONTROL



(57) Abstract: A method and system are provided for auditing, monitoring and controlling the energy consumption within a utility. Energy consumption data is obtained from a series of modules (15), (16), (17) and (108) monitoring and controlling a variety of physical conditions, such as ambient light (109), temperature (110), pressure (111), air velocity (112), cooling (113), and heating (114), and devices (19). These modules (15), (16), (17) and (108) transmit energy consumption data over a wireless personal area network (WPAN). A central control station (11) obtains the energy consumption data through a transceiver (115) and stores it in an energy usage database (12). Energy management logic (13) instructs the central control station (11) to calculate and provide to the user an energy management solution, to automatically control devices to effectively conserve energy, by applying rule-based artificial intelligence to the stored energy consumption data in conjunction with information from the Internet.

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PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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ARTIFICIAL-INTELLIGENCE-BASED ENERGY AUDITING, MONITORING AND CONTROL

Background of the Invention

1. Field of the Invention

The present invention relates to an approach for providing a user with an energy management solution based on energy consumption data obtained from modules monitoring and controlling energy consumption.

2. Description of the Related Art

Energy efficiency and conservation are becoming an increasingly important issue because the demand for energy is constantly increasing, while the dominant energy supplies – various types of fossil fuels – are steadily dwindling. As a result, energy costs will only grow with time, steadily gaining a larger percentage of both residential and commercial building budgets. In addition, because the majority of energy is produced from fossil fuels, the increased use of this energy source adversely affects the environment, contributing to global warming through the release of carbon oxide gases.

With the increased levels of energy consumption and energy costs, consumers are becoming financially burdened by the cost of energy. For many years, large companies and industrial complexes have used complicated, expensive systems to lower the usage and costs of energy. However, these approaches have proved to be too expensive and complicated for small businesses and residential consumers. As a result, such consumers are left without an effective means of reducing and managing energy usage.

Accordingly, there is a demand for an inexpensive, user-friendly system capable of easy installation that does not require any specialized knowledge. It is desirable that the system advise users of ways to conserve energy in a variety of settings (i.e., building environments/conditions), including home and office. Utilities can also use the system to monitor the efficacy of their energy efficiency programs.

Summary of the Invention

The aforementioned needs and others are addressed by the present invention in which a method and system are provided for auditing, monitoring, and controlling energy consumption.

In one aspect of the invention, a method of auditing, monitoring, and controlling energy consumption is disclosed. The method comprises obtaining energy consumption and physical conditions data from a series of modules that monitor and control a variety of physical conditions. These physical conditions are selected from a group consisting of current, voltage, air, velocity, humidity, light, occupancy, pressure, temperature, power, magnetic fields, electric fields, vibration frequency, vibration amplitude, relative location, absolute location, geolocation, altitude, and any combination thereof. The method comprises storing the energy consumption and physical conditions data in electronic memory. The method comprises producing an energy management solution using energy management logic. The method comprises providing the user with the energy management solution by applying any of rule-based logic, expert systems programming and combinations thereof to the energy consumption and physical conditions data.

In another aspect of the invention, a system for auditing, monitoring, and controlling the energy consumption is disclosed. The system comprises a series of modules transmitting information over a wireless personal area network (WPAN) to monitor and control energy use and a variety of physical conditions. The physical conditions are selected from a group consisting of current, voltage, air, velocity, humidity, light, occupancy, pressure, temperature, power, magnetic fields, electric fields, vibration frequency, vibration amplitude, relative location, absolute location, geolocation, altitude, and any combination thereof. The system comprises a central control station to receive data transmitted by the modules. The system comprises a storage mechanism to store data transmitted by the modules in electronic memory.

The system comprises an energy management logic to monitor and control the energy consumption.

A further understanding of the nature and advantages of the invention will become apparent by reference to the remaining portions of the specification and drawings.

Brief Description of the Drawings

Fig. 1 illustrates a system for auditing, monitoring, and controlling energy consumption according to an embodiment of the present invention.

Fig. 2 illustrates a method of energy auditing according to an embodiment of the present invention.

Fig. 3 illustrates a method of monitoring and controlling energy consumption within a utility according to an embodiment of the present invention.

Fig. 4 illustrates a module for monitoring and controlling energy consumption according to an embodiment of the present invention.

Detailed Description of the Preferred Embodiments

Fig. 1 illustrates a system for auditing, monitoring, and controlling energy consumption according to an embodiment of the present invention. The system comprises of a series of modules **15**, **16**, **17**, and **108** for monitoring and controlling various physical conditions such as cooling **114**, heating **113**, air velocity **112**, temperature **111**, pressure **110**, ambient light **109**, and occupancy **107** and devices **19**, such as a washing machine. The system also comprises a central control station **11** for receiving energy consumption data from the modules. The central control station **11** contains an energy usage database **12** for storing the energy consumption data received from the module, and energy management logic **13** for providing a user with an efficient energy management solution via a user display and alert device.

According to **Fig. 1**, the modules **15**, **16**, **17**, and **108** used for monitoring and controlling energy consumption of a utility are connected to each other as well as the central control station **11** by the means of a wireless personal area network (here after WPAN). The wireless personal area network uses any of a mesh, star, point-to-point, and ad-hoc topology and combinations thereof. Each of the modules **15**, **16**, **17**, and **108** are capable of communicating within a wireless network using the same protocol. According to an embodiment of the present invention, the wireless protocol used for communicating could be an IEEE wireless standard protocol such as IEEE 802.15.4. The modules **15**, **16**, **17**, and **108** use ZigBee specification, in addition to the IEEE wireless standard protocol, to improve and simplify communication over the WPAN. The data communicated is organized according to the requirements of any of the OpenAMI, Itron, OpenWay, Intelligrid, BACnet, LonWorks, or another Automated Metering Intitiative (AMI) standard or building or home automation data or communication standard.

According to **Fig. 1**, the modules **15**, **16**, **17**, and **108** monitor and /or control different physical conditions such as cooling **114**, heating **113**, air velocity **112**, temperature **111,** pressure **110,** ambient light **109,** and occupancy **107**, and devices **19**, such as a washing machine. Other conditions comprise electric current, voltage, humidity, pressure, power, magnetic fields, electric fields, vibration frequency, vibration amplitude, relative location, absolute location (geolocation), and altitude. The modules **15**, **16**, **17**, and **108** each comprise at least one sensor for monitoring and at least one relay or switch device for controlling the above physical conditions. The relay or switching device may be implemented in either hardware or software.

According to an embodiment of the present invention, a module can monitor and/or control one or more than one physical condition and/or device. The modules which monitor and control physical conditions **15** and **16**, such as cooling **114**, heating **113**, air velocity **112**, temperature **111**, pressure **110**, ambient light **109**, and occupancy **107**, further comprise

suitable sensors to monitor and control those particular physical conditions. The energy consumption data is stored within the module and transmitted over WPAN to the central control station **11**.

In an embodiment of the present invention, the module **17** which monitors and controls the energy consumption and status of a device **19**, such as a washing machine, further comprises a clamp to connect an electrical feed wire from the power outlet **18** to the device **19**. The module **17** may comprise a plug for connecting the module to the power outlet **18**. The module **17** may further comprise a meter for measuring current and voltage intake of the device, an analog to digital converter for converting analog current and voltage data into their digital equivalents, and a processor (not shown) for calculating the energy consumption of the device **19** by multiplying the current and voltage values.

The processor (not shown) in module **17** may further be configured to convert measured AC current and voltage values from AC to RMS. The module **17** may further comprise a memory to store the measured energy consumption of the device, which is then transmitted over the WPAN to the central control station **11.**

In one embodiment of the present invention, the memory within the modules **15, 16, 17**, and **108** is a volatile memory. In this case the modules **15, 16, 17**, and **108** would further comprise a battery or capacitor to maintain the volatile memory. The memory is a non-volatile memory. In another embodiment of the present invention, the power source required to operate the modules may be selected from a group consisting of a battery, capacitor, and a wall outlet. The source of power to operate the modules may be obtained by scavenging energy such as vibration or light from the environment.

The energy consumption data and the device status are transmitted over the WPAN to the central control database **11**. According to an embodiment of the present invention, each of the modules **15, 16, 17**, and **108,** as well as the central control station, may include transceivers **115** to both transmit and receive information over the WPAN. According to another

embodiment of the present invention, the central control station **11** may be connected to the WPAN by means of a Personal Computer Memory Card International Association (PCMCIA) hardware network adapter.

The central control station **11** further comprises of an energy usage database **12** and energy management logic **13**. The energy consumption data and the device status obtained from the modules **15**, **16**, **17** and **108** are stored in the energy usage database. The energy usage database **12** may also contain various energy related data such as end use surveys, engineering studies, simulations and device power consumption characteristics as defined by the manufacturer. The energy management logic **13** applies a rule-based artificial intelligence to the obtained energy consumption data stored in the energy usage database **12**, in conjunction with historical information, weather predictions, electricity cost information and future cost predictions, to provide a user with an efficient energy management solution.

According to an embodiment of the present invention, the energy management logic **13** may modify the rule-based artificial intelligence to produce a more efficient energy management solution. The energy management solution may further comprise of energy management decisions, on/off schedules and commands to reduce energy consumption and cost. The energy management decisions, on/off schedules and costs are then transmitted over the WPAN to the modules **15**, **16**, **17**, and **108** for execution. The modules **15**, **16**, **17**, and **108** further include a means for cutting off or controlling power supply to appliances and devices and may include electrical devices such as thermostats for controlling energy consumption.

In an embodiment of the present invention, the energy management logic **13** may further instruct a processor to generate logs, reports and/or graphs for the energy consumption data and status of devices. The energy management solution, comprising a recommendation to a user to reduce energy consumption and costs based on historical information obtained and stored from the devices and information from the Internet, is then provided to the user at the user display and alert device **14**. According to another embodiment of the present invention,

the user display and alert device **14** may be a personal computer, a display console, a mobile phone, an email account or a personal digital assistant (PDA). The user display may also interface with information gateway and demand response technologies from utilities, such as OpenWay, AMR, AMI and OpenAMI. In another embodiment of the invention, the central control station **11** may be a data processing device such as a personal computer or a PDA executing energy management logic **13**.

Fig. 2 discloses a method of energy auditing according to an embodiment of the present invention. At the start of this method the user receives executable instructions for auditing, monitoring, and controlling the energy consumption of a utility. The executable instructions may be received by the user embodied either on a computer-readable medium, such as a compact disc, on a signal supplied via a universal serial bus device (USB) or via the Internet. The utility may range from a small private office to a multi story building. The executable instructions may be installed on a data processing device such as a personal computer or a PDA.

At step **21**, a check is performed to determine whether the installation of the software comprising the executable instructions is complete and whether energy auditing for the utility may begin. At step **22**, a prompt of the user is issued to input the energy consumption data for the utility. The energy consumption data may include previous energy bills, building conditions, environmental conditions, device power usage, and information from sources outside the utilities, such as the utility companion or the internet. The energy consumption data may be directly obtained over a WPAN from monitoring and controlling modules, which are transmitting information over the WPAN. In this case, the data processing device on which the software is running would have to be connected to the WPAN either through the use of a trans-receiver or a Personal Computer Memory Card International Association (PCMCIA) hardware network adapter.

According to an embodiment of the present invention, at step **22**, the prompt will inquire from the user six categories of energy use: cooling, heating, lighting, major appliances, water heating and miscellaneous equipment. The prompt may request the user to input energy consumption data for all six categories, or obtain the energy consumption data from monitoring and controlling modules over the WPAN. At step **23**, the energy consumption data is stored into an energy usage database. Miscellaneous information may be obtained from the Internet such as future weather predictions. Various data, such as end use surveys, engineering studies, simulations and other industry gathered data may be stored in an internal database.

At step **24**, rule-based artificial intelligence and expert systems programming based on industry specific data and knowledge gathered from industry experts are applied to the collected data to generate an energy management solution. Collected data may be from case-studies, utility "pilot" programs to test energy saving advice, and/or services, industry experts or other research sources. The energy management solution may comprise recommendations to the user of various products and services for energy monitoring and management. The recommendations of various products and services may include time-of-use (TOU) pricing options with the user's utility, third-party energy efficient devices and actions to be performed in order to reduce energy costs. Third parties promote products and services for energy monitoring in the form of advertisements, sales, trials, trade-ins and combinations thereof.

At step **25,** the energy management solution is provided to the user on the data processing device. An energy monitoring and controlling phase is set up for the user's utility in step **26**. Once step **26** has been completed, the method returns to step **23** via **27.** The energy monitoring and controlling phase may be completely automated.

For example, the energy management solution may conclude that because there was no movement in an area of a home from 9AM to 5PM, the occupants were at work. Therefore, the air conditioner, lights, and fans were operating unnecessarily. The user would be given the

option that, should the house become empty, the air conditioner be adjusted and the lights and fans turned off automatically. Also, if the washing machine was run, the system could run it at the time during which electricity is the least expensive, but before the occupants are expected to get home, so there is a minimum of inconvenience. The system can perform these tasks automatically, or report the potential savings and leave the actions to the user. In either scenario, a cost-savings report can be presented to the user to show how much energy, pollution, money, and other factors were saved or affected by the actions.

Fig. 3 illustrates a method of monitoring and controlling energy consumption within a utility according to an embodiment of the present invention. At step **31**, all the modules monitoring and controlling various physical conditions and devices are instructed to transmit energy consumption data over the WPAN. The modules may be instructed to transmit energy consumption data at regular intervals of time. The time interval after which the modules transmit energy consumption data may be predetermined, specified by the user, or determined by the duration after which sufficient data has been collected and processed to provide an arbitrary number of instructions, commands, events, or recommendations. The energy consumption data is then stored in an energy consumption database.

At step **32**, the energy usage of the utility and the operation status of all devices and appliances are determined. The operational status of all the devices and appliances is determined by comparing their operating energy consumption characteristics with their ideal energy consumption characteristics. The ideal energy consumption characteristics are the energy consumption characteristics defined by the manufacturer.

At step **33**, a rule-based artificial intelligence is applied to the energy consumption data, in conjunction with weather predictions, electricity cost information and future cost predictions, to produce an energy management solution. Expert systems programming based on industry specific data and knowledge gathered from industry experts is applied to the collected data. The energy management solution may comprise on/off schedules for the

appliances and the devices. The energy management solution may also comprise of recommendations for cost savings and lowering energy consumption. Weather predictions, future cost predictions and electricity cost predictions may be downloaded from the Internet and stored in an internal database. The rule-based artificial intelligence may be modified in order to increase efficient usage of energy.

In step **34**, the energy monitoring and controlling decisions are transmitted to the respective modules and devices. At step **35**, the user is provided with the energy monitoring and controlling decisions. Logs, graphs and/or reports of the energy consumption of the utility may be generated and displayed to the user. The user may also be alerted in case any of the devices or the appliances malfunction. This alert may be sent as a short message service (SMS) to a mobile device, an email message at an email account, a RSS feed, an instant message, an audible alarm, a light indicator, and any combination thereof. Once step **35** has been completed, the method returns to step **31** via **36.**

In one embodiment of the present invention, the software may also provide the user with energy management solutions after taking into account the users habits and preferences. This is explained by means of a non-limiting example. If the user switches off all the lights within the utility between 12 AM to 6 AM every day but forgets to switch off the lights on a particular day, the software will notify the user to switch off the lights. The software may also schedule items such as washer, dryer and dishwasher to operate when the energy costs are the cheapest.

Fig. 4 discloses a module for monitoring and controlling energy consumption according to an embodiment of the present invention. The module **41** may further include an energy measurement device **42**, sensor or a plurality of sensors **43**, a memory **44**, a power source **45**, an internal clock **46**, control hardware (if necessary) **50**, and a processor **51**. The module is connected to a WPAN by means of a trans-receiver **47**. The communication protocol used by the modules to communicate may be an IEEE wireless standard protocol such as IEEE

802.15.4. The modules may use ZigBee specification in addition to the IEEE wireless protocol to simplify and improve communications.

The module **41** can be used to monitor and or control a variety of physical conditions such as air pressure, water flow, temperature and air velocity. The controlling and monitoring of these conditions is done by sensors **43** within the modules. T

The module **41** may also be able to monitor and/or control devices and appliances such as dishwashers, washing machines and coffee makers. In this case, the module **41** may further include a clamp to connect an electrical feed wire between the power outlet and the device **48**. The module **41** may include a plug to connect the module **41** to the power outlet **48**, and to connect the module **41** to the device **49**. The module **41** may also include an energy measurement device **42**. This energy management device may include a means for rectifying alternating current, an analog to digital for converting measured data into digital signals, and a means for calculating the energy consumption of the device.

The module **41** monitors the physical conditions and the devices and stores the measured energy consumption data in a memory **44**. The memory used to stored energy consumption data may be a volatile memory. In this case, the module **41** may further comprise a power source **45** to maintain the memory **44**, which may be a nonvolatile memory. The power source required to operate the module **41** may be selected from a group consisting of a capacitor, wall unit, battery or energy scavenged from the environment. The energy scavenged from the environment may be in the form of light or vibration.

A transceiver **47** on the module **41** transmits energy consumption data over the WPAN to the central control station **11**. Energy management decisions are then received by the module from the central control station via the WPAN. The module **41** may comprise an internal clock to help execute energy management decisions in case central control station **11** malfunctions.

Provided above for the edification of those of ordinary skill in the art, and not as a limitation on the spirit and the scope of the present invention, are detailed illustrations of a method and system for auditing, monitoring, and controlling the energy consumption of a utility via an artificial intelligence-based software and distributed wireless sensor networks. Numerous variations and modifications within the spirit of the present invention will, of course, occur to those of ordinary skill in the art in view of the embodiments that have now been disclosed. For example, while the present invention primarily implements IEEE 802.15.4 wireless standard protocol for communication, the present invention may also effectively implement any standard wireless communication protocol of the IEEE 802 family to establish communication.

As detailed in the illustrative examples contained herein, the present invention implements a WPAN to establish communication. However the present invention may establish communication with data processing devices and modules using TCP/IP protocols.

While the present invention has been described in connection with a number of embodiments, the present invention is not so limited, but is intended to be defined by the scope of the claims which follow and which are to be interpreted as broadly as is reasonable.

What we claim is:

1. A method comprising:

a. obtaining energy consumption and physical conditions data from a series of modules that monitor and control a variety of physical conditions, selected from a group consisting of current, voltage, air velocity, humidity, light, occupancy, pressure, temperature, power, magnetic fields, electric fields, vibration frequency, vibration amplitude, relative location, absolute location, geolocation, altitude, and any combination thereof;

b. storing the energy consumption and physical conditions data in electronic memory;

c. producing an energy management solution using energy management logic to analyze the energy consumption and physical conditions data; and

d. providing a user with the energy management solution by applying any of a rule-based logic, expert systems programming and combinations thereof to the energy consumption and physical conditions data.

2. The method of claim 1, wherein the modules communicate over a wireless personal area network (WPAN).

3. The method of claim 2, wherein the wireless personal area network used by the modules to communicate uses a topology selected from a group consisting of any of a mesh, star, point-to-point, ad-hoc topology and combinations thereof.

4. The method of claim 1, wherein the modules operate within any wireless network which uses the same communication protocol.

5. The method of claim 4, wherein the communication protocol is an IEEE 802.15.4 wireless standard protocol.

6. The method of claim 5, wherein the modules further use a specification for communication.

7. The method of claim 6, wherein the energy consumption and physical conditions data communicated is organized according to the requirements of a standard selected from the group consisting of OpenAMI, Itron, OpenWay, Intelligrid, BACnet, LonWorks, another Automated Metering Initiative (AMI) standard and a building or home automation data or communications standard.

8. The method of claim 1, wherein the specification used by the modules for communication is a ZigBee specification.

9. The method of claim 8, wherein the data communicated is organized according to the requirements of a standard selected from the group consisting of OpenAMI, Itron, OpenWay, Intelligrid, BACnet, LonWorks, another Automated Metering Initiative (AMI) standard and a building or home automation data or communications standard.

10. The method of claim 1, wherein the modules contain at least one sensor for monitoring and relay or switching device for controlling the physical conditions.

11. The method of claim 10, wherein the relay or switching device may be implemented in hardware or software.

12. The method of claim 1, wherein the modules further comprise a memory to store the energy consumption and physical conditions data.

13. The method of claim 10, wherein the memory to store the energy consumption and physical conditions data is a volatile memory.

14. The method of claim 12, wherein the memory to store the energy consumption data is a nonvolatile memory.

15. The method of claim 1, wherein the modules receive operating power selected from a group consisting of a battery, capacitor, wall outlet, scavenged energy from the surrounding environment, and combinations thereof.

16. The method of claim 1, wherein the modules are configured to be clamped onto an electrical feed wire.

17. The method of claim 1, wherein the modules are configured to be plugged into a pre-existing wall outlet.

18. The method of claim 1, wherein the modules further comprise infra red, capacitive coupling, pyroelectric infra red, carbon-dioxide, or ultrasonic occupancy sensors.

19. The method of claim 1, wherein the information used in the implementation of expert systems programming is industry specific data and knowledge gathered from any of case studies, utility "pilot" programs to test energy saving advice, devices, services, industry experts, and other research sources.

20. The method of claim 1, wherein providing a user with an energy management solution is selected from a group consisting of an SMS, an email alert, an RSS feed, instant messaging platform, an audible alarm, a light indicator and combinations thereof.

21. The method of claim 1, wherein the energy management solution may be provided in one of several methods, comprising:

a. a single report-style solution provided to the user after data measurement and processing has taken place;

b. a periodic report-style solution provided to the user after a predetermined interval of time; or

c. a continuous, real-time report provided to the user as soon as sufficient data has been collected and processed to provide an arbitrary number of instructions, commands, events or recommendations.

22. A system comprising:

a. a series of modules transmitting energy consumption and physical conditions data over a wireless personal area network (WPAN) to monitor and control energy use and a variety of physical conditions, selected from a group consisting of current, voltage, air velocity, humidity, light, occupancy, pressure, temperature, power, magnetic fields, electric fields, vibration frequency, vibration amplitude, relative location, absolute location, geolocation, or altitude, and any combination thereof;

b. a central control station to receive the energy consumption and physical conditions data transmitted by the modules;

c. a storage mechanism to store the energy consumption and physical conditions data transmitted by the modules in electronic memory; and

d. an energy management logic to monitor and control the energy consumption.

23. The system of claim 22, wherein the personal area network used by the modules to communicate uses topology selected from a group consisting of a mesh, star, point-to-point, or ad-hoc topology, and combinations thereof.

24. The system of claim 22, wherein the modules have the ability to work within any wireless network using the same communication protocol or standard.

25. The system of claim 22, wherein the communication protocol is an IEEE 802.15.4 wireless standard protocol.

26. The system of claim 25, wherein the energy consumption and physical conditions data communicated is organized according to the requirements of a standard selected from the group consisting of OpenAMI, Itron, OpenWay, Intelligrid, BACnet, LonWorks, another Automated Metering Initiative (AMI) standard, and a building or home automation data or communications standard.

27. The system of claim 22, wherein the specification used by the modules for communication is the ZigBee specification.

28 The system of claim 27, wherein the energy consumption and physical conditions data communicated is organized according to the requirements of a standard selected from the group consisting of OpenAMI, Itron, OpenWay, Intelligrid, BACnet, LonWorks, another Automated Metering Initiative (AMI) standard, and a building or home automation data or communications standard.

29. The system of claim 22, wherein the modules further comprise:

a. means for converting analog signals to digital signals;

b. means for calculating the power consumption of a device;

c. means for controlling the flow of electricity to a device;

d. means for measuring current and voltage data; and

e. means for converting AC current and voltage data to corresponding RMS values.

30. The system of claim 22, wherein the central control station is a data processing device.

31. The system of claim 30, wherein the data processing device is selected from a group consisting of a personal computer, personal digital assistant, embedded computer and combinations thereof.

32. The system of claim 22, wherein the energy management logic comprises executable instructions on a computer-readable medium processed in the central control station.

33. The system of claim 22, wherein communication between the central control station and the wireless personal area network is selected from a group consisting of a USB, IEEE1394 interface, PCMCIA hardware network adapter, and combinations thereof.

34. The system of claim 22, wherein the energy management logic further comprises:

a. instructions for obtaining energy consumption and physical conditions data from the series of modules;

b. instructions for obtaining additional information from the Internet;

c. instructions for comparing the energy consumption of a device with ideal operating condition of the device;

d. instructions for generating energy consumption logs and device status reports;

e. rule-based artificial intelligence to monitor and control energy consumption;

f. instructions for providing a user with the energy consumption logs and status reports; and

g. instructions for providing third parties with the ability to promote products and services.

35. The system of claim 34 wherein promotions of products and services may be in the form the group of advertisements, sales, trials, trade-ins, and combinations thereof.

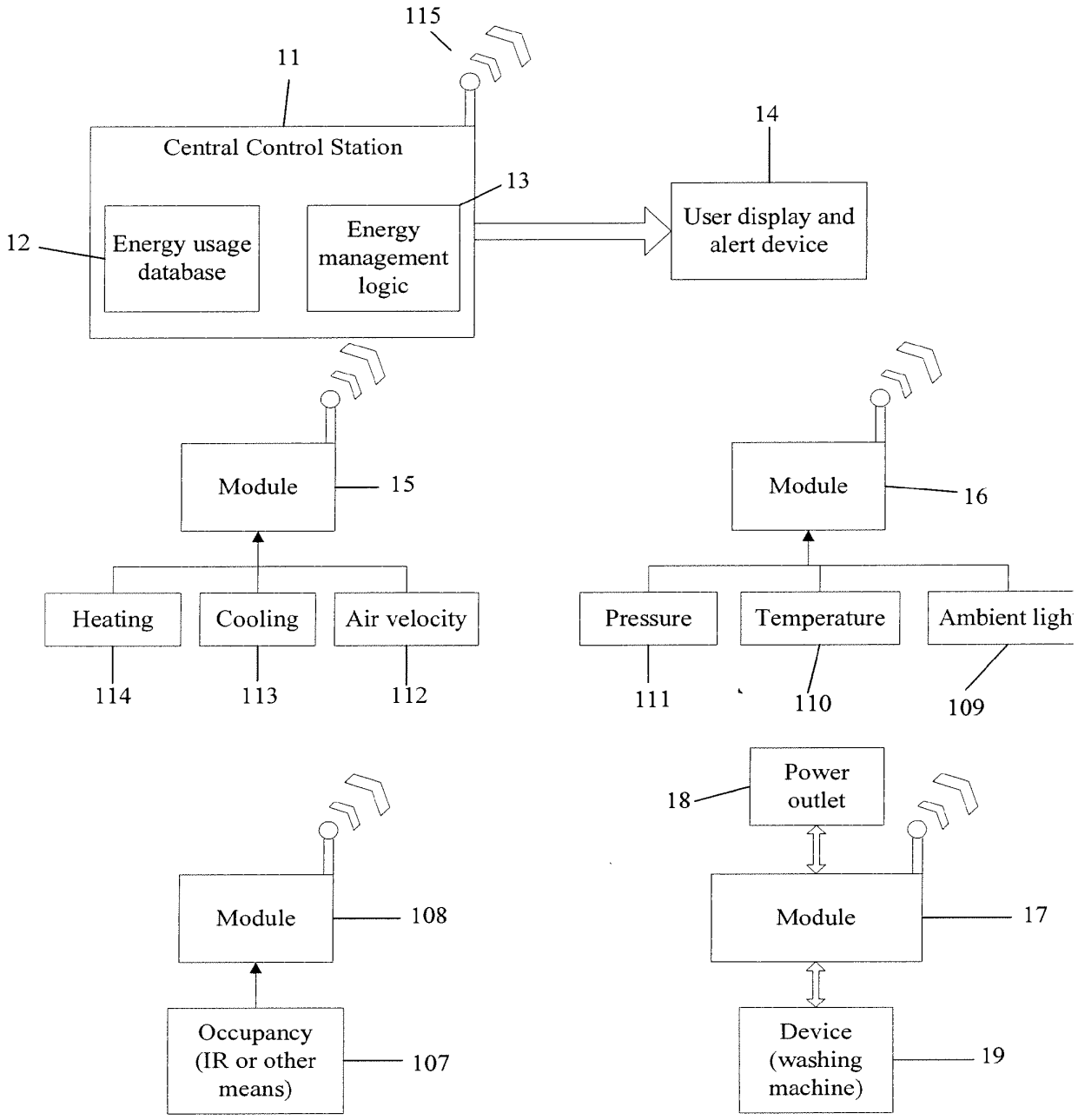


FIG. 1

WILLOW TECH. EX. 1005
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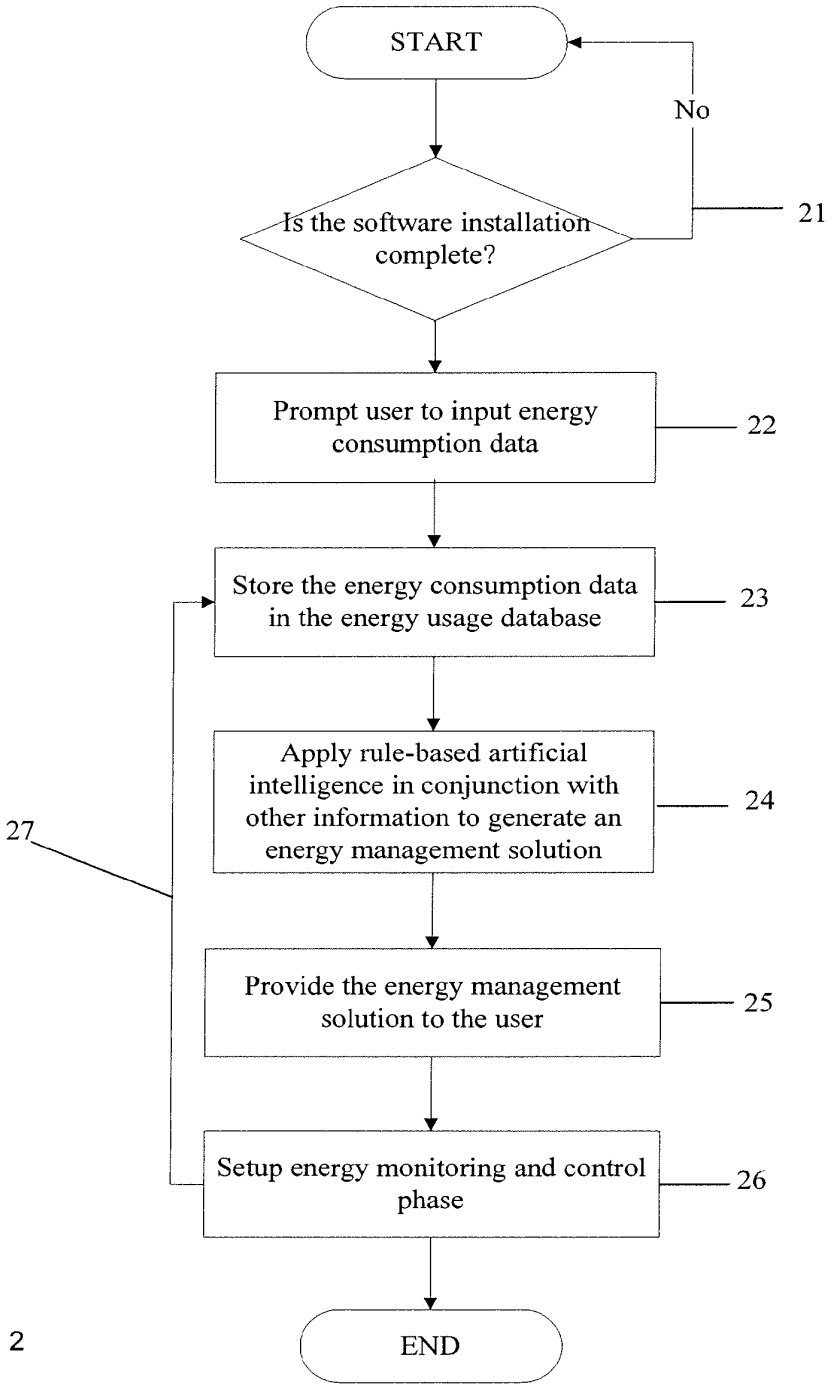


FIG. 2

WILLOW TECH. EX. 1005
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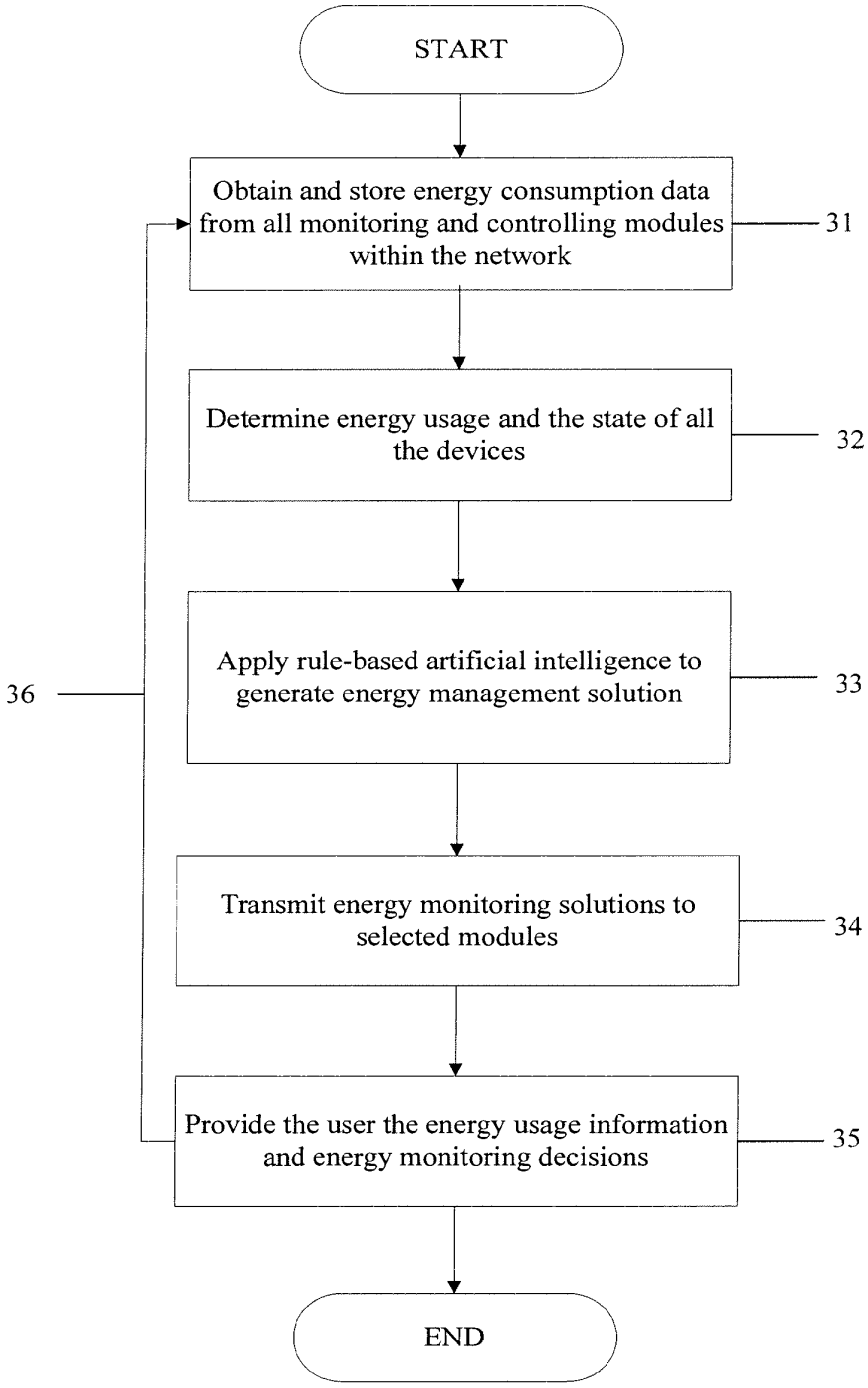


FIG. 3

WILLOW TECH. EX. 1005
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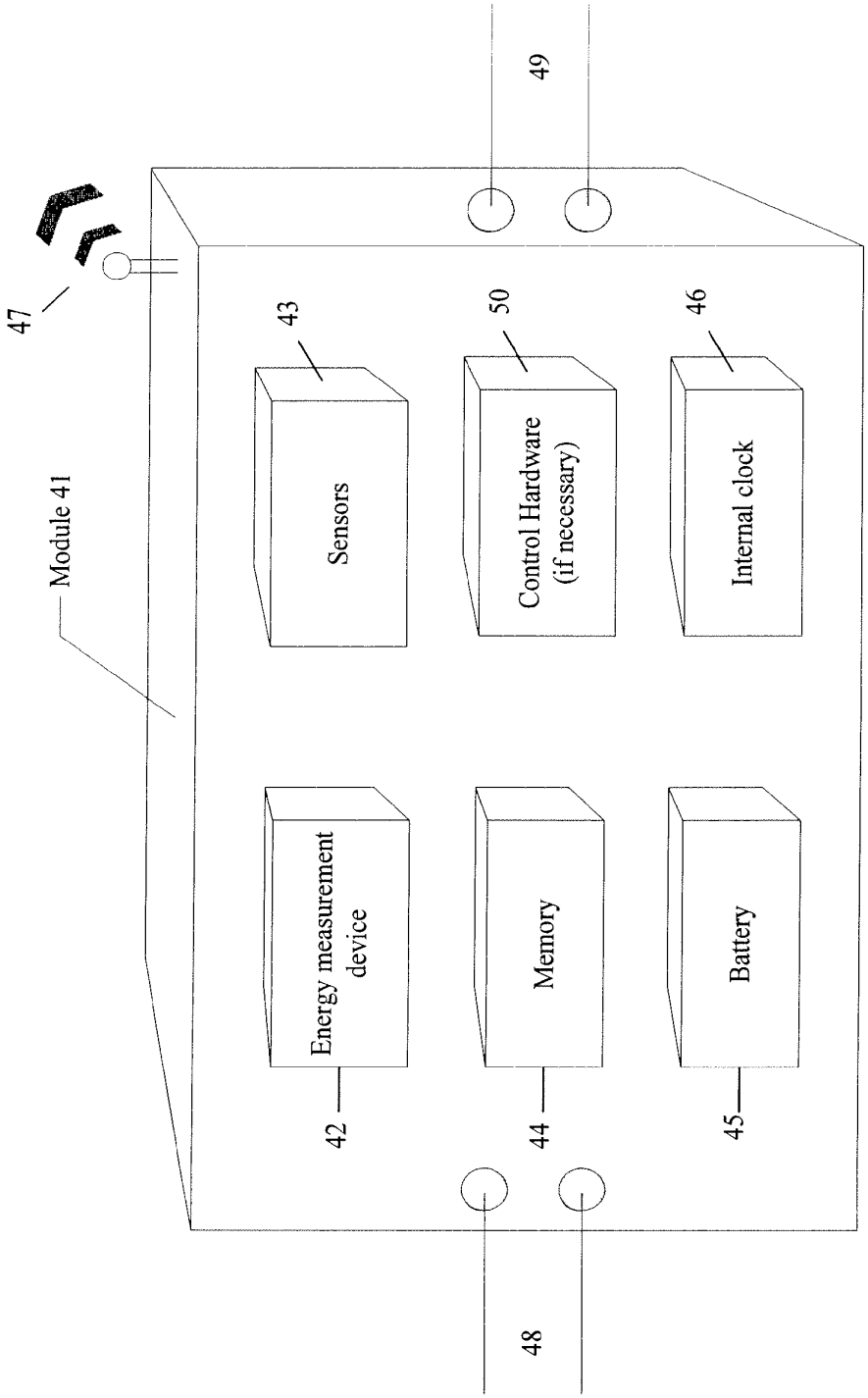


FIG. 4

WILLOW TECH. EX. 1005
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Espacenet

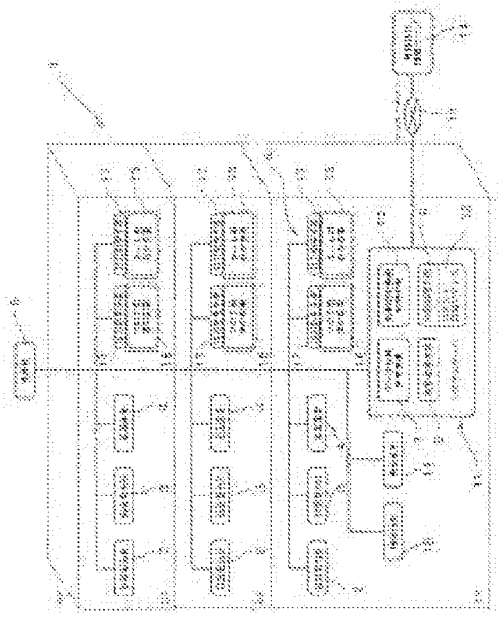
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ENERGY CONSUMPTION INFORMATION ANNOUNCING SYSTEM

Publication date:	2009-04-02
Inventor(s):	FURUTA KOICHI ±
Applicant(s):	DENSO FACILITIES CORP ±
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	- European:
Application number:	JP20070241029 20070918
Priority number(s):	JP20070241029 20070918

Abstract of JP 2009070339 (A)

PROBLEM TO BE SOLVED: To provide an energy consumption information announcing system for collecting and analyzing an energy consumption amount measured by each division of a building, announcing an analysis result to energy users in the divisions so as to visually obtain the result at a glance, and promoting to raise energy saving awareness. ; SOLUTION: The energy consumption information announcing system includes: energy consumption amount meters arranged by each division of the building, so as to generate energy consumption amount data; a data collecting and storage device 7 for collecting the energy consumption amount data via a communication line 6 and storing the data; a statistic processing means 8 for arbitrarily extracting the kept energy consumption amount data and statistically processing the data; an analysis processing means 9 for analyzing the statistically processed data, and obtaining a determination comment from a comment list file 12, based on the analysis result; output processing means 17 for visualizing the determination comment as character information or graphic information; and display devices 15, 16 for announcing the visualized determination comment. ;
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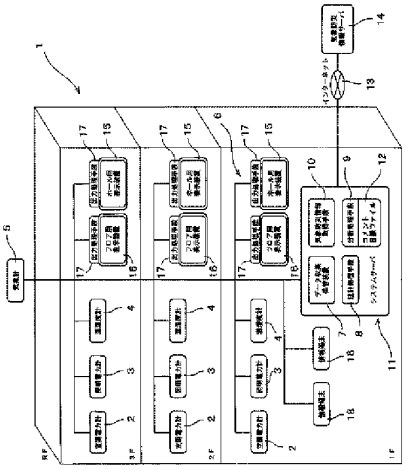
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(54)【発明の名称】エネルギー消費情報通知システム

(57)【要約】
【課題】建物の区画毎に計測したエネルギー消費量を収集し分析し、その分析結果を該区画におけるエネルギー利用者に視覚的に一目で把握できるように通知し、省エネルギー意識の向上を促進させるエネルギー消費情報通知システムを提供する。
【解決手段】建物の区画毎に設置されエネルギー消費量データを生成するエネルギー消費量計と、前記エネルギー消費量データを通信回線６を介して収集し保管するデータ収集保管装置７と、前記保管されたエネルギー消費量データを適宜抽出し統計処理する統計処理手段８と、前記統計処理されたデータを分析し該分析結果に基づいてコメント目録ファイル１２から判定コメントを取得する分析処理手段９と、前記判定コメントを文字情報や図形情報に可視化する出力処理手段１７と、前記可視化された判定コメントを通知する表示装置１５，１６とを備えてなる。
【選択図】図１



【特許請求の範囲】
【請求項1】
建物の区画毎に設置され該区画毎のエネルギー消費量を用途種別毎に計測しエネルギー消費量データを生成するエネルギー消費量計と、前記エネルギー消費量データを通信回線を介して収集し該エネルギー消費量データと用途種別情報と区画情報と日時情報とを関連付けて保管するデータ収集保管装置と、前記保管されたエネルギー消費量データを前記データ収集保管装置から適宜抽出し用途種別毎または単位区画毎または単位日時毎もしくはこれらの組み合わせ毎に統計処理する統計処理手段と、前記統計処理されたデータを分析し該分析結果に基づいてコメント目録ファイルから判定コメントを取得する分析処理手段と、前記判定コメントを通信回線を介して取得し文字情報または図形情報もしくはこれらを組み合わせた情報として可視化する出力処理手段と、前記区画毎に配置され前記可視化された判定コメントを通知する表示装置とを備えてなることを特徴とするエネルギー消費情報通知システム。
【請求項2】
建物の区画毎に設置され該区画毎のエネルギー消費量を用途種別毎に計測しエネルギー消費量データを生成するエネルギー消費量計と、前記建物の区画毎に設置され該区画毎の温湿度データを生成する温湿度計と、前記建物の区画外部に設置され気象データを生成する気象計と、を備える計測器と、前記計測器が生成した前記エネルギー消費量データと前記温湿度データと前記気象データとからなる計測データを通信回線を介して収集し該計測データと区画情報と日時情報と必要に応じて用途種別情報とを関連付けて保管するデータ収集保管装置と、前記保管された計測データを前記データ収集保管装置から適宜抽出し用途種別毎または単位区画毎または単位日時毎もしくはこれらの組み合わせ毎に統計処理する統計処理手段と、前記統計処理されたデータを分析し該分析結果に基づいてコメント目録ファイルから判定コメントを取得する分析処理手段と、前記判定コメントを通信回線を介して取得し文字情報または図形情報もしくはこれらを組み合わせた情報として可視化する出力処理手段と、前記区画毎に配置され前記可視化された判定コメントを通知する表示装置とを備えてなることを特徴とするエネルギー消費情報通知システム。

【発明の詳細な説明】
【技術分野】
【0001】
本発明は、オフィスビル等の建物で消費される電力等のエネルギー消費量をエネルギー利用者に視覚的に分かり易く通知し、省エネルギー意識の向上を促進させるエネルギー消費情報通知システムに関するものである。
【背景技術】
【0002】
地球温暖化防止策として二酸化炭素の排出量を削減することが世界的な課題であり、そのために過剰なエネルギー消費を抑制してエネルギーの有効利用を図ることが求められている。また、省エネルギーは地球環境保全としてのエコロジー的な立場のみならず、エネルギー消費にかかるコストを削減するといったエコノミー的側面も有することから無駄なエネルギー消費を排除するための様々な取り組みが行なわれている。エネルギーの無駄遣いを防止するには、先ずエネルギーの無駄遣いがどこにあるのかを具体的に把握することが必要である。そこで、空調設備や照明設備等が多数設置されているオフィスビル、商業ビル、病院、学校等の建物では、専用のエネルギー消費量管理システムが導入されることが多くなっている。このようなシステムとしては、例えば、下記特許文献で開示されているものがある。
【特許文献1】特開平１０－４９５５２号公報
【特許文献2】特開２００１－３５６８１４号公報
【発明の開示】
【発明が解決しようとする課題】
【0003】

上記特許文献１に記載された発明は、エネルギー消費設備の稼動情報を検出し記録する監視装置を対象建物に設置し、この監視装置から定期的にデータを収集して蓄積すると共に、エネルギー解析装置により対象建物毎にエネルギー消費量の解析を行なって、結果をグラフで出力するものであった。しかし、上記発明ではエネルギー消費量の解析結果をグラフ表示するために専用端末であるエネルギー解析装置が必要で、エネルギー消費量の解析結果を直接閲覧できるのは建物やエネルギーの管理者のみであった。従って、エネルギー利用者に対してはエネルギー消費量の解析結果を見た管理者から省エネルギー対策が通達されるものの、エネルギー使用者に省エネルギー意識の向上を直接訴えかける効果が乏しいものであった。

【0004】

上記特許文献２に記載された発明においては、エネルギーを消費する各設備にエネルギー消費に関する物理量を計測する多数の計測器を設け、計測データ収集手段によって各計測器の計測データを収集すると共に該計測データをデータ処理蓄積手段により処理し蓄積し端末装置等に表示させるシステムが提案されている。上記発明では部署や設備単位でのエネルギー消費量が計測でき、さらに、計測データを汎用端末装置に表示させて、エネルギー管理者のみならずエネルギー利用者も自由に計測データを閲覧できるようしている。しかし、計測データの分析や評価はデータの閲覧者に委ねられており、十分な知識や経験を有するエネルギー管理者にとっては有意な情報であっても、データ分析に慣れていない一般のエネルギー利用者にはデータの適切な評価が容易ではない場合があった。すなわち、エネルギー無駄遣いの有無やエネルギー無駄遣い箇所の特定等の判断に難しさが伴うものであった。また、計測データを閲覧するためには必ず端末装置を操作しなければならない煩わしさがあり、省エネルギー意識の低い人に対しては省エネルギー啓蒙効果が薄い傾向があった。

【課題を解決するための手段】

【0005】

そこで、上記のような課題を解決するために、請求項１に記載のエネルギー消費情報通知システムは、建物の区画毎に設置され該区画毎のエネルギー消費量を用途種別毎に計測しエネルギー消費量データを生成するエネルギー消費量計と、前記エネルギー消費量データを通信回線を介して収集し該エネルギー消費量データと用途種別情報と区画情報と日時情報とを関連付けて保管するデータ収集保管装置と、前記保管されたエネルギー消費量データを前記データ収集保管装置から適宜抽出し用途種別毎または単位区画毎または単位日時毎もしくはこれらの組み合わせ毎に統計処理する統計処理手段と、前記統計処理されたデータを分析し該分析結果に基づいてコメント目録ファイルから判定コメントを取得する分析処理手段と、前記判定コメントを通信回線を介して取得し文字情報または図形情報もしくはこれらを組み合わせた情報として可視化する出力処理手段と、前記区画毎に配置され前記可視化された判定コメントを通知する表示装置とを備えてなることを特徴とする。

【0006】

また、請求項２に記載のエネルギー消費情報通知システムは、建物の区画毎に設置され該区画毎のエネルギー消費量を用途種別毎に計測しエネルギー消費量データを生成するエネルギー消費量計と、前記建物の区画毎に設置され該区画毎の温湿度データを生成する温湿度計と、前記建物の区画外部に設置され気象データを生成する気象計と、を備える計測器と、前記計測器が生成した前記エネルギー消費量データと前記温湿度データと前記気象データとからなる計測データを通信回線を介して収集し該計測データと区画情報と日時情報と必要に応じて用途種別情報とを関連付けて保管するデータ収集保管装置と、前記保管された計測データを前記データ収集保管装置から適宜抽出し用途種別毎または単位区画毎または単位日時毎もしくはこれらの組み合わせ毎に統計処理する統計処理手段と、前記統計処理されたデータを分析し該分析結果に基づいてコメント目録ファイルから判定コメントを取得する分析処理手段と、前記判定コメントを通信回線を介して取得し文字情報または図形情報もしくはこれらを組み合わせた情報として可視化する出力処理手段と、前記区画毎に配置され前記可視化された判定コメントを通知する表示装置とを備えてなることを

特徴とする。

【発明の効果】

【0007】

本発明によれば、エネルギー消費量データを統計処理し分析処理した結果に基づいてコメント目録ファイルから適切な判定コメントを取得し、この判定コメントを文字情報や図形情報として可視化し通知することで、エネルギー消費が増加した区画や時刻または用途等の問題点を的確に指摘したり、改善策や対応策等のアドバイスを与えることが自動的にできる。また、表示装置が各区画毎に配置されたことから、建物内のエネルギー利用者は自分が所属する区画のエネルギー消費の問題点と改善策が一目瞭然に把握できる。従って、各区画のエネルギー利用者に対してエネルギー消費の現状や問題点および改善策を簡単かつ効果的に伝達し、より積極的な省エネルギー行動を促すことができる。

【0008】

また、本発明によれば、表示装置によって温湿度データおよび気象データを通知すると共に、その温湿度データおよび気象データを分析した結果に基づく判定コメントを通知する。つまり、室内温度や室内湿度および屋外気温等の状態により、空調の設定温度や設定湿度を変更したり、空調設備の電源を切ったりすることを促す等のアドバイスが自動的に表示されるようになる。従って、季節や気象条件に合わせて適切な省エネルギー行動を促すことができる。

【発明を実施するための最良の形態】

【0009】

次に、本発明に係るエネルギー消費情報通知システムの一実施形態を図１に従い説明する。本実施例においてはオフィスビル等の建物１の各階（１Ｆ，２Ｆ，３Ｆ）を一区画とし、各階にはエネルギー消費量計として、冷房や暖房に使用される電力の消費量を計測する空調電力計２と、蛍光灯などの照明装置に使用される電力の消費量を計測する照明電力計３とが設置される。また、建物１内部の温度および湿度を計測する温湿度計４が屋内の各階に設置され、建物１外部の温度・湿度等の気象状態を計測する気象計５が屋外（ＲＦ）に設置される。そして、上記エネルギー消費量計、温湿度計４、気象計５等の計測器は建物１全体を網羅するように配設されたローカルエリアネットワーク（ＬＡＮ）等の通信回線６に接続される。なお、この通信回線６はメタルケーブルや光ケーブル等を用いた有線ＬＡＮに限らず、電波や赤外線等で通信する無線送受信装置で構成された無線ＬＡＮでもよい。

【0010】

上記通信回線６の一端に、データ収集保管装置７、統計処理手段８、分析処理手段９、および、気象防災情報取得手段１０を具備するシステムサーバ１１が接続される。データ収集保管装置７は、空調電力計２と照明電力計３とが計測した電力消費量データ、温湿度計４が計測した温湿度データ、気象計５が計測した気象データ等の計測データを通信回線６を介して収集し、これら計測データに加えて、データが計測された階を示す区画情報、データが計測された日付と時刻を示す日時情報、電力消費量データの場合は空調電力もしくは照明電力のどちらであるかを示す用途種別情報を関連付けて記録し保管する装置である。

【0011】

統計処理手段８はデータ収集保管装置７に保管された計測データから所望の計測データを適宜抽出し該計測データに関連付けられた用途種別情報または単位区画情報または単位日時情報を利用することで該計測データを分類し集計するなどの統計処理を行なうものである。例えば、ある所定日の全消費電力量を統計処理により算出するには、計測データに関連付けられた日時情報が保持する日付を走査し該所定日と一致する日付の計測データのみを積算する処理を行なう。また、この所定日に建物の一階で消費された空調電力量を統計処理により算出するには、計測データに関連付けられた区画情報が保持する階の区別および同計測データに関連付けられた用途種別情報が保持する空調または照明の種別を上記日時情報が保持する日付と組み合わせて走査し、日付が所定日と一致し且つ階の区別が一

階であり且つ用途種別が空調である計測データのみを積算する処理を行なう。このように、計測データに関連付けられた用途種別情報と単位区画情報および単位日時情報は、単独で又は複数を組み合わせて統計処理される。

【0012】

分析処理手段９は統計処理手段８によって統計処理されたデータを基に、用途種別毎または単位区画毎または単位日時毎もしくはこれらの組み合わせ毎に過去の計測データと対比しながら電力消費量が増加した箇所の有無を調査する等の分析処理を行なう。そして、分析結果により電力消費量増加等の問題点が発見されたら、この結果に適した判定コメントをコメント目録ファイル１２から取得するものである。コメント目録ファイルには、分析により見つかった問題点を端的に表現したコメントや省エネルギー啓蒙活動を促すコメント等の多数の短い文章が予め準備されていて、その各文章が選択される条件と関連付けられて記憶されている。分析処理の一例として、上記所定日の建物一階の空調電力量が前週と比較して増加したか否かが分析される処理では、まず、該所定日の前週の建物一階における空調電力量が統計処理手段８により算出され、次に、分析処理手段９により該所定日とその前週の建物一階における空調電力量の差分が計算される。この計算結果は前週と比較した電力消費量の増減を定量的に示したものであるから、該計算結果が所定の値より大きい場合は電力消費量が基準値を超えて増加したと判断され、「Ｘ月Ｘ日　一階空調電力量　増加」等の判定コメントがコメント目録ファイル１２から取得される。

【0013】

また、気象防災情報取得手段１０はインターネット１３を介して外部の気象防災情報サーバ１４に接続し、明日の天気や気温等の気象情報および地震や台風等の防災情報を取得するものである。なお、本実施例においては、上記データ収集保管装置７、統計処理手段８、分析処理手段９、気象防災情報取得手段１０が一台のシステムサーバ１１に内蔵されているが、これらを通信回線６に接続された別々のシステムサーバに内蔵して協調して作動させてもよい。

【0014】

さらに、各階の適宜場所に大型の液晶パネル等からなるホール用表示装置１５およびフロア用表示装置１６が天井から吊り下げたり壁に固定するなどして設置される。このホール用表示装置１５およびフロア用表示装置１６により通知される統計処理されたデータおよび判定コメントは、出力処理手段１７により通信回線６を介して取得され文字情報または図形情報もしくはこれらを組み合わせた情報に可視化される。ホール用表示装置１５はロビーやエレベータホール等の人が多く集まる場所に設置されるもので、統計処理されたデータおよび判定コメントを出力処理手段１７により数値化したり又はグラフ化するなどしてエネルギー利用者向けに視覚的に見易く表示する装置である。また、フロア用表示装置１６は建物１の各階に少なくとも一機が設置され在席者が自席から容易に目視できるようにし、出力処理手段１７により数値化されたデータや判定コメント等の文字情報を表示するものである。一方、通信回線６に接続された情報端末１８は管理者向けに詳細なデータを表示したり、システムサーバ１１の保守管理を行なうことができる端末装置である。

【0015】

次に、本発明に係るエネルギー消費情報通知システムの作動を説明する。エネルギー消費量を計測する空調電力計２と照明電力計３、屋内の温度と湿度を計測する温湿度計４、屋外の温度・湿度を計測する気象計５等の計測器は、例えば５分毎等の所定の時間毎に計測データを生成し該計測データを一時的に保持する。そして、データ収集保管装置７が通信回線６を介してこれらの計測データを収集し、用途種別情報（電力消費量データのみ）、区画情報、日時情報等と関連付けて記録し保管する。

【0016】

以下、上記保管されたデータが図２に示した例のようにホール用表示装置１５に表示されるまでの作動を説明する。この例は、２００７年の６月３日（日）から６月９日（土）までの毎日の電力使用量を、前週の電力使用量と比較しつつ表示したものである。先ず、統計処理手段８が今週（６月３日～６月９日）および先週（５月２７日～６月２日）に計

測された電力消費量データをデータ収集保管装置７から抽出する。この際には、電力消費量データに関連付けられた用途種別情報と区画情報と日時情報も同時に抽出される。そして、用途種別情報により空調電力消費量データと照明電力消費量データを分けつつ日時情報により日付別に其々データを積算し、各日付毎の空調電力使用量と照明電力使用量を求める。次に、分析処理手段９が先週と今週の同じ曜日毎に空調電力および照明電力の使用量の差を分析する。そして、分析の結果として電力使用量の増加が所定の値を超えていた場合は、この結果の曜日、電力消費の種別、電力消費の増加量等に基づき、適切な判定コメントをコメント目録ファイル１２から取得する。

【0017】

上記統計処理および分析処理の結果は、出力処理手段１７により取得されホール用表示装置１５によって図２に示したようにグラフ表示される。図２に表示されたグラフの横軸１０１は曜日であり、左縦軸１０２は電力消費量をキロワット時（ＫＷＨ）で表し、右縦軸１０３は電力消費量を電気料金に換算した値を示している。各曜日欄には二本の棒グラフが隣接して表示されており、左側の棒グラフ１０４は先週の電力使用量を示し、右側の棒グラフ１０５は今週の電力使用量を示している。また、グラフの下部１０６は空調電力使用量を示し、グラフの上部１０７は照明電力使用量を示している。このようにして、用途種別毎かつ曜日毎の今週の電力使用量が前週の電力使用量と比較されつつ分かり易く表示されている。しかしながら、この棒グラフを一見しただけでは電力消費における問題点の有無判断は必ずしも容易ではない。そこで、「休日　空調電力量　増加」という判定コメント１０８を自動的に表示して土曜日の空調電力量が先週と比較して増加していることを指摘している。

【0018】

図３に示した例は、６月４日（月）の建物一階の電力使用量および先週月曜日の建物一階の電力使用量を、時刻を横軸１０９にして一時間毎に折れ線グラフ１１０で表示し判定コメント１１１を通知したものである。すなわち、データ収集保管装置７に保管されている６月４日（月）およびその一週間前の５月２７日（月）に計測された建物一階の電力消費量データを、統計処理手段８が抽出すると共に日時情報を使って一時間毎の電力消費量を算出し、その結果が折れ線グラフ１１０で表示され、さらに、分析処理手段９が先週と今週の電力消費量の時間推移を比較して今週は夕方１８時以降の電力使用量が増加したと判断したことから、「夜間　１Ｆ電力量増加」の判定コメント１１１が通知されている。

【0019】

また、図４に示した例は、上記図３と同じ６月４日（月）の電力使用量を先週月曜日の電力使用量と共に横軸１１２を各階別にして棒グラフで表示したもので、棒グラフの上方に消費電力量の合計１１３とその電気料金１１４が数値によって明示されている。この例においても、統計処理手段８が用途種別情報と区画情報に基づき空調および照明の用途種別毎に各階の電力消費量を算出し、分析処理手段９が先週と今週の各階における電力消費量の増加を分析した結果を基に、棒グラフが表示され「６Ｆ　空調電力量　増加」の判定コメント１１５が通知されている。なお、上記棒グラフや折れ線グラフは、左から右へと順に表示させる等のアニメーションによって動きを付け、人の興味を引き付け易くしながら表示させることが望ましい。

【0020】

図５はホール用表示装置１５に表示される省エネルギー掲示板の一例を示している。この省エネルギー掲示板は、日時１１６および「６／４（月）前週より１Ｆ電力夜間増加。省エネにご協力お願いします。」等の判定コメント１１７や「冷房は６月下旬から開始します。」等の情報伝達メッセージ１１８をリスト表示し、建物１内のエネルギー利用者に対して省エネルギー啓蒙行動を促したりエネルギー消費に関連する情報の伝達をするものである。なお、上記電力消費量のグラフ（図２～図４）および省エネルギー掲示板（図５）は、例えば３０秒毎等の所定の時間で自動的に画面切替されるように表示しても良いし、電力消費量のグラフと省エネルギー掲示板とを並べて表示しつつ電力消費量のグラフのみを所定の時間で自動的に画面切替させても良い。

【0021】
フロア用表示装置１６は、図６に示したように、主に各階における固有の情報や環境状態を数値および文字によって簡略表示する。図６（ａ）では、この階の昨日の電気料金を「昨日　電気料金　１２万円／日」として通知している。また、同階の現在の温度・湿度および温度と湿度より算出される不快指数を、「室内温度　２７．６℃」（ｂ）、「室内湿度　５０．３％」（ｃ）、「不快指数　快適（７４）」（ｄ）のように表示し、さらに、休憩時間に入る直前を見計らい「昼休み省エネ　モニタ電源切」（ｅ）や「昼休み省エネ　照明電源切」（ｆ）等の省エネ指示コメントを表示したり、「屋外の気温　２５．６℃」（ｇ）に続いて「省エネ活動　窓を開けよう」（ｈ）を表示するといった気象情報に基づく省エネ活動コメントを通知する。加えて、最後に退社する人へ向けて「退社前確認　空調ＳＷ切」（ｉ）等の表示もできる。上記表示は例えば１５秒毎等の所定の時間で自動的に画面切替されるように表示する。

【0022】
さらに、ホール用表示装置１５およびフロア用表示装置１６の画面上部に現在時刻１１９や気象防災情報取得手段１０により取得した気象情報１２０などを、図２から図６に示したように常に表示する。このように一般的に多数の人が高い関心を持つ情報を表示することで、省エネルギーに対する意識が低い人も表示装置に目を向ける機会が多くなるようし、省エネルギー意識の向上を促している。

【0023】
なお、本実施例では建物１の各階を一区画とした実施例を示したが、複数階にわたる部門を一つの大区画としたり又は各階を部署単位に小区画に分割して、エネルギー消費量計や表示装置を設置しても構わない。また、エネルギー消費量計として空調電力計２と照明電力計３とを実施例に示したが、これら以外にも、ガス流量計、飲料水流量計、工水流量計等を設置し計測することができる。さらに、気象計は屋外の気温と湿度を計測することにとどまらず、大気圧、風向、風速等の気象状態を計測して、省エネルギー啓蒙活動に役立てることができる。

【図面の簡単な説明】

【0024】
【図1】本発明に係るエネルギー消費情報通知システムを示す構成図。
【図2】電力使用量を曜日毎に棒グラフで表示したホール用表示装置を示す図。
【図3】一日の電力使用量の推移を折れ線グラフで表示したホール用表示装置を示す図。
【図4】電力使用量を各階毎に棒グラフで表示したホール用表示装置を示す図。
【図5】省エネルギー掲示板を表示したホール用表示装置を示す図。
【図6】フロア用表示装置の表示例を示す図。

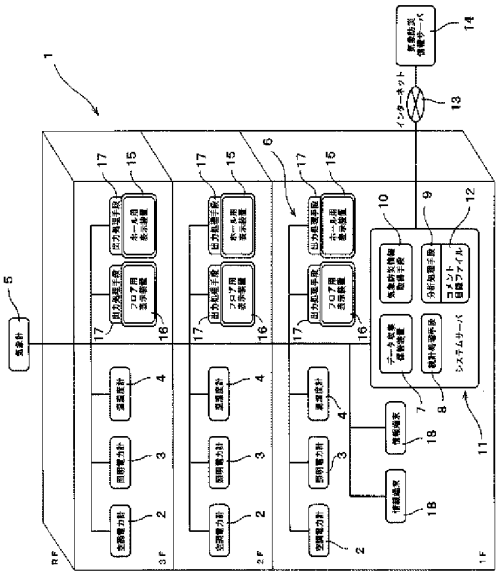
【符号の説明】

【0025】

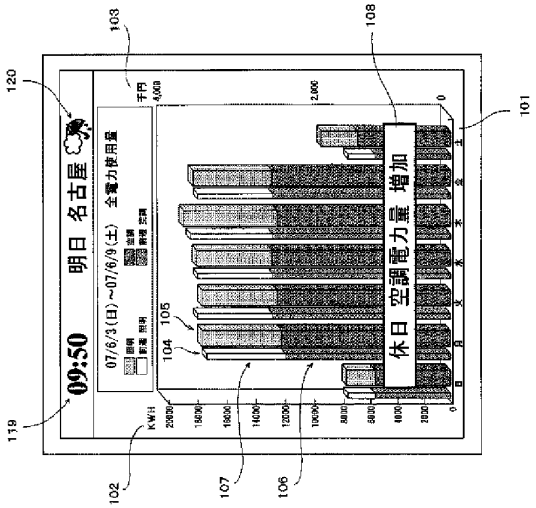
２	空調電力計
３	照明電力計
４	温湿度計
５	気象計
６	通信回線
７	データ収集保管装置
８	統計処理手段
９	分析処理手段
１０	気象防災情報取得手段
１１	システムサーバ
１２	コメント目録ファイル
１３	インターネット
１４	気象防災情報サーバ
１５	ホール用表示装置

１６　　フロア用表示装置
１７　　出力処理手段
１８　　情報端末

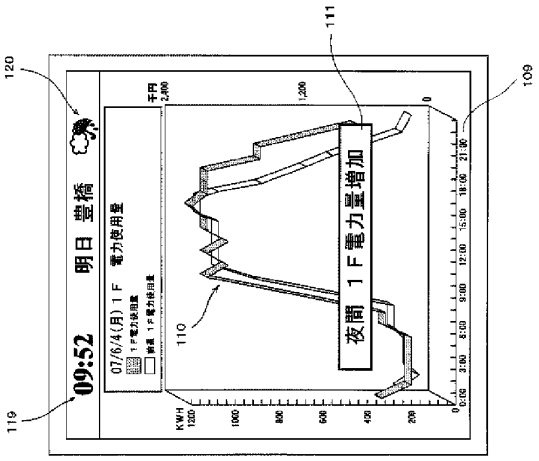
【図1】



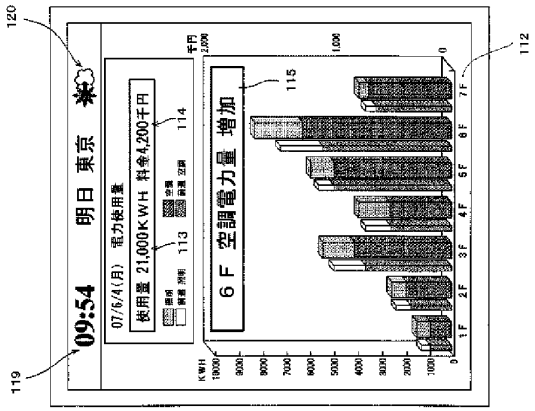
【図2】



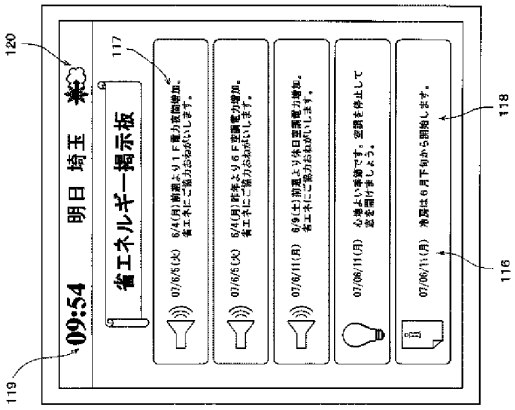
【図3】


120
09:52
明日 豊橋
07/6/4(月) 1F 電力使用量
1F電力使用量
前週 1F電力使用量
千円
KWH
夜間 1F電力量増加
110
111
109
119

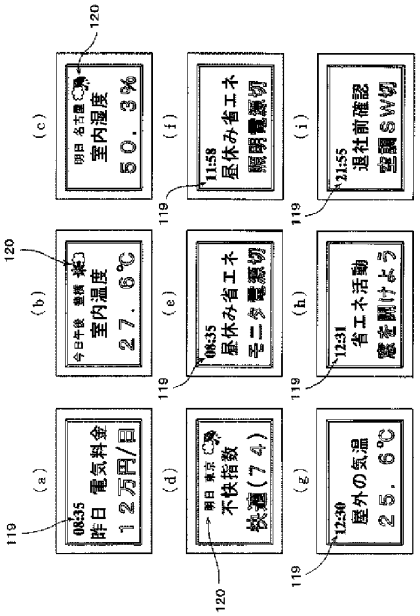
【図4】


120
09:54
明日 東京
07/6/4(月) 電力使用量
使用量 21,000KWH 料金4,200千円
113
114
6F 空調電力量 増加
115
112
119
千円
KWH
1F
2F
3F
4F
5F
6F
7F

【図5】


120
09:54
明日 埼玉
省エネルギー掲示板
117
07/6/5(火) 6/4(月)前週より1F電力使用量増加。省エネに一層力を込めましょう。
07/6/5(火) 6/4(月)前年より6F空調電力増加。省エネに一層力を込めましょう。
07/6/11(月) 6/9(土)前週より当日電気使用量増加。省エネに一層力を込めましょう。
07/6/11(月) 右端よりの表示です。空調を停止して窓を開けましょう。
07/6/11(月) 冷房は6月下旬から開始します。
116
118
119

【図6】


(a)
08:35
昨日 電気料金
12万円/日
(b)
今日午後 東京
室内温度
27.6℃
(c)
明日 名古屋
室内温度
50.3%
(d)
明日 東京
不快指数
快適(74)
(e)
08:35
昼休み省エネ
モニター集計切
(f)
11:58
昼休み省エネ
照明集計切
(g)
12:30
屋外の気温
25.6℃
(h)
12:31
省エネ活動
寝室照明よう
(i)
21:55
退社前確認
空調SW切
119
120

Electronic Patent Application Fee Transmittal

Application Number:	12776159
Filing Date:	07-May-2010
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Filer:	John F. Nethery/Claire B. Briggs
Attorney Docket Number:	10022/1726

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Publ. Fee- early, voluntary, or normal	1504	1	300	300
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for voluntary publication or rep	1803	1	130	130
		Total in USD ($)		**430**

Electronic Acknowledgement Receipt	
EFS ID:	10915328
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	John F. Nethery/Maggie Pieczonka
Filer Authorized By:	John F. Nethery
Attorney Docket Number:	10022/1726
Receipt Date:	09-SEP-2011
Filing Date:	07-MAY-2010
Time Stamp:	15:48:21
Application Type:	Utility under 35 USC 111(a)

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Payment was successfully received in RAM	$430
RAM confirmation Number	2572
Deposit Account	231925
Authorized User	
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	10022-1726_TransLtr.pdf	56470 2e04823acfb91973372637dc20a0a6c98d9da4b1	no	1
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Information:					
2		10022-1726_SuppPrelimAm_Drawings.pdf	712290 f90c6efc1780d8fb6f1749877db97cc85a0b8b53	yes	16

Multipart Description/PDF files in .zip description

Document Description	Start	End
Preliminary Amendment	1	1
Amendment Copy Claims/Response to Suggested Claims	2	6
Drawings-only black and white line drawings	7	7
Applicant Arguments/Remarks Made in an Amendment	8	8
Drawings-only black and white line drawings	9	16

Warnings:					
Information:					
3		10022-1726_SubofSubstituteSpec_MarkedUp_Clean.pdf	684957 54b8af8c09d1e107ad51e3446936cd8435c016b3	yes	113

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Document Description	Start	End
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Specification	3	84
Specification	85	113

Warnings:	
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4		10022-1726_RequestforRepublication_CleanSpec_Drawings.pdf	476028 e979996dab9bf1cfed4237b51892981bca42bd99	yes	44

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	Document Description	**Start**	**End**
	Request/Corrected Patent Application Publications	1	2
	Specification	3	30
	Claims	31	35
	Abstract	36	36
	Drawings-only black and white line drawings	37	44

Warnings:

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5	Transmittal Letter	10022-1726_SecSuppIDS.pdf	121181 408b3ecd111a75457fce70aeed5f2d9f9d363292	no	3

Warnings:

Information:

6	Information Disclosure Statement (IDS) Form (SB08)	10022-1726_FormPTO1449_SecSuppIDS.pdf	117283 83f3dbeeac08c9b63032c004ca74d79c18ce6c43	no	2

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Information:

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7	Foreign Reference	C9_EP0924949A1.pdf	933828 fad609123697083ace84635e5a9dbc4884316d92	no	16

Warnings:

Information:

8	Foreign Reference	C10WO2007118128A2.pdf	936760 d269e9a57500fa42bdd0c2668efe9b6b708d2b64	no	25

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9	Foreign Reference	C11_JP2009070339A.pdf	537631 577237ebfc0387b5a2578be410d84cdac1771183	no	11

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10	Non Patent Literature	C12_Sensus-EnergyMonitorandReporting.pdf	85733 e34eec9e0975f69b322a26def7dde199e7858eb2	no	1
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12	Non Patent Literature	C14_Sensus_automatedbuildingsArticle2.pdf	246850 0a70b640ae9235f9dd014c9d9039f811dc3006f8	no	5
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13	Non Patent Literature	C15_VES_AX_UserGuide.pdf	6695 419cbde258e86b0f15f260e861cf227b2775ae60	no	2
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14	Non Patent Literature	C16_pnnl-15149_market_assessment.pdf	1415898 dca58a793114ad45b9e06f02ffa2d1c9b0d663ed	no	162
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

This correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

September 9, 2011 Name: John F. Nethery, Reg. No.42,928 Signature: /John Nethery/

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay E. Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Andrew M. Schechter
Filed:	May 7, 2010	Art Unit:	2882
For:	Building Energy Consumption Analysis System	Conf. No.:	1676
Attorney Docket No:	10022/1726		

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Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Transmittal Cover Letter (1p.); Submission of Substitute Specification Under 37 CFR 1.125(b) (2pp.); Marked-Up Version of Specification (81pp. and 1p. coversheet); Clean Version of Specification (28pp. and 1p. coversheet); Supplemental Preliminary Amendment, including claim amendments and 8 replacement drawings sheets (16pp.); Request for Republication Under 37 CFR 1221(a) (1p. of Request, 35 pp. of Specification including claims and 8 Sheets of Drawings); Second Supplemental Information Disclosure Statement and PTO form 1449 (5pp.); 11 cited references C9 to C19.

Fee calculation:

☐ No additional fee is required.

☐ Small Entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☒ A petition or processing fee in an amount of $130 under 37 CFR § 1.17(i).

☒ A petition or processing fee in an amount of $300 under 37 CFR § 1.18(d).

☐ An additional filing fee has been calculated as shown below:

					Small Entity			Not a Small Entity	
	Claims Remaining After Amendment		Highest No. Previously Paid	Present Extra	Rate	Add'l Fee	OR	Rate	Add'l Fee
Total		Minus			x $26=			x $52=	
Indep.		Minus			x 110=			x $220=	
First Presentation of Multiple Dep. Claim					+$195=			+ $390=	
					Total	$		Total	$

Fee payment:

☒ Please charge Deposit Account No. 23-1925 in the amount of $430 for Publication Fee ($300) and Processing Fee ($130).

☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

/John Nethery/

September 9, 2011
Date

John F. Nethery (Reg. No. 42,928)

BRINKS HOFER GILSON & LIONE
NBC Tower – Suite 3600, 455 N. Cityfront Plaza Drive, Chicago, IL 60611-5599

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CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

This correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: September 9, 2011 Name: John F. Nethery, Reg. No. 42,298 Signature: 

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay E. Hedley et al.	
Appln. No.:	12/776,159	Examiner: Andrew M. Schechter
Filed:	May 7, 2010	Art Unit: 2882
For:	Building Energy Consumption Analysis System	Conf. No.: 1676
Attorney Docket No: 10022/1726		

SUPPLEMENTAL PRELIMINARY AMENDMENT

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Prior to examination of the above-identified application, please amend the application as follows. Amendments to the Claims begin on page 2. Amendments to the drawings begin on page 7. Remarks being on page 8.

In the Claims:

A complete listing of the claims with proper claim identifiers is set forth below.

1. (Original) A method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtaining energy data at the network operations center through the data connection to the energy data source;

performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and

generating and displaying a user interface on a display, the user interface including the analysis result.

2. (Original) The method of claim 1, where determining a balance point set comprises:

determining either or both of a heating balance point search window into the energy data and a cooling balance point search window into the energy data.

3. (Original) The method of claim 2, where determining a balance point set comprises:

executing either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

4. (Original) The method of claim 3, where executing the correlation analysis comprises:

executing a correlation analysis between temperature and energy consumption to find a best fit correlation.

5. (Original) The method of claim 3, where executing the correlation analysis comprises:
executing the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window.

6. (Original) An energy analysis system comprising:
a processor; and
a memory coupled to the processor, the memory comprising:
energy analysis logic that, when executed by the processor, causes an energy analysis system to:
establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;
obtain energy data at the network operations center through the data connection to the energy data source;
perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:
determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and
generate and display a user interface on a display, the user interface including the analysis result.

7. (Original) The system of claim 6, where the energy analysis logic further causes the energy analysis system to obtain either or both of a heating balance point search window and a cooling balance point search window.

8. (Original) The system of claim 7, where the energy analysis logic further causes the energy analysis system to:
execute either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

9. (Original) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:
execute a correlation analysis between temperature and energy consumption to find a best fit correlation.

10. (Original) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:
execute the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window.

11. (Currently Amended) A method for energy analysis comprising:
establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;
obtaining energy data at the network operations center through the data connection to the energy data source;
performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:
determining ~~control~~ building comparison baseline data within the energy data;
determining ~~user-defined~~actual consumption data within the energy data;

determining, as the analysis result, an exception rank by:
determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and
~~-~~comparing the comparison standard deviation ~~control building~~ data and the actual consumption ~~user-defined~~ data, the exception rank identifying specific data in the actual consumption~~user defined~~ data for further review; and
generating and displaying a user interface on a display, the user interface including the analysis result.

12. (Currently Amended) The method of claim 11, where determining an exception

rank comprises:

determining a ~~control~~ comparison average ~~and a control standard deviation~~ of the energy data within ~~a~~the time interval in the building comparison baseline ~~control building~~ data.

13. (Currently Amended) The method of claim 12, where determining an exception rank further comprises:

determining ~~a user-defined~~an actual consumption average of the energy data within the time interval in the ~~user-defined~~actual consumption data.

14. (Original) The method of claim 13, where determining an exception rank further comprises:

accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and

assigning the exception rank to the time interval according to the mapping.

15. (Currently Amended) The method of claim 14, where the statistical parameter comprises a standard deviation window with respect to the ~~control~~ comparison average.

16. (Currently Amended) An energy analysis system comprising:

a processor; and

a memory coupled to the processor, the memory comprising:

energy analysis logic that, when executed by the processor, causes an energy analysis system to:

establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtain energy data at the network operations center through the data connection to the energy data source;

perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:

determining ~~control~~ building comparison baseline data within the energy data;

determining ~~user-defined~~actual consumption data within the energy data;

determining, as the analysis result, an exception rank by:

determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and

comparing the ~~control building~~comparison standard deviation ~~data~~ and the ~~user-defined~~actual consumption data, the exception rank identifying specific data in the ~~user-defined~~actual consumption data for further review; and

generate and display a user interface on a display, the user interface including the analysis result.

17. (Currently Amended) The system of claim 16, where the energy analysis logic further causes the energy analysis system to:

determine a ~~control~~ comparison average ~~and a control standard deviation~~ of the energy data within ~~a~~ the time interval in the ~~control building~~building comparison baseline data.

18. (Currently Amended) The system of claim 17, where the energy analysis logic further causes the energy analysis system to:

determine ~~a user-defined~~an actual consumption average of the energy data within the time interval in the ~~user-defined~~actual consumption data.

19. (Original) The system of claim 18, where the energy analysis logic further causes the energy analysis system to:

access an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and

assign an exception rank to the time interval according to the mapping.

20. (Currently Amended) The method of claim 19, where the statistical parameter comprises a standard deviation window with respect to the ~~control~~ comparison average.

In the Drawings:

Please cancel the current set of drawings and in their place, use the enclosed set of 8 sheets of replacement drawings that contain Figures 1-7.

REMARKS

Claims 11-13, 15-18 and 20 are amended, and a new set of drawings is presented. No new matter has been added as a result of this amendment. If for any reason the Examiner is unable to allow the application in the next Office Action and believes that a telephone interview would be helpful to resolve any remaining issues, the Examiner is respectfully requested to contact the undersigned.

Respectfully submitted,

Dated: September 9, 2011

John F. Nethery, Reg. No. 42,928
Attorney for Assignee

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(312) 321-4200

1 / 8

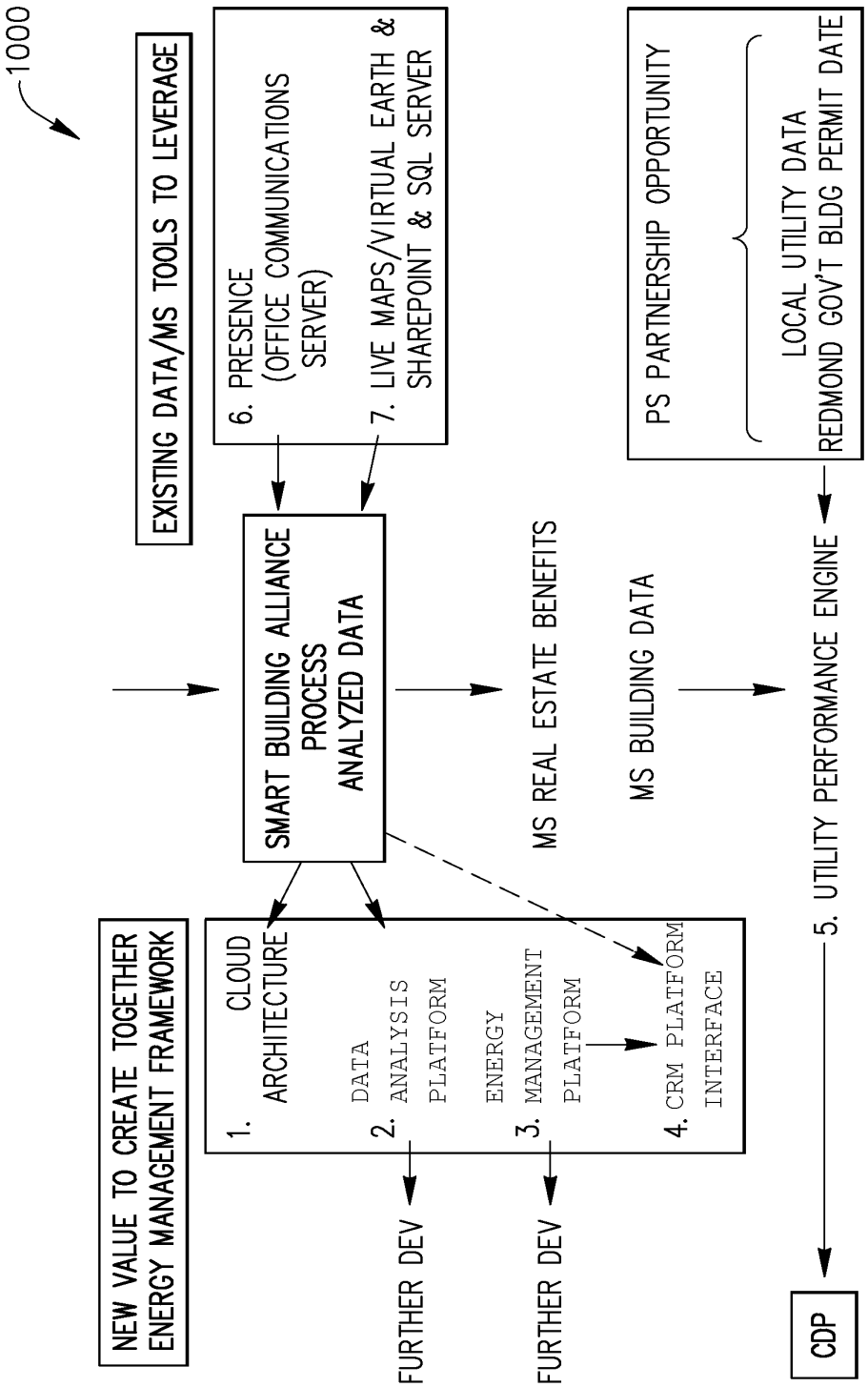

1000
EXISTING DATA/MS TOOLS TO LEVERAGE
6. PRESENCE (OFFICE COMMUNICATIONS SERVER)
7. LIVE MAPS/VIRTUAL EARTH & SHAREPOINT & SQL SERVER
PS PARTNERSHIP OPPORTUNITY
LOCAL UTILITY DATA
REDMOND GOV'T BLDG PERMIT DATE
SMART BUILDING ALLIANCE PROCESS ANALYZED DATA
MS REAL ESTATE BENEFITS
MS BUILDING DATA
5. UTILITY PERFORMANCE ENGINE
NEW VALUE TO CREATE TOGETHER ENERGY MANAGEMENT FRAMEWORK
1. CLOUD ARCHITECTURE
2. DATA ANALYSIS PLATFORM
3. ENERGY MANAGEMENT PLATFORM
4. CRM PLATFORM INTERFACE
FURTHER DEV
FURTHER DEV
CDP

Figure 1

2 / 8

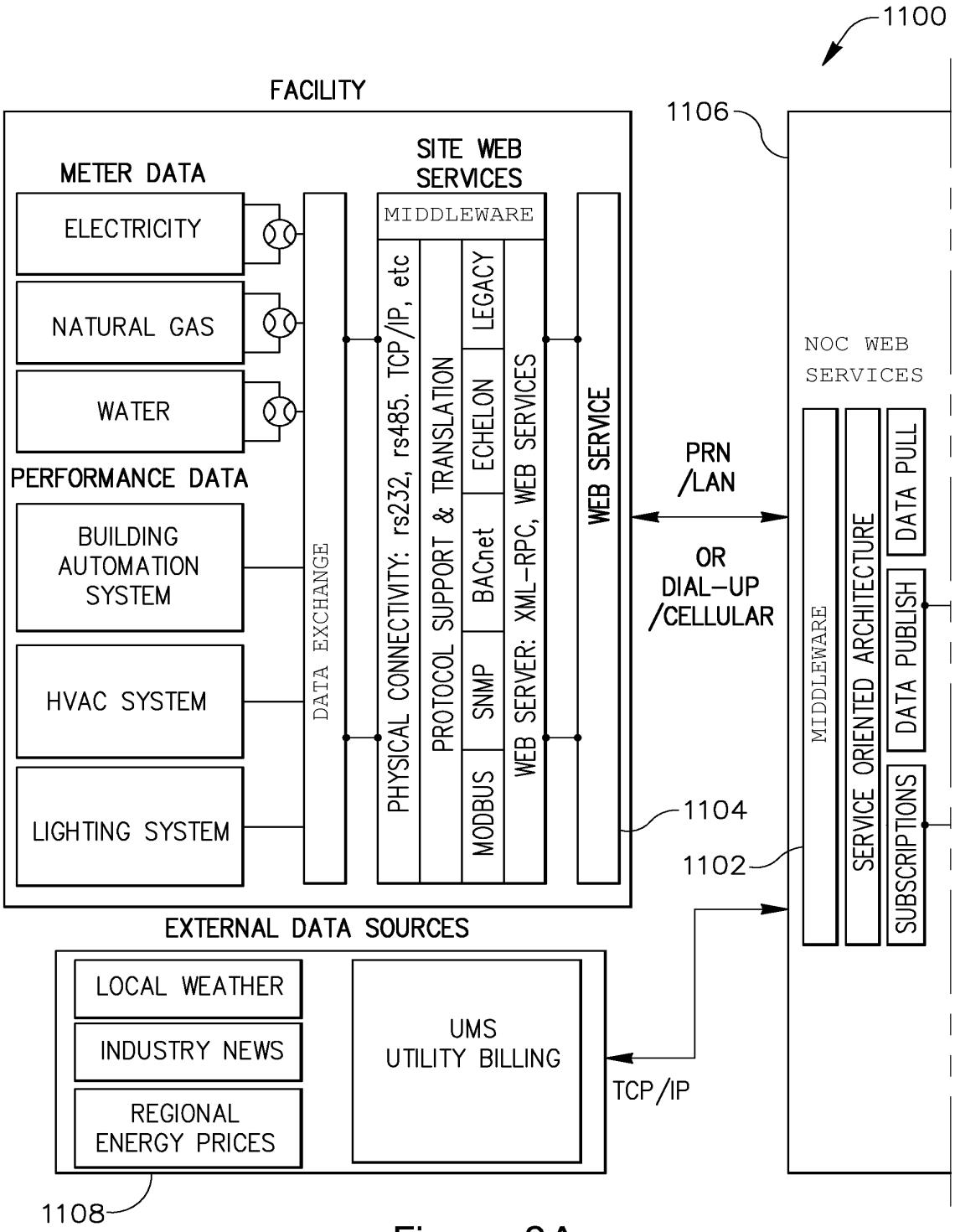

1100
FACILITY
1106
METER DATA
ELECTRICITY
NATURAL GAS
WATER
PERFORMANCE DATA
BUILDING AUTOMATION SYSTEM
HVAC SYSTEM
LIGHTING SYSTEM
DATA EXCHANGE
SITE WEB SERVICES
MIDDLEWARE
PHYSICAL CONNECTIVITY: rs232, rs485, TCP/IP, etc
PROTOCOL SUPPORT & TRANSLATION
MODBUS
SNMP
BACnet
ECHELON
LEGACY
WEB SERVER: XML-RPC, WEB SERVICES
WEB SERVICE
PRN /LAN
OR DIAL-UP /CELLULAR
NOC WEB SERVICES
MIDDLEWARE
SERVICE ORIENTED ARCHITECTURE
DATA PULL
DATA PUBLISH
SUBSCRIPTIONS
1104
1102
EXTERNAL DATA SOURCES
LOCAL WEATHER
INDUSTRY NEWS
REGIONAL ENERGY PRICES
UMS UTILITY BILLING
TCP/IP
1108

Figure 2A

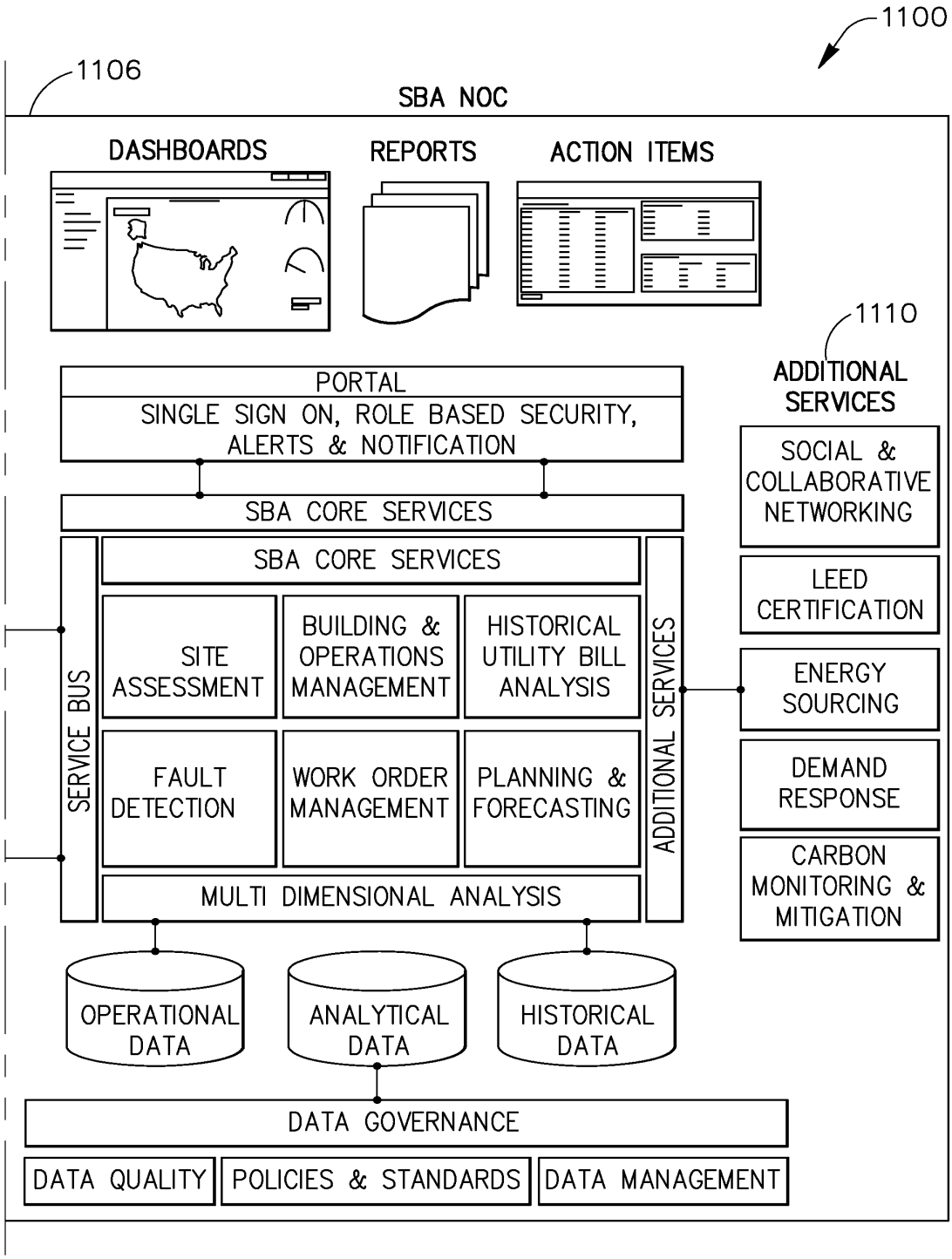

1100
1106
SBA NOC
DASHBOARDS
REPORTS
ACTION ITEMS
1110
ADDITIONAL SERVICES
PORTAL
SINGLE SIGN ON, ROLE BASED SECURITY, ALERTS & NOTIFICATION
SBA CORE SERVICES
SBA CORE SERVICES
SERVICE BUS
SITE ASSESSMENT
BUILDING & OPERATIONS MANAGEMENT
HISTORICAL UTILITY BILL ANALYSIS
FAULT DETECTION
WORK ORDER MANAGEMENT
PLANNING & FORECASTING
MULTI DIMENSIONAL ANALYSIS
ADDITIONAL SERVICES
SOCIAL & COLLABORATIVE NETWORKING
LEED CERTIFICATION
ENERGY SOURCING
DEMAND RESPONSE
CARBON MONITORING & MITIGATION
OPERATIONAL DATA
ANALYTICAL DATA
HISTORICAL DATA
DATA GOVERNANCE
DATA QUALITY
POLICIES & STANDARDS
DATA MANAGEMENT

Figure 2B

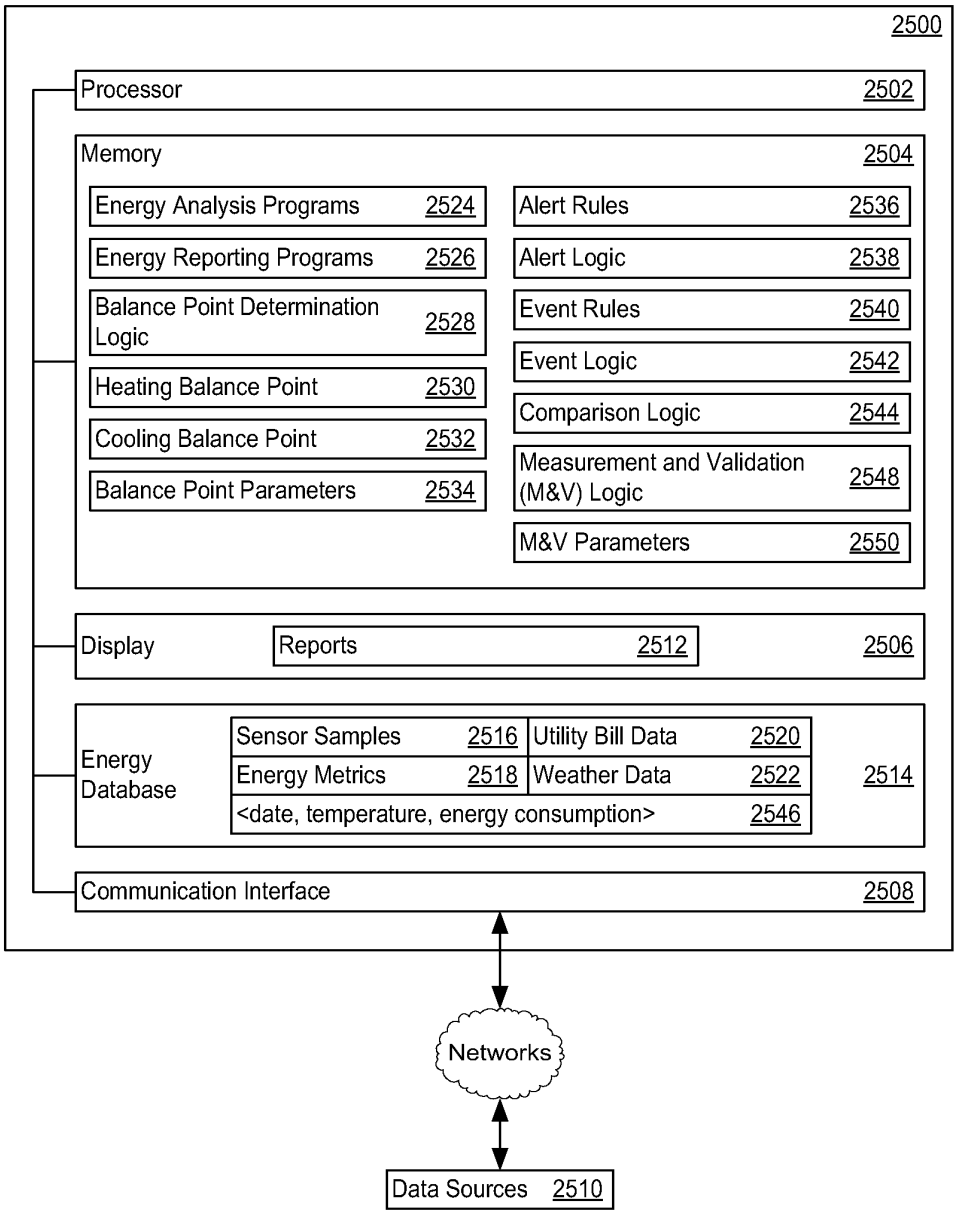

2500
Processor 2502
Memory 2504
Energy Analysis Programs 2524
Energy Reporting Programs 2526
Balance Point Determination Logic 2528
Heating Balance Point 2530
Cooling Balance Point 2532
Balance Point Parameters 2534
Alert Rules 2536
Alert Logic 2538
Event Rules 2540
Event Logic 2542
Comparison Logic 2544
Measurement and Validation (M&V) Logic 2548
M&V Parameters 2550
Display
Reports 2512
2506
Energy Database
Sensor Samples 2516
Utility Bill Data 2520
Energy Metrics 2518
Weather Data 2522
<date, temperature, energy consumption> 2546
2514
Communication Interface 2508
Networks
Data Sources 2510

Figure 3

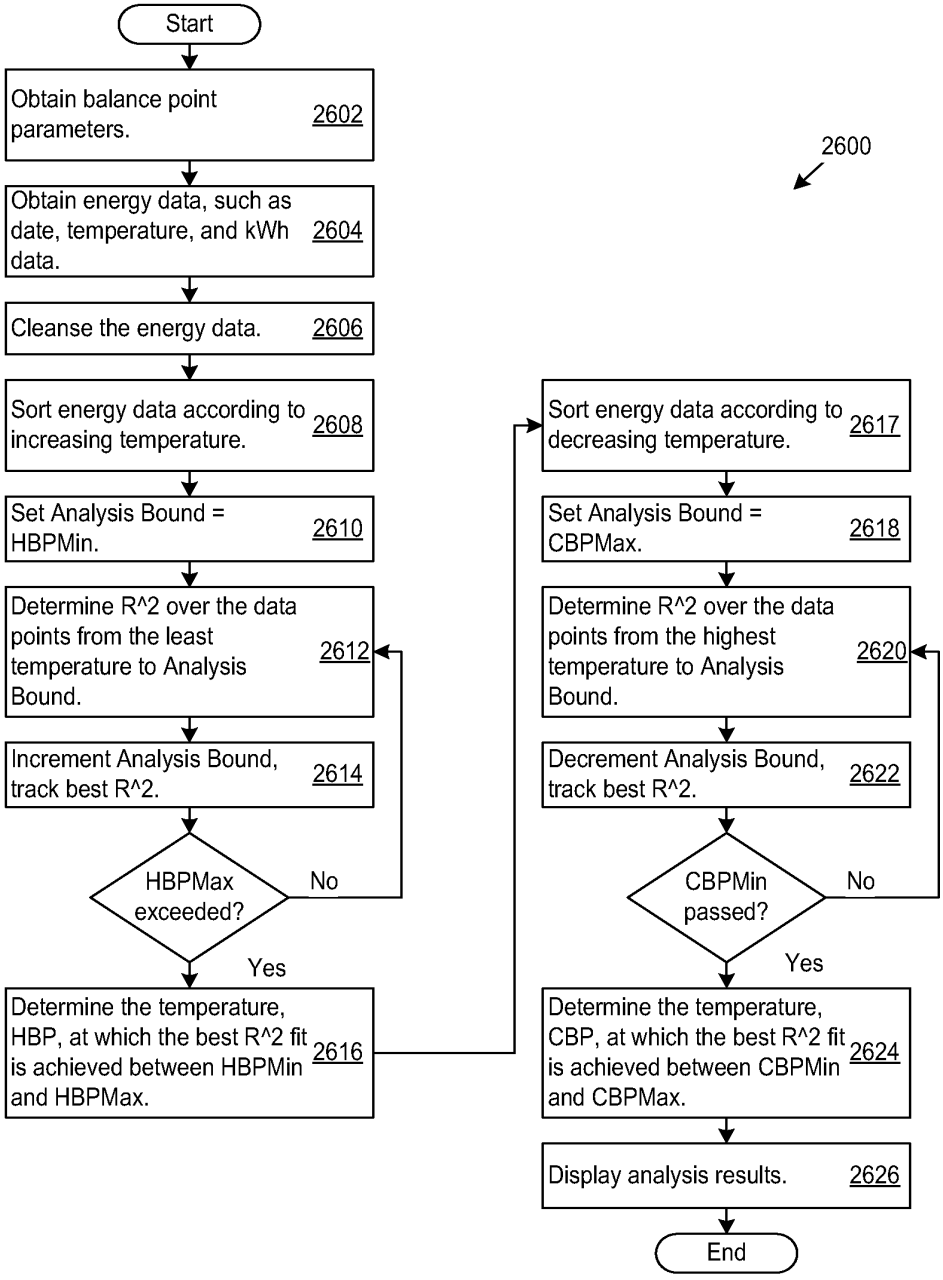

Start
Obtain balance point parameters. 2602
Obtain energy data, such as date, temperature, and kWh data. 2604
Cleanse the energy data. 2606
Sort energy data according to increasing temperature. 2608
Set Analysis Bound = HBPMin. 2610
Determine R^2 over the data points from the least temperature to Analysis Bound. 2612
Increment Analysis Bound, track best R^2. 2614
HBPMax exceeded?
No
Yes
Determine the temperature, HBP, at which the best R^2 fit is achieved between HBPMin and HBPMax. 2616
2600
Sort energy data according to decreasing temperature. 2617
Set Analysis Bound = CBPMax. 2618
Determine R^2 over the data points from the highest temperature to Analysis Bound. 2620
Decrement Analysis Bound, track best R^2. 2622
CBPMin passed?
No
Yes
Determine the temperature, CBP, at which the best R^2 fit is achieved between CBPMin and CBPMax. 2624
Display analysis results. 2626
End

Figure 4

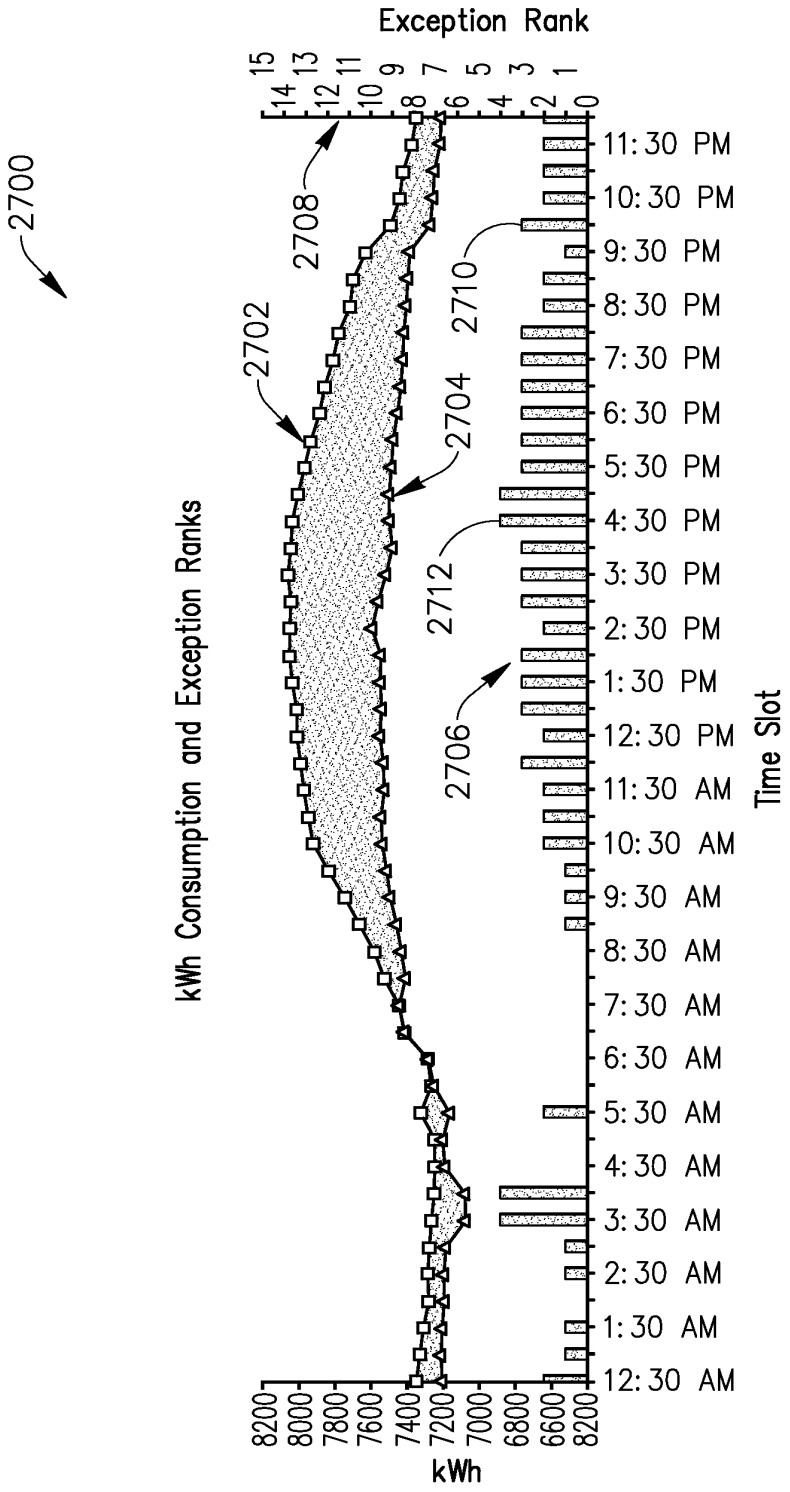

2700
Exception Rank
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
2708
2710
2702
2704
2712
2706
kWh Consumption and Exception Ranks
11:30 PM
10:30 PM
9:30 PM
8:30 PM
7:30 PM
6:30 PM
5:30 PM
4:30 PM
3:30 PM
2:30 PM
1:30 PM
12:30 PM
11:30 AM
10:30 AM
9:30 AM
8:30 AM
7:30 AM
6:30 AM
5:30 AM
4:30 AM
3:30 AM
2:30 AM
1:30 AM
12:30 AM
Time Slot
8200 8000 7800 7600 7400 7200 7000 6800 6600 8200
kWh

Figure 5

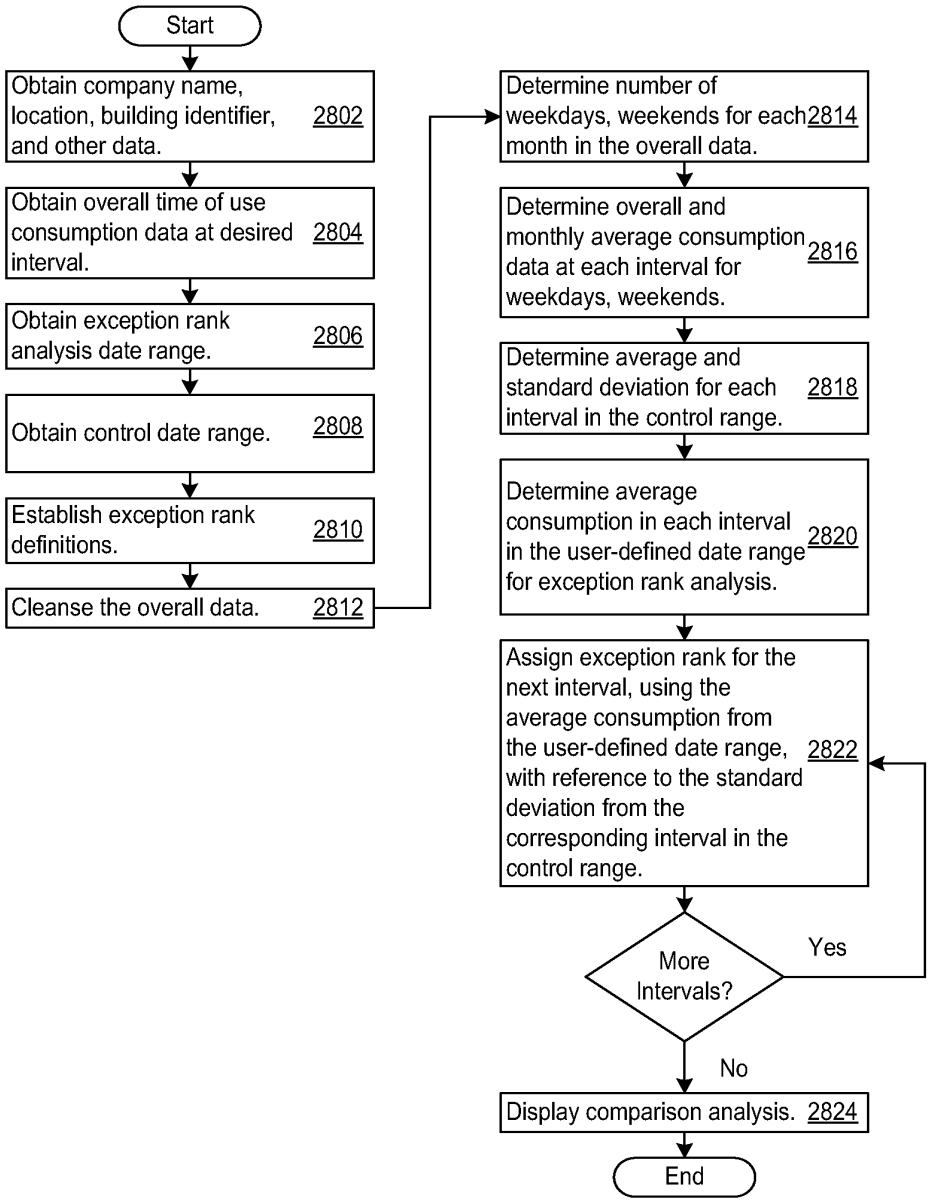

Start
Obtain company name, location, building identifier, and other data. 2802
Obtain overall time of use consumption data at desired interval. 2804
Obtain exception rank analysis date range. 2806
Obtain control date range. 2808
Establish exception rank definitions. 2810
Cleanse the overall data. 2812
Determine number of weekdays, weekends for each month in the overall data. 2814
Determine overall and monthly average consumption data at each interval for weekdays, weekends. 2816
Determine average and standard deviation for each interval in the control range. 2818
Determine average consumption in each interval in the user-defined date range for exception rank analysis. 2820
Assign exception rank for the next interval, using the average consumption from the user-defined date range, with reference to the standard deviation from the corresponding interval in the control range. 2822
More Intervals?
Yes
No
Display comparison analysis. 2824
End

Figure 6

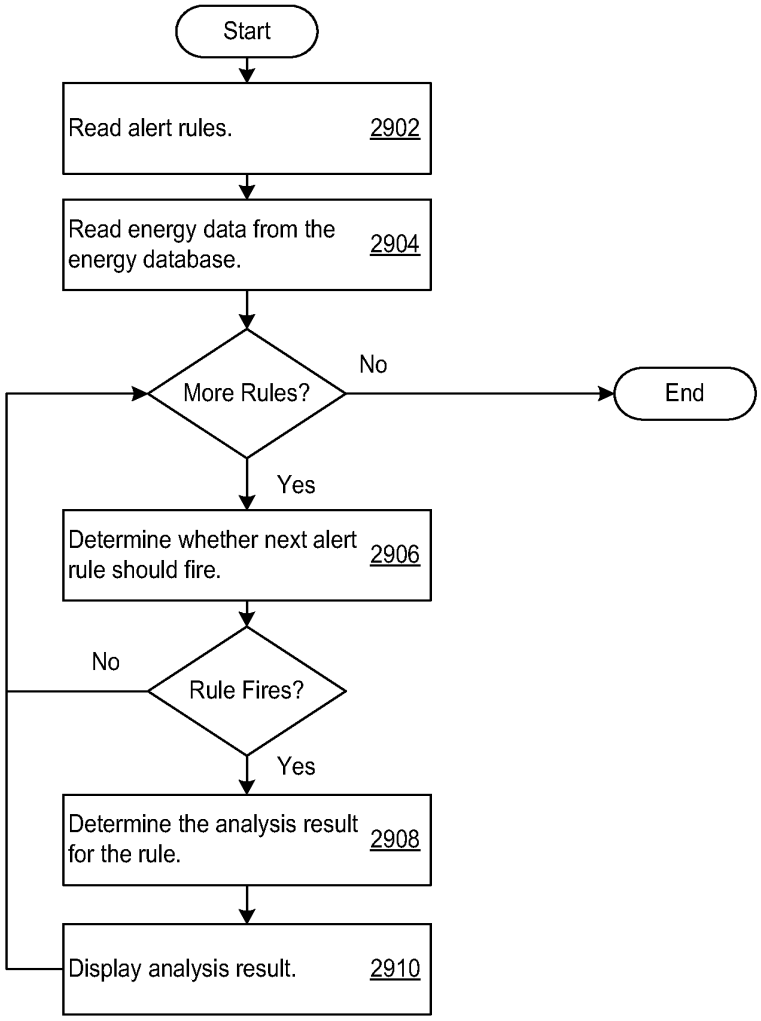
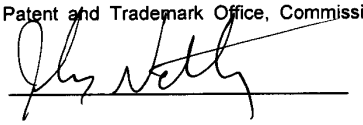

Start
Read alert rules. 2902
Read energy data from the energy database. 2904
More Rules?
No
End
Yes
Determine whether next alert rule should fire. 2906
Rule Fires?
No
Yes
Determine the analysis result for the rule. 2908
Display analysis result. 2910

Figure 7

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

This correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: September 9, 2011 Name: John F. Nethery, Reg. No. 42,298 Signature: 

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay E. Hedley et al.	
Appln. No.:	12/776,159	Examiner: Andrew M. Schechter
Filed:	May 7, 2010	Art Unit: 2882
For:	Building Energy Consumption Analysis System	Conf. No.: 1676
Attorney Docket No:	10022/1726	

SUBMISSION OF SUBSTITUTE SPECIFICATION UNDER 37 CFR 1.125(b)

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Prior to examination of the above-identified application, please amend the application as shown in the attached substitute specification, which includes no new matter. Assignee encloses a version of the specification (81 pages) with markings showing all changes relative to the immediate prior version of the specification, using underlining and strikethrough. A clean version (28 pages) without markings is also enclosed.

A separate amendment is submitted for the claims and a separate paper is submitted to present replacement drawings.

Respectfully submitted,

Dated: September 9, 2011

John F. Nethery, Reg. No. 42,928
Attorney for Assignee

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CHICAGO, IL 60610
(312) 321-4200

MARKED-UP VERSION OF SPECIFICATION

BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

INVENTORS:

Jay Hedley
Boris Tsypin
Deepak Raghu

BACKGROUND OF THE INVENTION

1. Cross Reference to Related Applications

[001] This application claims priority to U.S. provisional patent application serial numbers 61/176,855 and 61/176,790, both filed 8-May-2009 and titled Building Sensor Operational Data Analysis for Energy Saving System Control.

2. Technical Field.

[002] This disclosure relates to obtaining and analyzing building energy data. This disclosure also relates to engaging in an energy analysis to determine analysis results, and optionally responsively controlling building systems, such as lighting, heating, air-conditioning, and other energy consuming systems.

3. Related Art.

[003] Energy consumption, monitoring, and management are crucial components of sustainable, eco-friendly infrastructures now and into the future. In the past, energy monitoring systems, such as those available from Sensus Machine Intelligence, have obtained and analyzed energy data from individual pieces of equipment in a building. A need exists to provide energy data focused analysis results to accurately determine building energy expenditures, performance and costs.

SUMMARY

[004] An energy analysis system provides energy analysis results. The energy analysis system may include a processor, a communication interface coupled to the processor, and a memory coupled to the processor. The memory may include energy analysis logic that, when executed by the processor, causes an energy analysis system to: establish a data connection from a network operations center through an energy data connectivity interface to an energy data source, obtain energy data at the network operations center through the data connection to the energy data source, and perform an energy analysis in the network operations center on the energy data to produce an analysis result.

[005] The energy analysis may include: determining ~~control~~ building comparison baseline data within the energy data, determining ~~user-defined~~actual consumption data within the energy data, and determining, as the analysis result, an exception rank by determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data, and comparing the ~~control building~~comparison standard deviation ~~data~~ and the ~~user-defined~~actual consumption data. The exception rank may identify specific data in the ~~user-defined~~actual consumption data for further review.

[006] As another example, the energy analysis may include: determining a balance point set from the energy data as the analysis result. The balance point set may include both a heating balance point and a cooling balance point. The system may display any analysis result in a user interface on a display.

[007] Other systems, methods, features and advantages will be, or will become, apparent to one with skill in the art upon examination of the following figures and detailed description. It is intended that all such additional systems, methods, features and advantages be included within this description, be within the scope of the invention, and be protected by the following claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[008] The systems and methods may be better understood with reference to the following drawings and description. The components in the figures are not

necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. Moreover, in the figures, like referenced numerals designate corresponding parts throughout the different views.

~~[009] Figure 1 shows a system for building energy analysis.~~

~~[010] Figure 2 shows an operational diagram.~~

~~[011] Figure 3 shows a foundation diagram.~~

~~[012] Figure 4 shows a benefit diagram.~~

~~[013] Figure 5 shows an energy and savings impact analysis.~~

~~[014] Figure 6 shows an end-to-end analysis process that the system may implement.~~

~~[015] Figures 7A, 7B, 7C, and 7D show findings that the system may generate from its analysis.~~

~~[016] Figures 8A, 8B, and 8C shows example baseline reports 800 that the system may generate.~~

~~[017] Figure 9 shows examples of automated analysis of intelligent alarms and detection of maintenance activities.~~

~~[018]~~[009] Figure ~~10~~ 1 shows an example of a development framework for ~~the~~ a system for building energy analysis.

~~[019]~~[010] Figures ~~11~~2A and ~~11~~2B show a system architecture for building energy analysis.

~~[020] Figures 12A and 12B show a phased implementation plan for the system.~~

~~[021] Figure 13 shows a threshold based alerting process that the system may implement.~~

~~[022] Figure 14 shows a process flowchart.~~

~~[023] Figure 15 shows business rules, controls and technology (including data configuration) to provide a secure environment.~~

~~[024] Figure 16 shows a program management methodology.~~

~~[025] Figure 17 shows a scalability scenario.~~

~~[026] Figure 18 shows dashboard screenshots for reporting screens that the system may generate.~~

~~[027] Figure 19 shows a dashboard screenshot for an analytics reporting screen that the system may generate.~~

~~[028] Figure 20 shows a dashboard screenshot for a trend reporting screen that the system may generate.~~

~~[029] Figures 21A and 21B show a dashboard screenshot for a monitoring reporting screen of historical energy comparison that the system may generate.~~

~~[030] Figures 22A and 22B show a dashboard screenshot for a monitoring reporting screen of actual energy usage versus budged amount that the system may generate.~~

~~[031] Figure 23 shows a dashboard screenshot for a monitoring reporting screen of Interactive Automated Fault Detection and Diagnosis that the system may generate.~~

~~[032] Figure 24 shows a sample reporting format for measuring and optimizing comfort, efficiency, and operations within each building space, including reporting on operations of building equipment and systems, specifically regarding Analysis Focused on Equipment Performance.~~

~~[033]~~[011] Figure ~~25~~ 3 shows an example of a particular machine for implementing the system for building energy analysis.

~~[034]~~[012] Figure ~~26~~ 4 shows balance point determination logic.

~~[035]~~[013] Figure ~~27~~ 5 shows a kilowatt hour consumption and exception ranks analysis.

~~[036]~~[014] Figure ~~28~~ 6 shows comparison logic for determining exception ranks.

~~[037]~~[015] Figure ~~29~~ 7 shows alert logic for determining building level alerts.

DETAILED DESCRIPTION

~~[038] Figure 1 shows an overview of a system 100 for building energy analysis. The system 100 converges buildings systems 102 with Information Technology (IT) 104 to facilitate a new level of data analysis and continuous control 106. The system 100 gathers data and indicators for fact-based decision-making and sound environmental management. The system 100 drives continuous improvement and facilitates managers to mark progress and reach productivity goals. As IT converges with building technologies, the system 100 permits~~

ongoing system optimization, making it more feasible and more effective for companies to sustain performance of their existing real estate portfolio. In some cases, the system may reduce building operating costs by 20—30% or more, yielding an increase in building value of $10—$20 / sqft or more. The system 100 focuses on providing data focused services to optimize building operations and costs.

[039] The system 100 may be implemented with a wide range of technologies. The technologies may span data capture and analysis over a wide range of building systems, as shown in the operational diagram 200 in Figure 2. Such building systems include automation systems 202, high voltage air conditioning (HVAC) systems 204, lighting system 206, power systems 208, security systems 210, radio frequency identification systems (e.g., to track assets, personnel, and inventory) 212, and sensor system 214 (such as pressure, motion, vibration, temperature, and contact sensors). Energy and consulting services 216 may provide input into the system 100 as well. Such technologies are available from, as examples, Richards Zeta(TM) company, Interval Data Systems(TM) company, Facility Solutions Group(TM) company, Sensus(TM) company, Constellation NewEnergy(TM) company, and other providers. Accordingly, the system 100 may implement installation of equipment and on the ground repair & maintenance services, Integration, Configuration, Protocol Translation, Portal for Remote Building Automation Systems (BAS) Programming & Optimization, Automated Fault Detection Diagnostics (AFDD), Maintenance Optimization, BAS Analysis, Baseline Scorecard (BOSS), and System Optimization, and other features.

[040] Figure 3 shows a foundation diagram 300 based on the system 100 data centric approach that helps deliver additional services in the future. The system 100 may focus on data services and deliver benefits based on information from the building sensor and control infrastructure. Accessing the operational data and using it to control system operations can facilitate significant additional savings and revenue-generating opportunities.

[041] Figure 4 shows a benefit diagram 400. The benefit diagram 400 illustrates qualitative and quantitative benefits delivered by the system 100. The benefit diagram 400 also illustrates several example main benefits drivers.

[042] Figure 5 shows an energy and savings impact analysis 500. The analysis 500 explains an example scenario under which company share price is increased due to energy saving which the system 100 may help achieve.

[043] Figure 6 shows an end-to-end analysis process 600 that the system 100 may implement. The analysis process 600 may, for example, include full optimization and monitoring over a multi-year period. In one implementation, the process 600 may include systems information collection and integration (602) (e.g., using information from energy bills or other documents), preliminary data collection (604), analysis (606) (e.g., to generate scorecards and baseline reports), detailed data collection (608), and generate recommended actions (610) (e.g., in the form of a solutions report), and corrective actions (612) (e.g., in the form of a verification report). Beyond initial installation and analysis, the system 100 may continue to be optimized to provide continuous monitoring for each integrated facility, with options for further integration of enterprise systems. The system 100 may be implemented in or under a gain sharing agreement that facilitates the system 100 implementer or provider to share both the up-front cost and the continuing benefits. This establishes a long-term relationship that leads to continuously increasing benefits.

[044] For example (602) and / or (604) may include an analysis of the historical billing information and interval data, such as that showing building power usage measured every 5 to 15 minutes. Figure 7 shows findings 700 that the system 100 may generate from the analysis. The findings 700 may include building efficiency deterioration 702, unnecessary peaking 704, sub-optimal occupancy schedules 706, and temperature correlations 708.

[045] As a further example, (602) and / or (604) may further include setting a baseline of building performance. In other words, the system 100, based for example on access to Building Management System (BMS) information, may create a baseline performance so that the system 100 shows a room by room picture before and after picture of energy consumption. Figure 8 shows example baseline reports 800 that the system 100 may generate, including a room detail scorecard 802, consumption / demand graph 804, a top level scorecard baseline (e.g., comfort / efficient / operations) charts 806, or other baseline reports.

~~[046] Analysis (606) may include programming and maintenance activities to improve system performance. This may include continuous, real-time, and/or automated analysis of systems operation. Figure 9 shows examples 900 of automated analysis of intelligent alarms and detection of maintenance activities.~~

~~[047] The inputs to the system 100, concerning Data Collection – Analytics – Fault Detection – Continuous Control, and other aspects may include:~~

~~[048] Utility bills and interval data~~

~~[049] Building blueprints and BAS design diagrams~~

~~[050] Building control system information~~

~~[051] Contact information for controls vendor and building engineers~~

~~[052] Access to facility (e.g., physical or remote access).~~

~~[053] The system 100 may combine strategies to improve the efficiency of a building's energy and maintenance by delivering an energy framework to support new solutions for the strategic new market of high performing buildings and energy management. The system 100 leverages the development of a robust energy management framework, through the connectivity and data management of buildings worldwide and associated implementation technologies. Such technologies may include Outlook, Office Communicator, Sharepoint, and other technologies for use in the energy framework and Building Management Systems. The system 100 and system implementation may also align with the leading energy management companies (e.g., Sensus MI, ION EEM), improving data collection, and delivering advanced applications managed, as examples, through Azure and Microsoft's Cloud architecture. The system 100 may further leverage Microsoft (TM) Dynamics to facilitate integration between Utilities and Owners of Building Data, generating dashboards of KPIs, SMART city, SMART grid, carbon tracking, energy consumption, SMART Grid integration, INDE, demand response, and other systems.~~

~~[054]~~[016] Figure ~~10-1~~ shows an example of a development framework 1000 for ~~the~~ a system for building energy analysis~~100~~. The following may be undertaken with regard to developing the system ~~100~~:

~~[055]~~[017] Create the strategy and roadmap for co-developing the Energy Management Framework (EMF).

[056][018] Internally pilot the SMART Buildings platform to be the proving grounds of the EMF and serve as the credential for the EMF and its premier energy management application.

[057][019] Co-develop the EMF leveraging .NET, SQL Server, Dynamics, Virtual Earth, Azure, and Sharepoint to lead the industry in defining a unique platform to develop, deployed, and manage energy related applications.

[058][020] Deploy the EMF using, e.g., Azure's cloud services OS to manage advanced engineering calculations and data management requirements.

[059][021] Investigate leading technologies for building system connectivity and integration (i.e. Plexus) and help scale additional drivers, scalability, and security with a platform for any company to leverage.

[060][022] Further define the strategy of the EMF to leverage additional MSFT technologies as the market develops (e.g., Office Communicator, carbon tracking with Sharepoint, Outlook integration with BAS, as examples).

[061][023] Integrate into existing Energy systems and technologies deployed at MSFT (i.e. ION/EEM & MRO).

[062][024] Align with utility companies to leverage Dynamics specific solutions as part of the world's energy / carbon dashboards (SMART Grid, CCF Project 2 degrees, INDE, demand response programs, carbon tracking/management/trading, Utility Performance Engine, SMART City).

[063][025] Figures 11 2A and 2B shows an architecture 1100 for the system 100. The system 100 may provide an energy data focused approach based on data management and analytics of existing systems and equipment versus a capital intensive approach. The system 100 may connect and integrate in a hardware and software agnostic way with multiple vendor solutions & protocols (e.g., provided by Trane, Siemens, Johnson Control, Honeywell, and others). The system 100 may provide an open IP-based two way (read/write) infrastructure connecting one or more buildings in a portfolio to a network operations center with web-based control capabilities. The system may, as examples:

[064][026] 1) deliver continuous re-commissioning through setpoint control and schedule optimization;

[066][027] 2) delivers 24 hours a day x 7 days a week (24x7) automated equipment fault detection and diagnosis down to one-minute intervals and prioritized by user defined options: rank, severity, cost of fault, location, and others;

[066][028] 3) establish operational guidelines for setpoints and schedules across all equipment and BAS data for a portfolio of buildings, managed through a central command center;

[067][029] 4) deliver measurable calculated monthly results tracking energy reductions: (10% min in year 1);

[068][030] 5) integrate to existing Maintenance Repair & Operations applications and Energy Management systems;

[069][031] 6) include the ability to install, connect, and integrate additional meters, sub-meters, sensors into the common platform as required;

[070][032] 7) be supported by world class project management, change management, and training organization; and

[074][033] 8) be delivered on a scalable architecture to easily and securely scale with the client's needs.

[072][034] With reference still to Figures ~~11~~2A and 2B, the architecture 1000 includes:

[073][035] At the building (e.g., company facility): ~~a mediator~~ middleware 1102 ~~(e.g., a Richards-Zeta Mediator 2500) that~~ provides a connectivity interface for connecting to one or more meters and sub-systems in a facility. The meters may include utility meters as well as any Building Automation System (BAS), lighting or security control system, or other systems.

[074][036] Site Web Services 1104: The middleware ~~mediator~~ 1102 communicates the data it collects to the System Network Operations Center (NOC) 1106. The middleware ~~mediator~~ 1102 may received the energy data from web services 1104 installed onsite at any desired facilities. In other words, the web services 1104 may establish a data connection to the middleware ~~mediator~~ 1102 and send building energy data to the middleware ~~mediator~~ 1102. However, any other type of connectivity interface as a data transmission mechanism may be employed to communicate data to the middleware ~~mediator~~ 1102, including file

transfer, message passing (whether web services based or not), shared memories, or other data transfer mechanisms.

[075][037] System NOC 1106: The NOC 1106 may use a Service-Oriented Architecture (SOA) to aggregate data across all facilities. Its core services provide analytics and other data management services to the user via a Web-based portal, or Rich Internet Application (RIA). Examples of the specific implementation of the NOC 1106 and the analysis results that the NOC 1106 may provide are discussed below, and in particular with regard to Figures ~~25-28~~3-6.

[076][038] External Data sources 1108: In addition, the NOC collects relevant data from external data sources, such as the National Weather Service, and may also obtain reports on regional energy prices and 3rd-party or company systems.

[077][039] Additional Services 1110: Because of the versatility of the system 100 infrastructure, additional services may be layered onto the core. The middleware ~~mediator~~ 1102 has 2-way communication that supports Demand Response programs. Additional services also include a collaborative social network in which company facility managers and operators can share information on operations. They may also drive LEED certification of company buildings, perform carbon tracking and mitigation services, and others.

[078][040] The system ~~100~~ energy management data services offer a unique approach at delivering a comprehensive view of a facility's operations. The system ~~100~~ may implement continuous optimized control through real time/interval data acquisition and analysis of all relevant facility data. The System Enterprise Energy Management System (EEMS) may include or involve: (1) a physical site assessment, (2) historical utility bill analysis, (3) utility meter interval data analysis, (4) holistic facility controls analysis, (5) real-time automated equipment fault detection and (6) energy sourcing and demand-response energy management. From these inputs the System energy management system generates insight in the form of reports, dashboards, and alerts that provide actionable information that leads to realized energy reduction and cost savings.

[079][041] The system ~~100~~ may begin with a detailed audit of the facility premises. Facilities are surveyed to fully document machine type, layout and building structure, operating hours, building automation capabilities and potential

need for additional metering and sub-metering. Specific care is given to observe the unique properties of each building. The walkthrough provides critical baseline information on the premises' layout, engineering, and operational health.

[080][042] Historical utility bill analysis is the next phase of the system ~~100~~ implementation. The historical utility bill analysis provides an in-depth look at utility bill trends over time, including general or seasonal trends energy trends. This information is crucial to understanding the way a building has been operating so energy saving opportunities can be recognized. It also provides a benchmark against which later energy saving measures can be compared. Additionally, it is common to find billing errors during this phase, which are immediate opportunities for savings.

[081][043] Meter interval data analysis is a third phase of the system ~~100~~ solution. To obtain data about energy consumption, an energy data middleware ~~mediator~~ 1102 is installed and connected to on-site utility meters. The middleware ~~mediator~~ 1102 is used to collect utility data from each of the meters and sub-meters in a building, including the building automation system. This data is then cleansed and collected to get a consumption breakdown by building, section or floor and can be viewed in the robust EEMS tool. Much like the billing analysis, this information is used to spot trends and benchmark future energy saving strategies.

~~[082][044] A holistic picture of the building emerges during the facility controls analysis, where the system 100 team analyzes and report on the "design intent" of the building controls versus the current performance of the building. Here, the~~[082][044] The middleware ~~mediator~~ 1102 extracts data from each building system and piece of equipment in the building. This data is tracked over time to observe subtle features in the way the equipment works and the building operates as a whole. As months and even years of data are collected, macro-scale trends related to seasonality, occupancy, and utilization rates all emerge. These trends help contextualize power usage and other metrics, allowing for even greater insight into building operations and further opportunities for savings.

[083][045] The system ~~100~~ solution utilizes data captured by the middleware ~~mediator~~ 1102 on a per-minute basis. This fine level of granularity facilitates the

System solution to identify real-time trends and problems which were previously undetectable. Additionally, it provides real-time actionable reporting that prioritizes problems and suggests a tangible cost to their continued neglect or systematic inefficiencies. Automatic fault detection begins with as little as three weeks of collected data, and continues for the life of the System contract.

[084][046] The middleware ~~mediator~~ 1102 provides for bi-directional (read/write) capability with any integrated system. This facilitates for 24/7 continuous optimized control of the systems connected to it. The middleware ~~mediator~~ 1102 has an intelligence layer allowing for full closed loop advanced math and logic between any of the previously disparate systems. The middleware ~~mediator~~ 1102 also sends and consumes Web services. An example Web service would be an Automated Demand Response (ADR) notice and pricing level signal from Constellation New Energy (CNE) triggering the middleware ~~mediator~~ 1102 on board logic and control to automatically shed electrical loads by turning off non essential lighting and changing set points on chilled water and HVAC zones.

[085][047] Thus, the system ~~100~~ and NOC 1106 may establish a data connection from the network operations center 1106 through an energy data middleware ~~mediator~~ 1102 to an energy data source 1104. They may then obtain energy data at the network operations center 1106 through the data connection to the energy data source 1104. The system ~~100~~ and NOC 1106 may also perform an energy analysis in the network operations center 1106 on the energy data to produce an analysis result, as described below, for example in connection with Figures ~~25-28~~3-6.

[086][048] Another component of the system ~~100~~ solution is the strategic energy sourcing and demand-response energy planning. Energy sourcing experts will help each facility to find the lowest cost and/or greenest power available in that market. Green options include offsetting a facility's energy requirements with renewable sources of energy, including wind, small hydroelectric, landfill gas, and biomass, providing an electricity choice that can directly support the building of new renewable power plants. The system demand response solution is an additional service that can provide direct revenue to a facility. Facilities sign up with the regional ISO's demand response program and receive annual payment

for participation, in exchange for agreeing to shed load an agreed number of times. System helps to engineer a demand response solution that minimizes impact on facility operations. Both energy sourcing and demand response are administered to meet regional regulations while delivering value to the customer.

[0087][0049] The system ~~100~~ solution achieves cost savings on several fronts. Most notably, savings are realized through reductions in total energy consumption and decreases in both scheduled and unscheduled maintenance.

[0088][0050] Energy savings occur when building control sequences are optimized to run in the most economic fashion. Wasteful situations like running an unoccupied building at/near full capacity are easily eliminated. More subtle improvements can be identified through system ~~100~~ analytic solutions which identify mis-configured and even machines needing repairs. The system ~~100~~ solution's automatic fault detection and diagnosis tool not only provides a clear understanding of a problem, but suggests a financial consequence with letting the problem go unresolved. The EEMS' reporting gives a level of detail which requires less man-hours to investigate – freeing the facility team to address the most promising energy saving opportunities rather than simply assessing the state of the building.

[0089][0051] Efficient building operations leads to decreases in scheduled maintenance costs. This increases the lifespan of the equipment and decreasing the replacement frequency, thus allowing a facility to optimize its operations with the equipment it has, rather than recommending new capital purchases. Unscheduled maintenance costs also decrease based on detection of inefficient machines. Some machines may achieve the desired end result (say, cooling a room to 72 degrees), but do so in a highly inefficient manner which cuts its lifespan by as much as half. As an example, a machine which is operating in both heating and cooling mode may be able to achieve a final temperature of 72 degrees by mixing hot and cold air. However, this is highly inefficient and could cause the machine to break unexpectedly.

[0090][0052] Altogether, the system ~~100~~ solution provides direct, continuous, and reliable energy savings without requiring major capital purchases. The system ~~100~~ solution helps a facility makes the best use of the equipment it already has,

by optimizing energy consumption and maximizing the lifespan of the equipment. Through its data-driven solution, the system 100 provides an approach that is unique in the marketplace for bringing an information-technology-driven business intelligence capability to the world of facility energy management.

[091] Figure 12 shows a phased implementation plan 1200 for the system 100:

[092] 1. EEMS Database Repository

[093] Initial Setup

[094] The mediator 1102 may be installed directly into the existing metering infrastructure to retrieve available metering data. The system configuration may occur remotely once there is established network connectivity. The EEMS database may be configured while installing the mediator 1102. Configuration may include commissioning each meter and facility within the database and cleansing, validating and normalizing the data points retrieved.

[095] Utility/Energy Consumption Data Retrieval from Meter/Sub-meter data

[096] The system 100 will support data retrieval from meters and sub-meters through the mediator 1102, which may serve as a unifying platform for intelligent and connected buildings. The mediator 1102 also can connect to building automation and other building sub-systems, including lighting and security, via its Multi-Protocol Exchange (MPX) platform and framework.

[097] Key Performance Indicators Tracking

[098] The system 100 tracks data points such as temperatures, flow rates and weather conditions as interval data points. The system 100 will store this information with a timestamp, point value and data quality rating for each collected point/interval. The system 100 can then normalize time values into any interval the user desires to align points for output/reporting.

[099] Most key performance indicators (KPIs) are the result of calculations based on these data values. The system 100 can calculate ongoing consumption and operating cost rates (e.g., $/hour) at the desired data collection rate (e.g., every 15 minutes) or via KPIs normalized by size (e.g., Btu/square foot). In addition to cost and consumption-based KPIs, comfort and indoor air quality (IAQ) indicators are available to show how well the system meets thermal comfort and ventilation requirements.

[0100] Utility/Equipment Data Retrieval from company Enterprise Applications and External Resources

[0101] Through systems integration, the system 100 may retrieve data from existing company enterprise applications or external resources. The system's open, service-oriented architecture (SOA) can interface with existing company enterprise systems to deliver a fully-integrated energy and maintenance management solution.

[0102] The specifics of the communications link will depend on the system's details. The system EEMS will be able to read and extract data from SQL-compliant databases (e.g., OracleDB, SQL Server, MySQL), subscribe to a Web services data feed, or build a custom interface, as required. The EEMS may be linked to or import data from existing databases and Excel files and process other flat files in formats specified by the utility company. These may be continuous feeds or regularly scheduled updates (e.g., daily, monthly).

[0103] Data Transfer and Uploads into the EEMS Data Repository

[0104] The system solution collects and transfers data via the mediator 1102. The mediator 1102 integrates, collects, logs and exports information into the EEMS data repository either through the internet via a routed network (e.g., the postal system routed network PRN) or by using a built-in cellular wireless link. Data is aggregated locally on the mediator 1102, and then transferred at specified frequencies over the active communication link. The EEMS receives the data via Web service and processes and loads it into the database in real-time. Thus, the system EEMS supports real-time access to facility metering data via the mediator 1102 HTML and XML (AJAX) Web page dashboards and Graphical User Interfaces (GUI) and up to one minute to the EEMS data exported Network Operations Center.

[0105] Data Normalization (Weather and Time Series/Interval)

[0106] The database architecture may be based on the need to manage interval data and normalize it on a time basis from many different resources (metering systems, building automation systems, weather, eFMS, UMS etc). The database may manage data of any frequency, whether it will be in set intervals or collected on a change-of-value (COV) basis. The EEMS will align data from different

sources with a uniform time coding system so that values can be normalized to whatever interval the EEMS user chooses to display. In agreement with industry proven practices, the system will perform weather normalization as part of the Baseline Energy Record and various tracking and analysis reports included in system EEMS.

[0107] Calculation of Key Values for Interpretation of Consumption and Cost Information

[0108] The system EEMS may include a calculation engine that facilitates performance of nearly any type of calculation at 15-minute intervals. Example calculations include normalized usage and cost parameters, such as Btu/square foot, to facilitate comparisons across facilities. The EEMS will derive the cost data from integration with a bill consolidation platform that provides indices such as cost/square foot or consumption/hour.

[0109] 2. Data Collection and Connectivity

[0110] Data Collection and Connectivity Requirements

[0111] Data Collection/Transfer With and Without Connectivity to the network

[0112] The system solution will accommodate any company's connectivity requirements:

[0113] In cases where a routed network connectivity is not available, the mediator 1102 will use an on-board dial-in/dial-out modem for communicating to a remote monitoring system via wireless cellular or other connection mechanism.

[0114] In cases where routed network connectivity is available, the mediator 1102 will not require any additional network infrastructure beyond a connection to the network. From the perspective of an IT manager, no difference exists between a mediator 1102 and normal Web traffic.

[0115] The system solution will confirm that data security through Linux-based security features that include packet filtering firewalls, secure shell, SSL, IPSec and data logging. The mediator 1102 firewall uses the Netfilter packet filtering subsystem built into the Linux operating system. It will support the secure shell protocol, which will provide strong authentication and secure communications over insecure networks such as the Internet. SSL will facilitate encrypted transmission of data between Web browsers and Web servers. The IPSec

protocol will provide security in network-to-network connections. It will provide access control, data integrity, authentication and confidentiality for secure private communication across insecure public networks such as the Internet. Data logging will record a variety of connection attempts and authentication requests to determine if there is an attempt to access information without authorization.

[0116] Communication Data Rates, Speed and Volume

[0117] The system solution will have little impact on network traffic. The mediator 1102 only transmits the value associated with a data point when that value changed. This will reduce strain on the network.

[0118] For connections to existing building automation systems, data rates above the controller may be 100mb TCP/IP, while data rates below the controller will increase all possible throughputs from the legacy systems. Data rates below the controller will depend on the actual installed legacy systems. The mediator 1102 will translate these disparate systems' physical layers, communications protocols and data network speeds (baud rates) into a high speed IT standards object model.

[0119] Data Collection Requirements

[0120] List of Data Points Collected by system EEMS for Each Facility

[0121] The system EEMS may collect a wide range of data points to perform operational analysis, corrections, and measurement and verification (M&V). The system will attempt to collect every existing networked data point in a facility.

[0122] The following list represents a subset of additional operational points the EEMS collects:

[0123] Space temperature setpoints (min/max, occupied/unoccupied)

[0124] Space/zone occupancy status

[0125] Variable air volume system (VAV) operational data such as supply air temperature, reheat valve position, heating mode, reheat valve type, supply air setpoints (min/max, heating/cooling, occupied/unoccupied), air flow, damper position, etc.

[0126] Variable frequency drive (VFD) operational data such as speed, fan optimal start/stop, warm-up, etc.

[0127] Air handler units (AHU) supply/return/mixed air temperature, outside air temperature, return air humidity, etc.

[0128] Hot/chilled water supply and return temperature, hot/chilled water flow, cooling valve position, hot water valve position, lockout temperature, etc.

[0129] Duct static pressure and static setpoint

[0130] The system platform may provide the ability to determine required data collection durations and customize this upon request. System controllers extract data in instances where on-board controllers cannot transmit data.

[0131] Criteria, Logic and Level of Data to be Collected

[0132] The system may collect all available data points. The system 100 collects data in support of operational analysis, recommended corrections, and M&V activities. The system uses utility consumption and weather data for building performance analysis, baseline and benchmark calculations, and M&V tracking. The system may use operational and facility data points to understand at a holistic level the performance of each facility regarding comfort, air quality, and energy and operational efficiency. The system may use equipment inventories to measure energy consumption at the equipment level and rank the impact of improvements. In the end, every data point generated within a facility may be used by the system, which may attempt to collect that data on a frequent basis for EEMS.

[0133] Justification and Cost/Risk Benefits for Metering & Sub-metering

[0134] The system may be expanded by adding additional metering after analyzing the available data. If a modern digital control system exists with data readily available, then additional metering may represent an unnecessary expense. This approach to making the best use of existing equipment and control systems represents a change in the way the organization can make decisions using the system. Note the recurring system theme of using data and facts to make business decisions, versus investing in additional assets that may be unnecessary for achieving benefits.

[0135] For older facilities, inexpensive sub-metering can provide additional information without the expense of a full control system upgrade.

[0136] Data Collection and Frequency Schedule

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[0137] The system EEMS solution will meet the company minimum requirements and offers an even better data collection capability. The system may collect real-time data, which may be defined as having a one-minute interval. The real time collection interval is adjustable, e.g., up to a 15-minute interval or other interval. The table below lists a specific data collection and frequency schedule example.

Company EEMS Requirements			System Solution
Categories	Type/Unit	Requested Frequency	Data Reading Frequency
Electrical	kW, kWh	15 minutes	real-time
Natural Gas	CCF	15 minutes	real-time
Water	gal.	15 minutes	real-time
Steam	lbs., mmbtu, F degree, psi and mmbtu	15 minutes	real-time
Chillers	kW, tons of cooling, F degree, flow rates	15 minutes	real-time
Boilers	Fuel use, steam/hot water production, auxiliary load (pumps, blowers and fans)	n/a	real-time
Room/Zone Temperatures	F degree	n/a	real-time
Indoor/outdoor Temperatures	F degree	n/a	real-time
Load Consumption	Peak demand, date/time of peak consumption, etc.	n/a	real-time
Power Outage Information	date/time and restoration	n/a	real-time
Instantaneous Demands	watts, vars, volts, amps, kVA power, factor, etc.	n/a	real-time
UMS data	Utility data	daily	daily
eFMS data	Facilities inventory information & energy related projects	as needed	as needed
MTSC data	Maintenance Contact Information	monthly	monthly

[0138] EEMS Data Storage Capability for 15-Minute/Hourly Real-time Access and Reporting

[0139] The system solution may deliver real-time access and reporting of collected data. For most points, the system may poll at one-minute intervals. However, data is generally stored at the data collection rate. This means 15-minute interval data is stored every 15 minutes, and hourly data is stored hourly. Data that infrequently changes (e.g. set points) is stored only when changed. No limit to the number of points collected and stored exists. Not only will the EEMS meet company three-year archiving requirements, but it also will extend the time requirement at the company request. The database architecture will not impose a performance penalty for increased volume of data storage.

[0140] Item 3.2.2.1 Metering and Sub-metering of Major Systems

[0141] Meter, Sub-meter, and Pulse Data Collection and Analysis

[0142] The system EEMS will collect data at each facility by installing a mediator 1102. The mediator 1102 currently supports standard protocols such as BACnet, Modbus, LonTalk, SNMP and dozens of proprietary current and legacy protocols of control equipment and building automation systems. The mediator 1102 can be configured quickly to the appropriate protocols, making building sensor and controller information available to centralized analysis applications in a common format. The mediator captures data elements from these systems.

[0143] Overview of Proposed Metering/Sub-Metering Solution

[0144] The system solution will include required metering and/or sub-metering infrastructure as requested, meeting or surpassing the company's data collection requirements. This infrastructure will be connected to a facility mediator 1102 to provide connectivity to the central EEMS.

[0145] Integration of Meter/Sub-meter into Existing company and Utility Equipment

[0146] The system will connect to utility-owned equipment via a KYZ pulse output for electric that can be installed on the utility IDR meters, and pulse outputs for gas and water. The system may maintain a real-time connection at each site with all assets required to meet these specifications.

[0147] Installation includes labor, materials, equipment and incidentals required to configure and integrate the EEMS systems including mobilization and setup, data collection, equipment and storage, communications linkage to EEMS data repository, and an established web interface to dashboards and reports. Installation may also include connection to one (1) utility provided meter pulse outputs to Mediator panel (wiring 100 feet or less), connection to one (1) utility provided pulse output from water meter (wiring 100 feet or less), connection to one (1) utility provided pulse output from gas meter (wiring 100 feet or less), installation of two (2) Modbus outputs from electric sub-meters, (less than or equal to 400 amps, wiring 100 feet or less) connect from customer provided Ethernet to Mediator panel (wiring 100 feet or less).

[0148] Maintenance & Repair Support for Installed Metering Equipment

[0149] The system 100 may be managed through the system Network Operation Center (NOC) and may manage service requests via the EEMS.

[0150] Additional Data Points

[0151] For each equipment type (RTU, VAV, AHU, etc.), the system may identify the minimum point types required to evaluate existing operations. Beyond those, the system will determine on a case-by-case basis if it can obtain more actionable information from additional points. As a rule of thumb, the system may pull all available points, because the more points available, the more powerful the analysis. Generally, though, point lists are not generic; they are identified on an equipment-by-equipment and/or system-by-system basis since the individual manufacturer, model, controller, and system design affect point recommendations.

[0152] Calculated Energy Requirements

[0153] Calculations, Parameters & Algorithms Supporting Identification of Anomalies & Diagnostics

[0154] The system 100 creates and displays a virtually unlimited number of calculations of almost any complexity. The EEMS will store and manage the calculation results in the same way as other interval data points, including viewing, reporting and further analysis, or even as a factor in another calculation. When the company adds new calculations to the system, the calculation engine

will go back to the earliest point where all factors are available and can perform the calculation historically, as well as the ongoing calculations every 15 minutes going forward. This will facilitate the company experimenting with different scenarios and determine the impact of a change based on actual historical operational data.

[0155] Calculations range from simple (e.g., Delta T) to complex (regression-based Baseline Energy Model normalized for weather and occupancy patterns). The EEMS may support industry standards such as indices for thermal comfort (ASHRAE 55-2004) and minimum ventilation requirements (ASHRAE 62.1-2007). The ventilation index is an example where the system first will integrate data from external systems (space planning data for room sizes and uses).

[0156] Algorithms and Options for Customization/Expanding These Algorithms

[0157] The system may implement numerous defined algorithms (e.g., delta T, pump brake horsepower, variable speed drive kW, cooling tons, make-up water Btu, heating coil MBtu). These operate by specifying the data points (or constant values) to use as calculation factors.

[0158] The EEMS will provide the company with options to customize its calculations. Users typically need this capability for more complex calculations where the system design will affect the calculation requirements. For example, calculating the CFM of outside air delivered to a specific room depends on the air handler design and available data points from the control system. The calculation engine also will allow company users to add entirely new calculations to the system.

[0159] Data Feed from Local Airport/Weather Station for Energy Data Normalization

[0160] The EEMS may collect local weather data at the facility level by using standard Web services provided by NOAA's National Weather Service. It will normalize weather data to the NOAA standard if drawn from an alternate source.

[0161] EEMS Interface with company Enterprise and External Systems (eFMS, UMS, MTSC) & Frequency of Data Transfer, Storage and Analytics

[0162] The system will integrate with existing company systems via standard interface protocols through its open, SOA architecture. The system design

facilitates a rapid, low risk and seamless integration with these various systems. Details on the form and complexity of the interface depends on the systems, but the system EEMS may accept these systems' data at appropriate frequencies and volumes. The system 100 may include automated interfaces to the external systems where the system may scan for data updates to these systems. The system may then be able to transfer data easily as it is updated, at whatever frequency is required to build a complete picture of facility operations.

[0163] Calculation of Initial Cost and Consumption Baselines and Demand Profiles

[0164] The system 100 may generate a Baseline Energy Record that is a formal baseline of energy usage. To that end, the system 100 may implement an energy model such as that shown in U.S. Patent #5,566,084 to normalize for weather and occupancy variables. The baseline calculations may employ at least 12 months of utility data and corresponding weather data, with 24 or 36 months of data preferred, and can use any level of detail from monthly utility bills to 15-minute interval data. Thus, access to utility billing data will facilitate the system to provide immediate analytical value.

[0165] The Baseline Energy Model calculation may use a polynomial regression methodology that factors in weather variables and occupancy patterns (weekdays/weekends, etc.), which is important at company facilities that are not 24x7 operations. Each utility meter has its own baseline model. Once calculated, the models may be converted to common units (e.g., MBtu) and mathematically combined for a total building energy baseline. (Water use also has a baseline model, but is not part of an energy total.) The system interface includes roll up baselines and benchmark the resulting performance against other facilities, districts, areas, or to the national level. The Baseline Energy Model may provide the basis for forecasting and budgeting, M&V, and greenhouse gas tracking.

[0166] Collection Process of Historical Utility Data That is not Available in UMS

[0167] The system may gather utility bill and time of use (TOU) information. With the a company-supplied Letter of Agency, system implementers may acquire historical data from the local utility companies, which the EEMS can load directly into its repository to fuel baseline calculations.

[0168] EEMS Capture and Storage Capabilities of Maintenance Contact Information

[0169] The system EEMS will store maintenance contact information and other company organizational data at various levels of the facility hierarchy. EEMS will store national, regional, and facility specific information as meta-data attached to each node in the company facility network.

[0170] Integration of building automation and lighting systems (and any future such systems) are a core function of the system platform, and require no additional infrastructure beyond the initial installation of the mediator 1102.

[0171] Integration Capability through the Use of Open Communication Protocols

[0172] The system platform is open, as defined by modern IT standards. No additional downloads are required. The system platform may be DHTML, dynamic XML, and AJAX both at the NOC and mediator 1102 (local site) level. The platform is open on both the I/O side and the GUI, and the data is bi-directional. The mediator 1102 Multi-Protocol Exchange (MPX™) software framework normalizes both IP and legacy serial based protocol. The mediator 1102 supports building systems standards like BACnet, Lonworks, Modbus, and SNMP. The mediator 1102 supports IT and networking standards like TCP/IP, HTTP, HTTPS, FTP, and SMTP. This facilitates for intra-protocol communication and uniform application of services such as logging. This also facilitates the common presentation of information from all intelligent machines found in buildings.

[0173] The system's open architecture supports proven building systems engineering and selection which will work well with company's advised plan to add and upgrade lighting control, building automation and metering systems. The open architecture also supports proven enterprise applications, services and service providers never locking company into one proprietary provider or building systems manufacture. The system open architecture will empower company with choices and ultimate flexibility in engineering and procurement.

[0174] Company EEMS User Interface

[0175] Item 3.3.1 Dashboard

[0176] Dashboard Features and Functionality

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[0177] The system user interface (UI) is a rich internet application (RIA) that provides an interactive framework for viewing dashboards and reports. The UI will present a holistic overview of facility performance by combining key items such as scorecards, recommendations, alerts, and energy/equipment data into a common format. Additionally, direct integration with the system NOC will permit real-time data analysis of HVAC interval data and energy consumption.

[0178] The EEMS dashboard has three main views: trends, real-time monitoring, and analysis. Each has a set of customizable dashboard elements relevant to the specific view. The user can select the data elements he/she wishes to analyze on their dashboard dynamically by clicking on a list of available elements and dragging the element to the frame. This will allow comparison of similar equipment or facilities, for example.

[0179] The EEMS has the ability to tailor the list of dashboard elements for each user based on their profile and privileges. An executive profile, for example, may have access to operating expenses, energy savings, and enterprise-wide energy consumption. A facilities manager may have access to building energy consumption, room comfort, and costs. An operations engineer may have access to detailed HVAC or Air Handling Unit interval data.

[0180] In addition to the dashboard, the system provides the user with additional insight and complimentary content, such as geographical analysis, financials, alerts, and relevant news.

[0181] System Navigation and Available Customized Views

[0182] The system EEMS has user friendly navigation that begins with a secure user sign-on. The system will authenticate the user and return the user profile, in addition to the user's customized view of dashboard elements. The user will navigate between each dashboard view by clicking on the respective dashboard tab.

[0183] Each dashboard element will have a collapsed and expanded view. By clicking on an individual element, the element will expand to a larger view. In certain cases, the expanded view will permit user interaction. Examples of user interactions include (but are not limited to) increasing the time axis on interval or

meter data, entering new dates, browsing to view data on a specific machine or system.

[0184] List of System Generated Dashboard Elements

[0185] Dashboard elements may include the following elements:

[0186] 30 day rolling consumption

[0187] 30 day rolling demand

[0188] Worst meter consumption

[0189] Worst meter demand

[0190] YTD energy costs

[0191] Savings

[0192] Baseline Energy Record

[0193] Calendar View Consumption versus Baseline/Cost

[0194] Tracking versus Baseline Energy Record

[0195] Dashboard Identification and Alert of Abnormalities Features

[0196] The EEMS dashboard includes the following capabilities to detect abnormalities, identify predictive maintenance and provide actionable information:

[0197] Real Time Interface: A user will be able to select a certain number of data values or formula results for any combination of machines or systems and then view them on a real time page with any active fault information. This will be valuable if a technician wants to view the data values together. The real time interface will facilitate a user to proceed through timestamps for items that do not connect in real time.

[0198] Interactive Graph: After configuration, a fault will link to an interactive graph. The user will be able to select from one of the time ranges on which the fault occurred or will enter a customized range. Pre-selected values and a multiple graph template will load, which will provide more information about that particular fault. The user can modify the interactive graphs to analyze the problem further or to create a new graph.

[0199] Interactive Graph Features include: This includes the ability to plot the graphs at once; the ability to graph any stored data value or formula (even with different conversions such as C or F for example); and the ability to zoom or

~~expand into the graph with the mouse, scroll forward and backward in time, draw trend lines, and save or email graphs.~~

~~[0200] Alerts: The system EEMS will generate and display alerts based on faults that the analytics will identify. These faults could range from machine level maintenance issues to zone comfort or performance issues and to holistic facility wide energy management issues (such as a Demand Response event or a significant change in local energy prices)~~

[0201] Reporting

[0202] The system 100 may implement the following Reports and Reporting Points:

system EEMS Reporting	
Greenhouse Gas/Carbon Footprint --SWAG conversion (CO2/kWh, etc.)	--Periodic Carbon Footprint Report
ENERGY STAR Reporting Baseline report with weather normalized data Energy consumption profiles matched with operational characteristics Energy metrics - i.e. ENERGY STAR benchmark score, btu/SqFT Benchmarking reports - i.e. past vs. current performance, industry average, best practice, etc. Periodic survey results reports Periodic audit reports	Energy Summary/Usage Report (i.e. Dashboard Reports) Current Reading/Current Reading Summary Daily Comparison/Daily Comparison Summary Daily Consumption/Daily Consumption Summary Electric Utility Monthly Consumption /Electric Utility Monthly Consumption Summary --Benchmarking reports Historical Energy Comparison Report Portfolio benchmarking Report Building Pattern of Operations - i.e. TOUs consumption data
Monthly and Annual Overall Energy Consumption Reports All utility consumption Energy usage index (EUI) in Btu/SqFt Weather normalized data per facility	Energy Summary/Usage Report (see above) Building Energy Use Comparative to Baseline Building Operations Scorecard Systems (BOSS) reports Room Summary/Detailed Scorecard
Performance Analysis --Comparison of developed EUI to normalized baseline budget per facility	Reporting Dashboard Energy Summary/Usage Report (see above) Actual Energy Costs vs. Budget Amount Summary Report

Equipment Analysis Reports Sub-meter data of power feed to the equipment load in kW compared to predetermined operational threshold Associated system temperatures and/or equipment operation for major equipments	BOSS Reports (see above) Interactive AFDD Reports (refer to question d above) Fault Summary Report System/Sub-system Scorecard
Exception/Variance Reports by facility and equipment type	BOSS reports (see above) Interact AFDD reports (refer to question d above)
Measurement & verification plan report per facility List of installed Energy Conservation Measures (ECM)\ Installed ECM compared against weather normalized baseline data Energy savings calculation based on historical billing data	Baseline Development Reports Building's Savings Potential Based on Benchmark Comparison

[0203] Type of Report Definition

[0204] The reporting Dashboard may show a top-level view of most critical energy management elements that will facilitate users to drill down information to site level.

[0205] Periodic Carbon Footprint Report: provides monthly/quarter/yearly carbon measurement of energy consumption per facility/region and/or of the enterprise real estate portfolio

[0206] Energy Summary provides energy consumption information summarized by site, type of building, and type of energy

[0207] Usage Report includes the usage data displayed as the daily average of the total usage in a billing cycle.

[0208] Benchmarking reports include:

[0209] Historical Energy Comparison Report shows comparison of energy usage between the prior and the current years and

[0210] Portfolio Benchmarking Report shows Comparison of energy usage among similar buildings within the enterprise portfolio (per region or at the nation level) and/or against industry best practices

[0211] Building Pattern of Operations – i.e. TOUs consumption data demonstrates TOU consumption pattern and long term energy consumption in kwh/day and cost trend ($/month)

[0212] Building Energy Use Comparative to Baseline consists of annual/monthly snapshot cost at the baseline level and unit energy cost ($/SqFt) per facility

[0213] Building Operations Scorecard Systems (BOSS) reports

[0214] Room Summary Scorecard contains ranking of room portfolios within a facility/building based on comparing their actual performance against the facility/building service level objectives — i.e. comfort, efficiency, and operations

[0215] Room Detail Scorecard shows each individual room, organized by air handle and the pass/fail ratings and indication of which operational data led to failure ranking

[0216] Actual Energy Costs vs. Budget Amount Summary Report displays graphs up to 12 months' worth of data in one report

[0217] Web-based Exception Reporting and Alarming provides a list of alarm and

[0218] Interactive AFDD Reports

[0219] Fault Summary Report contains advanced sorting capabilities for a summary of quantity of faults identified by the location and machine or system within any selected specific period. It also lists fault descriptions, severity ranking, and the fault monetary impact. This information helps prioritize corrective actions

[0220] Subsystem Scorecard includes assessment results and explanation failure rankings of various primary and secondary systems and equipment throughout the building, such as air handlers, chilled water, steam and hot water, pumps, heat recovery units, etc.

[0221] Baseline Development Report contains weather-normalized energy consumption based on regression analysis

[0222] Building's Savings Potential Based on Benchmark Comparison comprises measurement and verification information — i.e. before and after savings and median savings — per facility that has implemented Energy Conservation Measures

[0223] Trend Analysis and Benchmarking Reports Capabilities

[0224] system EEMS performs trend analysis and benchmarking by creating sophisticated graphics from interval data stored in the repository. Graphics for trend analysis include, but are not limited to time-series daily load profiles, multi-daily profiles, averages, highs and lows, point overlays and 3-D charts. The EEMS also provides a monthly consumption profile during a fiscal/calendar year or comparison of these monthly profiles over the years. These graphics will facilitate the company to analyze their building performance quickly over time.

[0225] The EEMS will generate benchmarking reports by plotting whole-building energy consumption for each building in a bar chart. The company also will have options to compare their facilities by size, climate zone, building types, and will be able to benchmark their portfolio to industry proven practices and typical industry benchmarks such as annual energy use intensities (EUIs), etc

[0226] Ad hoc Reporting Capability

[0227] Users will be able to customize and design trend analysis reporting for interactive, ad hoc usage. Users can create reports with a simple drag-and-drop interface and save the results, if desired. Users may export data and charts into Excel, .csv, or other common formats. Additionally, for users with limited access, predefined reports will offer a variety of selection criteria and will be downloadable into a variety of formats, including PDF, XML, .csv, and Excel.

[0228] Software for Accessing the Dashboard

[0229] Users may access the dashboard through a standard Web browser with Adobe Flash player to access the system EEMS.

[0230] Greenhouse Gas/Carbon FootPrint and Energy Star Reporting

[0231] The system EEMS will be able to track greenhouse gas (GHG) emissions and identify options for carbon footprint reduction, including priority areas, reduction initiatives, and timeframes to achieve results with a reasonable commitment range. The methodology may be aligned with GHG protocol and

Carbon Trust approach, system can assist the company with Greenhouse Gas/Carbon Footprint and Energy Star reporting by:

[0232] Providing carbon equivalencies (with select REC products) and annual reconciliation reports based on actual utility billed usage.

[0233] Public relations management through joint press releases, press events, and alliance acknowledgements.

[0234] Assisting with applications to the EPA Power Partnership Program or to the CRS/Green-e Logo Program (if applicable) to the Energy Star Certification and/or Partnership Program, EPA Power Partnership Program or to the CRS/Green-e Logo Program (if applicable).

[0235] EEMS Capabilities to Accommodate the company Geographical Hierarchy & Equipment Analysis

[0236] Data configuration supports both functional and geographical hierarchies. The system will support an array of hierarchical views of the underlying data that the company can organize on a geographical or equipment basis. The system will roll up Baseline Energy Models, tracking and reporting by facility/geography, department, or utility type, etc. Similarly, the Building Operations Scorecard analysis with summary level reporting can roll up by geography, equipment types, or building functions, etc.

[0237] Integration Capability through the Use of Open Communication Protocols

[0238] Performance tracking reports will compare operations against the Baseline Energy Record. These reports will provide ongoing measurement and verification of operational performance, normalized for weather and occupancy/schedule variations.

[0239] Remote Monitoring & Analysis Operational Support

[0240] Certified Energy Managers

[0241] The system may be operated or monitored by two full-time, on-site, certified energy managers.

[0242] Remote Monitoring & Analysis and Diagnosis

[0243] Notification, Escalation and Verification (auto-correct) Process

[0244] As shown in Figure 13, system's EEMS supports threshold-based alerting and notification 1300 of raw input data and data derived through the analytics

engine. The user can configure threshold criteria. The system EEMS incorporates notifications and prioritizes them based on customizable business rules. These notifications can be integrated into a users work queue.

[0245] Detailed Automated System Functions and Repeatable Processes

[0246] The flexible EEMS user interface facilitates a user to manage directly his/her alerts and the notification process. Alerts and notifications are integrated into the user's work queue, permitting detailed tracking and resolution of alerts.

[0247] Overview of Business Rules and Data Configuration

[0248] The first step in the monitoring process will be configuring site data, meter data, temperature data and utility data into monitoring groups. The EEMS will process these groups automatically, making them quickly accessible for visual review.

[0249] The business rules may be based on standardized set points and proven practices, as agreed in discussions between the system and the company. Typically these rules are organized around a balance of comfort, efficiency and operational performance. The AFDD (Automated Fault Detection & Diagnostics) system can be configured to send alerts and notifications automatically, based on these business rules

[0250] Business Rules for Detection of System Anomalies and Corrective Measures

[0251] system EEMS will apply business rules in a systematic manner to identify common issues that drive inefficiencies. The BOSS energy scorecard system will identify issues associated with Comfort, Efficiency and Operations indices. These indices are created on a room-by-room basis, allowing for granular detection of system anomalies, and the illumination of a clear path to apply corrective measures.

[0252] Key Outputs of Reactive and Proactive Monitoring and Analysis

[0253] The EEMS for the company is created to achieve the right balance of comfort, efficiency and improved operations. Outputs take the form of identified problems rooted in hardware or programming. Built-in mediator 1102 capabilities will identify and resolve the majority of programming issues remotely. Maintenance personnel will correct identified hardware issues, whether

mechanical or electrical/electronic. The associated work order will include detailed information about the identified problem so that problem resolution is rapid and straightforward. The solution will then confirm that the work undertaken resolves the identified problem.

[0254] Process for identifying, recommending and prioritizing

[0255] In general, priorities are based on the level of effort (labor and materials) to achieve design intent. Priorities may also be determined by a collective decision of the EEMS and the facility representative. The highest priority fixes are typically those with the least cost and greatest impact.

[0256] Scorecards may be Re-run periodically to assess building operations by their key performance indicators. The scorecard will determine areas for operational concentration. Simultaneously, the AFDD system will identify equipment issues in advance of failure, turning reactive maintenance events into proactive ones.

[0257] The system 100 may prioritize Energy Efficiency Measures (EEMs) and demand management opportunities based on the level of effort (labor and materials) to achieve the predicted level of impact. This business case will be shared with and approved by the facility representative. Highest priority fixes are identified by the highest level of potential positive impact. The system would achieve and maintain optimum building performance through the use of baselines and scorecards. The system may periodically and automatically rerun standardized scorecards to assess the building operations against key performance indicators. The scorecard will determine areas for operational improvements focused on comfort, operations, and efficiency. Simultaneously, the AFDD system will continuously identify equipment inefficiencies in advance of failure, turning reactive maintenance into proactive maintenance.

[0258] EEMS Capability to Implement Recommendations

[0259] system may, as examples, implement recommendations in one of two ways. system could implement most software changes through remote access/control of a facility's systems using the two-way communication capability of the Mediator™, system could also implement fixes that require physical corrections through its established national network of maintenance personnel

(assuming that the company prefers that the system implement the changes instead of the company employees).

[0260] Cost Estimating and Budget Forecasting

[0261] The Baseline Energy Model builds on cost estimating and budget forecasting. The EEMS creates the model using historical energy usage, weather and schedule data. It develops an energy/utility forecast using the energy model, anticipated weather (with ranges for more extreme and more moderate weather) and expected building occupancy schedules. The last step applies building tariff information and targeted energy savings to determine the utility budget.

[0262] Minimal Requirements for the company Involvement

[0263] the company implementation team supporting the project would include project managers to coordinate with local offices, regions and project personnel. Some personnel would obtain engineering information about sites and re-integrate findings into the company engineering organization. The system does not require the company to provide its own resources for installation, programming, service, maintenance or controls system repair.

[0264] the company' support with giving vendors access to its facilities is a key factor in the project's success. This would help define communication methods, establish connectivity and perform initial validations. the company would need to provide standard operating guidelines such as sequences and set points for each facility so that the system can to measure and verify compliance and performance. Helping the system understand the company' existing processes for managing and solving faults is important to the joint success. The company may also help with setting the financial thresholds and business rules to trigger specific work activities.

[0265] Ability to Plan and Implement Measurement and Verification (M&V)

[0266] Process and Prior Experience with Tracking, Validating and Reporting M&V

[0267] The system may have the capability for Measurement and Verification (M&V) of "installed energy conservation measures." One approach would be to establish a baseline and then track numerous quantitative measures of building health and efficiency (efficiency, comfort, and maintenance). The system may

base the method for measuring a wide range of performance factors on indices that track thermal comfort and ventilation based on ASHRAE standards. The system may track these factors in addition to tracking the traditional power and efficiency indices (i.e., kWh, kW, Therms, Btu/square foot, etc.).

[0268] The system uses a combination of utility bill, utility time of use data, whole meter data, and 15 minute building control data to analyze building operations and to find and verify energy savings. Each data source provides insights into building operations and energy reduction opportunities. The system will track system change recommendations against a baseline set using a standardized methodology. This confirms that the system will verify and track results against a pre-determined goal.

[0269] As the company requested, the system may calibrate the baseline to the FY2003 utility bills. The system may normalize the baseline by using additional inputs such as weather independent load and cooling/heating loads.

[0270] The system provides data rich methods for tracking system performance should not require sub metering. With information already available through existing sensor systems, the system can calculate the energy consumption in the building systems easily and accurately. The system may use sub meters selectively should the company wish to isolate lighting, postal equipment, and miscellaneous plug loads.

[0271] The system may provide the following post implementation support services:

[0272] Help Desk (at Network Operating Center)

[0273] A multi tiered help desk will augment the support team with skilled resources to resolve user needs quickly. The Post Implementation Support team will provide customer support throughout the deployment cycle.

[0274] System Maintenance & Enhancement

[0275] Some issues and requests may need system changes through configuration or code changes. The system application maintenance resources will triage problems to assess priorities, and then will begin completing the work using the extensive tools, resources, and knowledge capital available to them.

[0276] Subject Matter Advisors' (SMA) Support

[0277] system SMA/E supports are ongoing throughout the project deployment until the end of the service contract. Their primary roles to provide in-depth energy management analysis whenever necessary

[0278] Risks and Possible Constraints

[0279] The system may be implemented with a standardized project management process to provide a smooth startup and will extend through the initial pilot of any number of buildings and the subsequent rollout to any number of additional buildings. System implementation schedule often depends upon:

[0280] Access to building facility managers

[0281] Limited building control system documentation (site plans, control drawings, etc)

[0282] Uncommon protocols not currently supported by more than 65 interfaces built into the mediator 1102

[0283] mediator 1102processing ability across devices installed on oversaturated networks

[0284] Operational back-up and maintenance/repair plan in the event of system outages or lost communication

[0285] The system NOC may operate 24/7 and will receive immediate notice in the event of communication loss to a facility. The system will monitor connectivity and data storage continually and confirm that the system sends out automated SMS, email, RSS and phone call notifications to a designated list of people who can solve or further investigate the issue. The system will use local and regional affiliates to provide efficient response times for any level of support. It also can integrate the response system into the existing the company incident tracking system, if appropriate.

[0286] system employs robust technology at the control level that is highly resilient to loss of power or external communications. In the event of power failures, the mediator 1102supports optional gel cell battery, on-board trickle charger, and uninterruptible power supply (UPS). The mediator 1102 will continue to log data locally until issues are resolved.

[0287] Role and Responsibilities of Program Manager(s)

[0288] The system implementation may engage a program manager (PM) to direct and coordinate the activities within an EEMS program rollout to obtain high efficiency and economy of operations. He or she will manage all contractors. The PM will have a complete and thorough understanding of energy management and will have a deep knowledge of large EEMS implementations. The PM will interpret, organize, execute and coordinate assignments. The PM will make decisions about the budget and all program-relevant issues. He or she will escalate strategic issues to the program sponsor for joint decision-making.

[0289] The PM's primary responsibilities will include:

[0290] Developing and maintaining the rollout schedule with program priorities

[0291] Developing and managing project scope, budget and schedules in accordance with approved plans

[0292] Allocating and managing project resources

[0293] Monitoring progress of and providing support for global efforts and implementation programs on a weekly basis

[0294] Reporting on status and performance

[0295] Managing alliance partners, contractors and subcontractors

[0296] Resolving outstanding risks and issues

[0297] Developing necessary communication and training material

[0298] Question j—Proposed EEMS Open Architecture

[0299] The mediator 1102 design is based on open systems and technologies, including the Linux Operating System, standard RS-232 and RS-485 communication ports, Dallas 1-Wire bus ports, 10/100 base TX Ethernet connectivity, support for a wide range of TCP/IP related protocols including UDP, TCP, SMTP, IP, FTP, HTTP, HTTPS, SNMP and more. The mediator 1102 supports data retrieval by communicating wired or wirelessly to the meter/sub-meters and via more than 65 protocol drivers that the mediator 1102 supports.

[0300] The data warehouse, data analysis tools, publishing, reporting, GUI, and other tools/protocols may meet any standard.

Protocol	
Description	Example
Operating System	Microsoft Windows, Web (Microsoft or Linux Servers)

Database Managemont	SQLServer, Oracle
Data Collection	OLE, BACnet, LonWorks, Modbus
Data Analysis Tools	Excel, CVS, PDF, Access
Publishing	Microsoft Office (Excel, Word, PowerPoint), XML, HTML, PDF
User Interface	Web
Other protocols	XML, Web Services, TCP/IP, SQL

[0301] Open Architecture Solution

[0302] EEMS Open Architecture

[0303] The system has designed and built every aspect of the EEMS architecture and platform using the latest development methodologies, open protocols and advanced technologies. This begins with the mediator 1102 and its ability to connect seamlessly to existing and often proprietary protocols of Trane, Barber Coleman, Invensys, Johnson, Staefa, etc. Building data accessed through this device is Web facilitated and securely transmitted to the system NOC. Advanced data services and analytics platform then manages the data. The NOC is built on an SOA, and the portal capabilities facilitate the clients to access data easily and drill into more advance analytics to monitor and manage their buildings' performance.

[0304] These facts combine to create an open platform that isn't tied to any one supplier's proprietary protocols. the company can make software, infrastructure and capital investments independent of considerations for the system. EEMS because system's solution is free to interface with any standard or proprietary protocol.

[0305] Integration with Non-standard Equipment

[0306] The mediator 1102 supports more than 65 proprietary communication protocols for non-standard equipment. The mediator 1102 integrates into the physical device either via RS-485, RS-232 or IP and extracts the data in the framework of the Mediator™. The mediator 1102 normalizes the data and facilitates it to be moved bi-directionally back down to the building systems or

through the enterprise. Due to this versatility of the system solution, system can integrate with whatever equipment the company is using, standard or not.

[0307] Training Program

[0308] Training on the system may include a pilot and national training plan, such as the postal service Instructional System Design (ISD) Model and Training Management Procedures (resulting, e.g., in a customized two-hour training course that includes instruction on: How to Use the EEMS Reporting Tool (i.e., navigation, functionality and creating ad hoc reports) and How to Use the Reports to Manage Energy Usage to Improve Business Results. The training material will include instructor notes and class exercises to reinforce learning. In addition, on-screen help files will be available within the EEMS to support a user at time of use. Training may include the "train-the-trainer" method.

[0309] The system training may be delivered via the Web through the company Automated Enrollment System to complement the instructor-led training. According to ASTD industry learning standards, an interactive, Web-based training course can increase retention by 70 percent and reduce training time by 50 percent. This option provides an easy-to-access approach for ongoing refresher training.

[0310] Ancillary Services

[0311] The system solution will lay the groundwork for integrating all system expansions and potential ancillary services into a common, open platform. With the mediator 1102 as the hub, the company could integrate any existing or future technologies into the EEMS. The proposed solution will use existing infrastructure and provide an open pathway to future upgrades and system expansions. Future system expansions would be accomplished without requiring controller upgrades or proprietary, single-source systems or equipment. The mediator 1102 ability to send and receive data will give the company a powerful tool for remote facility control. The mediator 1102 open architecture is the sensible technology platform for seamless integration with other business systems.

[0312] Modifications/Upgrades to Standardize Operational Sequences and Control Points

[0313] No additional modifications and/or upgrades will be necessary for standardizing operational sequences and control points. The mediator 1102 can connect to any existing (legacy or upgraded) system and, through its two-way communication capability, send standardized operational sequences and control points to any site.

[0314] Technical Approach for Identification, Integration, and Standardization of the company Systems

[0315] system's EEMS abstracts the data from existing and future the company systems into a common object model. This permits uniform processing, presentation and sharing of data among sub-systems. The mediator 1102 acts as a foundation layer to interface with existing building management and metering systems via its standardized and flexible array of IP-based services, while the EEMS uses an SOA to maintain high flexibility for integration into other the company enterprise software systems.

[0316] Remote Control of Equipment

[0317] Question a—EEMS Remote Control Capability

[0318] A significant benefit of system's tight integration with local control networks and equipment is the capability to configure and control securely the remote building sensor logic and control system sequencing from the NOC. All systems and data integrated into the mediator 1102 may be accessed remotely. Local mediator 1102 applications (closed loop math/logic, schedules, trends, alarms, events, Web page GUI, systems and data configuration, data exporters, ADR, and AFDD services, etc.) can be modified and enhanced remotely based on agreed business rules.

[0319] EEMS Capabilities and Deployment for Demand Reduction Strategies

[0320] system NOC can send real time pricing of electricity for ISO DR programs. The mediator 1102 can be programmed via on board closed-loop logic to shed electrical loads when the DR signal is sent.

[0321] Optimization of Equipment Configuration

[0322] AFDD can remotely improve control system sequencing (based on operational requirements, design intent and space comfort) and resolve many

control systems faults (depending on fault level). This continuous monitoring, improvement and fault resolution facilitates better equipment operations.

[0323] Preventative Maintenance and Repair

[0324] Monitoring, Tracking and Reporting Capabilities for Preventive Maintenance Activities

[0325] system may employ a thin Client Service order and project management tracking system to log, report, track and verify service deployments. The system facilitates real-time customer updates on daily service calls and large project rollouts. For all future scheduled visits, the system includes the routine maintenance items to be performed, the time allocated, and the time available to solve identified faults.

[0326] Continuous analysis and AFDD system is tightly integrated into the project management tracking system. The majority of preventative maintenance tasks are handled as "condition based maintenance" tasks. Service work orders are automatically dispatched as a product of the continuous commissioning and AFDD process. The EEMS M&V process independently verifies the performance of serviced equipment.

[0327] Scheduling and Deployment of Preventive Maintenance Activities

[0328] The Fault Resolution Scheduler (FRS) tracks and resolves faults. Faults are assigned to scheduled service visits (or expedited in cases of urgency) and are sent to the system field services. The majority of faults found do not normally justify urgent unscheduled action. The FRS specifies the action the system technician should take (investigate or solve). The FRS also estimates the time to accomplish the required action for the fault. Faults are automatically scheduled with future service visits once the FRS assigns the visit type, time and action. Actions included as part of routine maintenance are automatically assigned to the next visit.

[0329] EEMS Capability to Incorporate Electrical Signature Analysis for System Diagnostics

[0330] Level three of the system AFDD platform can handle condition based detection and diagnostics of mechanical faults using electrical signature analysis incorporating voltage and amp data. This technology works well on the company

sorting equipment. This electrical data is not often available without additional sensors on HVAC equipment. The system can apply similar technology used for electrical signature analysis to perform automated early detection and diagnosis of problems to thermodynamic data points that are often available without adding extra sensors.

[0331] List of Client Credentials for EEMS Preventive Maintenance Management Capability

[0332] Equipment Types and Application List

[0333] Process Flow Chart and Average Response Time

[0334] Figure 14 show a process flowchart 1400 for responding to work orders.

[0335] Responding to:

[0336] Emergency: 4 hours

[0337] Urgent: 24 hours

[0338] Routine: 3 ~ 5 days

[0339] Maintenance And Repair

[0340] Technicians and Engineers Deployment Capability for System Repair

[0341] The system may be supported by an extensive fleet of sign trucks and cranes operated by a highly trained professional staffs and broad nationwide affiliate network. When a work order is created in the system system, it searches a database for the appropriate technician by ZIP code. The system then narrows the search to a specific field, such as EMS controls, electrical only or sign repair.

[0342] Tracking, Scheduling and Reporting of Maintenance & Repair Activities

[0343] The FRS specifies the action the system technician should take (investigate or solve). The FRS also estimates the time to accomplish the required action for the fault. Fault details are sent to special client teams in the NOC. These teams issue work orders, obtain schedule dates, and note the cause of the problem, the repairs that they made, the repairs pending, and the parts ordered to complete the work. The teams also obtain quotes from the technician's office, obtain customer approval and complete the job. Customers can access the current status of their orders and issues within the EEMS.

[0344] Equipment Types Repaired and Repair Actions List

[0345] The system provides maintenance, repair and upgrade services for various electrical, lighting and mechanical systems. The repair services include equipment/computer design and re-build, repair of light controls, UPS systems, dedicated circuits and sub-metering troubleshooting.

[0346] Integration with Trouble Ticketing and Maintenance

[0347] The system's EEMS continuously identifies and prioritizes equipment faults. The prioritized punch list can be sent to eMARS, based on pre-defined rules. The eMARS can communicate completion of various trouble tickets for energy conservation measurement and verification purposes.

[0348] Bill Management and Payment

[0349] EEMS Utility Bill Management and Payments Features

[0350] system provides a comprehensive and industrialized solution for utility bill management and payment. The system may provide an end-to-end solution to facilitate an efficient and tightly controlled invoice processing and payment service. The system may realize utility spend reductions through auditing at scale/depth and rate analysis. The system provide flexible reporting of detailed utility data to drive future conservation and sustainability initiatives.

[0351] Integration of Utility Billing and Consumption Data via EDI 810

[0352] The system can receive and process utility bill data via an EDI (Electronic Data Interchange) transmission from a vendor. A dedicated EDI group may develop the technical relationships and maintains strict requirements for quality in the transmission and to confirm that all key data elements are received. They also monitor daily feeds/rejects for process integrity.

[0353] Value-added Interfaces through APIs or Other Open Non-Priority Protocols

[0354] The EEMS solution uses an open architecture and SOA design principles, enabling integration with endless Web services and Web 2.0 APIs. Additionally, connectivity to enterprise data stores and applications facilitates integration to ERP systems and other back-end corporate data. Value-added interfaces could include Web applications, mobile widgets (for delivery of information to mobile phones), or RSS feeds.

[0355] The information retrieved and/or delivered through these interfaces could include facility information such as utilization of the parking structure, position of

the elevators, lighting status, room reservation status/occupancy, status of blinds, sprinklers, air filters, fire alarms and a host of other facility properties. General connectivity to the Web can permit delivery of blogs, podcasts, RSS news feeds, video streams, and other data for direct integration into the EEMS portal.

[0356]

[0357] APPLICATION AND system FUNCTIONALITY & TRAITS

[0358] EEMS Infrastructure Support Capacity

[0359] The system may support an unlimited number of users and user groups effectively. It grants permissions for data access to user groups according to any of the appropriate 255 levels available for read, update, add, and delete access. Access control applies to both properties of data items and controlling hierarchical views (e.g., specific facility) of data the user can view.

[0360] System Access, Navigation and User Access Functionality

[0361] System access may require a username/password. The system supports strong passwords (length, character mix, and character repeat restrictions) with configurable options for features such as password expiration and reuse frequency. The EEMS uses role based security to determine the menu options and functionality that a user can access.

[0362] Support Services for Potential Upgrades and Customization

[0363] The proposed solution is fully scalable and compatible with almost any upgrade pathway the company could extend, upgrade, and customize the EEMS as it sees fit without being bound to any specific equipment manufacturers.

[0364] Overview of Business Rules and Data Configuration

[0365] Figure 15 outlines the business rules, controls and technology (including data configuration) to provide a secure environment 1500 for analysis and monitoring. The system also would work with the company IT Security personnel to establish and facilitate joint methods for monitoring security procedures, mitigating identified security risks, and training system personnel on the company security policies and procedures. The system plans to conduct annual review activities including self-assessments, contingency plan testing, and vulnerability scans.

[0366] Process for Data Access, Storage and Retrieval

[0367] The system may implement application security controls to govern the protection of the company data as it resides within the application. The role-permissions and user-profile definitions define user access and restrict users to only access data that their profile is authorized to see, keeping the core security principles of least privileges and separation of duties. The system would establish detailed account set-up procedures for users applying for access to the system.

[0368] Compliance Procedures for Secure Environment

[0369] At a macro level, the system may implement a security solution includes keeping the company data separate from other companies' data. Only company-cleared personnel will have access to the company data. The system has secure communication processes between the company and the solution.

[0370] The system facility may be guarded by on-site security personnel and monitored 24 hours a day, seven days a week by a private security firm. The system controls the facility's entrances by proximity control, and monitor them by closed-circuit television cameras, which record on time-lapse recorders. All user access is logged and can be tracked and reported on if necessary. Floor and server room access requires badge and card key access.

[0371] Security Policies and Procedures Compliance

[0372] The system EEMS and approach may meet any desired security policies and procedures, such as postal service Handbooks AS-895-A, Application Information Security Access, AS-805D Information Security Connectivity Process, Administrative Support Manual Issue 13, Section 272.3 Clearances and Public Law 102-569, Section 508, Electronic and Information Technology Accessibility Guidelines.

[0373] Database Security Requirements

[0374] Overview of system Information Security Policies, Procedures and Compliance

[0375] The system may reside in an environment that meets any desired security requirements and the EEMS solution may run from one of a Department of Defense (DoD) approved facility, for example, or any other systems, data centers, and facilities to meet or exceed Government data security requirements. The environment may use standard operation procedures (SOPs) to comply with

Federal privacy requirements, applicable laws, regulations, and the company policies and procedures for developing, implementing, and operating information systems. The system may deliver performance and integrity reports to provide transparency into services the system provides, including elevation of security breaches in a timely manner based on established protocols , with layers of security authentication in the solution, down to the individual user and task level.

[0376] The environment may include running a separate instance of the solution on dedicated virtual local area network. Each standard environment includes the required firewalls, LDAP and SSL. All access to the system may happen via the Internet over SSL, with transmission of data feeds via a secure VPN connection using 128-Bit SSL encryption. All support personnel may have passed rigorous screening requirements and obtained whatever required security clearance.

[0377] Data Encryption and/or Other Access Controls

[0378] All data facilities containing client information may be encrypted.

[0379] Business Continuity, Contingency and Disaster Recovery Planning

[0380] In the event of a severe impairment of operations at the NOC, the system implementation may include or would transfer operations to the most appropriate back-up site within a network of similar facilities within the United States.

[0381] The system approach may include planned, tested and documented procedures and processes to restore mission-critical business functions and avert unacceptable business interruptions in the event of an unplanned outage. The strategy places emphasis on business functions that are critically impacted. Identification of business continuity requirements early in the project provide the opportunity to develop options that minimize cost and increase flexibility by using existing capabilities.

[0382] In the event of a disaster and the implementation of the business continuity plan, the solution would support the following activities:

[0383] Identify key users included in disaster recovery activities

[0384] Develop and maintain a call tree and list of personnel authorized to declare a disaster

[0385] Develop and keep up-to-date emergency response procedures

[0386] Set up and maintain the disaster recovery site in a state of readiness

[0387] Application changes and upgrades must take into account disaster recovery plans

[0388] Infrastructure changes and upgrades must take into account disaster recovery plans

[0389] Make operating system, database, and third application software and licenses available for restore

[0390] Store vital system software and data (including the EEM application database and file systems) backups offsite in a timely manner and make them readily accessible from (remote) secured facilities

[0391] Perform disaster recovery testing using the disaster recovery site, procedures and personnel.

[0392] Backup and Recovery procedures and Offsite Data Storage Processes

[0393] MAINTENANCE AND SUPPORT FOR EEMS DEPLOYED HARDWARE AND SYSTEMS

[0394] General Maintenance including Software Enhancement and User Guide Updates

[0395] The software life cycle development and maintenance methodology includes:

[0396] Smooth Operations: The system has processed and capabilities to develop, test and implement enhancements without disrupting ongoing operations

[0397] Data: There are numerous interconnections and data dependencies across the EEMS. System enhancements require full regression testing to reduce risk of data corruption or incorrect data processing

[0398] Staff: The operations staff supporting the EEMS system hold specialized functional and technical skill sets. Enabling the team to execute enhancements while understanding maintenance requirements maximizes staff skills, business and technical knowledge. It also encourages knowledge transfer, cross training, and provides growth opportunities

[0399] Technical Environment: Tightly integrating enhancement and maintenance efforts facilitates close coordination of development and testing environments and

data needs and maximizes configuration management of source code and migration control

[0400] Training and User Guide Updates: The system will update training and user guides to reflect enhancements.

[0401] Question b — Process and Methods for Identifying Software Deficiencies

[0402] On an as-needed basis, system application maintenance personnel will work with users to understand, research, and resolve problems with the EEMS. The system will work with the company to determine if a reported problem is a deficiency. The system will track deficiencies via a deficiency report management tool and record enhancements for possible consideration by application owners.

[0403] The system will base service levels for deficiency correction on deficiency severity. The system will base severity definitions on several factors including the criticality of the application. The system will resolve high-severity deficiencies as emergency corrections for immediate release upon correction, whereas non-emergency deficiencies will not be treated as an emergency and would typically not be released until the next scheduled maintenance release.

[0404] For software or data deficiencies, the system will assign to all deficiencies a severity code and will correct the deficiencies in accordance with the company governance processes. The system will work with the company to define the characteristics of severity levels that drive the release path of a fix. Equally important to application deficiency management is data correction management. Upon completion of an impact analysis, the system will address data fixes appropriately.

[0405] Maintenance Cost

[0406] The cost to fix deficiencies (i.e., application not working as documented) may be included in the maintenance costs.

[0407] Response Time and Process for Help Desk

[0408] The Help Desk approach provides the EEMS users with a central contact point to provide rapid issue resolution and customer support. Support starts when an end user contacts the Help Desk with a request. The Help Desk uses industry-standard tools to record contacts as trouble tickets with information regarding both issue and resolution. The system may use Standard Operating Procedures

(SOP) such as those used on Federal government projects. The Help Desk performs data extraction at regular intervals for analysis to determine trends and develop approaches to resolve common issues. The help desk is available 7 days a week, 24 hours a day, 365 days per year. The average response time for help desk calls is driven by the service level agreements (SLAs) in place with a given customer, but average at around 45 seconds.

[0409] EDI Exchange Service Business Partner Communication Options

[0410] The system EEMS supports standard EDI protocols including EDIINT AS2, FTP w/PGP, and connect:direct.

[0411] The system may employ Internet Protocol (IP) infrastructure that facilitates the effective integration of disparate building systems. The system may integrate third-party building systems that used protocols such as Modbus, Lonworks®, BACnet and numerous other current, legacy and proprietary protocols. system's ability to seamlessly connect to existing and often proprietary protocols of Trane, Barber Coleman, Invensys, Johnson, Staefa, and more is a critical capability to help the company receive a truly open architecture. The system may also incorporate diagnostic tools that facilitate persistent and interactive commissioning. The system may combine utility bill, Time of Use (TOU), metering, and Building Automation Systems (BAS) data into the process of energy reduction. The system may further employ advanced Automated Fault Detection and Diagnosis (AFDD) analysis for HVAC and refrigeration equipment delivered as a browser-based Software as a Service (SaaS). This provides intelligent remote applications that continuously analyze sensor, machine, and building system data create prioritized, actionable information are hosted on a scalable M2M (Machine to Machine) platform providing data and FDDI analysis results via IT open-standard Web services. The system may also combine both national and Web-based electrical and controls product distribution with service, support and project management capabilities. The system may include the following solutions: Intelligence and tools to help customers make informed decisions and manage electricity purchasing risks, thorough energy analysis and strategic pricing options to meet customers needs, online reporting tools with access to energy usage and billing information, renewable energy, load response

programs and wholesale origination power purchases with generators. Expense management solutions, e.g., from Cadence, may be implemented to allow multiple site enterprises to more effectively manage and reduce electric, gas, water, sewer, lease and waste expenses.

[0412] Figure 16 shows a program management methodology 1600 for the system 100, which may be driven from a strong Program Management Office (PMO). Figure 16 shows an example of a PMO structure to provide the company with an established and mature set of program management services, reducing startup time and accelerating savings realization.

[0413] Figure 17 shows a scalability scenario 1700. The scenario 1700 connects buildings 1702 to the external world 1704 through the mediator 1102. The scenario 1700 leverages Internet Protocol or other protocols, Web Services, Web interfaces, or other interfaces to the Network operations center 1106.

[0414] The scenario 1700 may employ a Site Level Infrastructure (SLI), such as a Web-facilitated SLI, as the backbone of the solution. The mediator 1102 comprises hardware that resides inside the four walls of the company facilities. It is an IP-based device that serves as the conduit to the EEMS. The system 100 supports local Web-based real time views of meter and machine data, but the company will also be able to control the building at a site level, regional level and national level. Demand response (DR) may also be implemented across multiple sites as the solution would provide all functionality in a scalable fashion to the size the company will ultimately require.

[0415] The system may support reporting on not only what the consumption curves look like, but also support altering control strategies, schedules, sequences, and set points, etc. The system 100 infrastructure discussed above, provides supervisory control over existing systems (no up front need to start replacing equipment). The system provides real time reporting and M&V dashboards supplied by the score boarding and score carding approach. This visibility the system provides facilitates the company to make far better decisions going forward.

[0416] The company EEMS backbone would promote increased data analytics, pulling meter data as requested, but also a host of additional parameters:

[0417] 60-second machine interval data via sensors or existing BMS (facilitates superior fault detection)

[0418] Real time machine efficiency (energy, carbon and cost drivers)

[0419] Sub meter and meter data

[0420] Lighting where available

[0421] Set points

[0422] The infrastructure facilitates: identification of problems, control HVAC systems, and commission continuously to improve performance. The infrastructure also would facilitate load management, sub-metering of major systems, identification and prioritization of preventative maintenance opportunities, and verification that buildings continue to perform within pre-defined energy performance parameters.

[0423] The system may analyze available utility bills and time of use (TOU) data. The system may also compare the design intent of the facility to what it actually is doing and advise and work with the company on suspected causes and remedies of sub par performance. The system may make a large portion of the "fixes" remotely with the company concurrence and send them back through the backbone's bi-directional data architecture.

[0424] Table 1-5 below show scenario examples for the system 100.

Scenario 1: Facility Manager—Managing signals, alerts, & alarms	
Current Capability	System 100 Advantage
Occasionally views BMS data to adjust setpoints in the control system in a reactionary mode to system alarms, events, hot/cold calls, or negative changes in the performance of the building. Spends hours attempting to diagnosis a "high pressure" alarm on a chiller and later calls a	Logs into the SMART Buildings platform and reviews (in real time) the top energy and performance issues occurring in their facility. Actionable items are sorted by user defined priorities, ranking, dollar cost impact, number of faults, etc. Facility Manager sorts the dashboard by chiller type and views the dynamic "dirty coil alert" generated at 20%, weeks and

technician to determine days or potentially weeks later the chiller actually has a dirty coil .vs. the generic "high pressure" alarm issued by the BMS.	potentially months before the BMS has generated the static alarm at 60%.

Scenario 2: Enterprise Energy Manager — Tracking energy across a real estate portfolio	
Current Capability	System 100 Advantage
The Enterprise Manager needs to track the progress of the company's energy & carbon reduction programs across a portfolio of 20 buildings (lighting retros, BMS recommissioning, new equipment performance, etc). Limited to no connected real estate infrastructure, manual utility bill analysis in arrears monthly using excel, and manual report generation.	Continuous real time performance reporting at one minute intervals across the energy manager's real estate portfolio. Energy and carbon analytics highlighting buildings with the highest energy usage, trending, and drill down capabilities from portfolio rollup down to individual buildings and even down to a specific piece of equipment's performance.

Scenario 3: Facility Manager — Continuous commissioning	
Current Capability	System 100 Advantage
N/A — Current BMS does not support	With an ongoing snapshot of one minute interval data 24x7, System's energy models deliver continuous optimization of both schedules and setpoints in a building. Energy models deliver setpoint changes based on seasonal and

	occupancy changes throughout the day (e.g. 20 degree drop in temperature as a cold front moves into the area or the automated setpoint / schedule changes required from a cloudy morning to a sunny afternoon).

Scenario 4: Utility Company / ISO — Interfacing with the SMART City / SMART Grid	
Current Capability	System 100 Advantage
N/A — Current BMS does not support	Predictive capabilities in Systems and established energy models allow building owners to interface with Demand Response programs and structure their energy procurement to the best of their advantage, avoiding higher peak KWH costs. Advanced load shed strategies are implemented to take advantage of ongoing DR programs and incentives.

Scenario 5: Chief Engineer — Advanced building performance strategy	
Current Capability	System 100 Advantage
Chief engineer attempts to establish a building performance strategy to prioritize his workload based on the issues with the highest energy impacts. Realizes he has no way to conduct this analysis.	Delivers a real time dashboard sorted by the most URGENT faults in each building across the entire portfolio with their exact economic impact. Cost is derived from the specifications of each machine, combined with System's analytic models and data.

[0425] As noted above, the system 100 may include a mediator 1102, such as a Richards-Zeta Mediator 2500. The mediator 1102 may implement a middleware system including hardware (e.g., a Richards-Zeta mediator 1102 Multi-Protocol Exchange device) and software (e.g., a Richards-Zeta mediator 1102 system software). Thus, the mediator logic 1102 may be implemented as an embedded device with no moving parts, including a journaling file system that stores data on a Flash memory device for robustness against random power failure events that typically causes file system corruption. In addition, the mediator 1102 may include battery management circuits that allow it to perform its own uninterruptible power supply functionality.

[0426] The mediator 1102 may include multiple 10/100 Base-T Ethernet ports for network connections, an RJ-11 port for connecting to an internal modem, a console port, RS-232 serial port, four RS-485 serial ports (configurable as terminated/non-terminated), an IrDA infrared data link port to allow communications with a PDA, pulse counter/frequency counter/digital inputs, Dallas 1-Wire ports, universal serial bus ports, solid-state single pole normally open relay outputs, with 0-60V, 1.0A AC/2.0A DC outputs, opto-isolated, or other interfaces.

[0427] The mediator 1102 may include 512 MB or more of compact flash memory, expandable to up to 2GB externally, which acts as a solid-state hard drive, and 512 MB or more of SDRAM. After power-up, the mediator 1102 Framework Software application loads from Flash into RAM and executes from RAM. The main board has a special header which provides some in-circuit emulation capability and the ability to program its own boot load flash without removing the EEPROM chip.

[0428] The mediator 1102 may operate on 24VAC power provided by a customer-supplied 24 VAC class 2 transformer (typically 40 VA), and may include defenses against power disruptions and failures. For example, the mediator 1102 may include a large capacitor with enough capacity to withstand two or three missing 60-cycle power cycles. In addition, the mediator 1102 may include provisions for an optional external gel cell or lead-acid battery. The battery may be trickle-

charged continually and used as an onboard UPS, so that the system can continue to operate in the event of brownouts or power loss.

[0429] The mediator 1102 Software includes:

[0430] The mediator 1102 Framework Software application

[0431] The mediator 1102 Operating Environment (MOE)

[0432] The mediator 1102 Framework Software

[0433] The mediator 1102 Framework Software provides the core functionality of the mediator 1102 system. This includes:

[0434] Assembling a running system from configuration data

[0435] Getting and setting values

[0436] Processing raw data

[0437] Presenting data from disparate stheces in a uniform format

[0438] Making data easily available to end users

[0439] Providing services such as data logging and HTTP services

[0440] Providing an environment for custom system configuration

[0441] Providing an environment for developing custom solutions

[0442] Providing both REST and XML-RPC based Web services for external value add applications.

[0443] The mediator 1102 Framework Software is written in Python, an open-source programming language that supports robust, object-oriented applications. One feature of the mediator 1102 Framework architecture is dynamic system configuration. Conventional programs are monolithic in design, which means they would contain all of the code required for any possible site configuration. Much of the program may not be applicable to a particular site, but it would be loaded and run nonetheless. Dynamic system configuration facilitates the Framework to assemble a system that includes only the program code that a particular site configuration actually requires.

[0444] The mediator 1102 Framework provides the structure on which it builds the system that represents a site. It also provides the functionality to assemble the system from configuration data. It then provides the operating environment in which that system runs. As a result, the mediator 1102 facilitates any site

configuration to be represented in software. In addition, it facilitates an existing system to be modified or extended easily and quickly, without shutting it down.

[0445] The mediator 1102 Operating Environment (MOE) system software is based on a Red Hat 2.4 series Linux kernel and a Red Hat-derived user space, thereby providing true multi-tasking, multi-threads, virtual memory, shared libraries, demand loading, shared copy-on-write executables, sophisticated memory management, loadable device driver modules, and robust TCP/IP networking. The MOE facilitates the mediator 1102 to run multiple services and protocols simultaneously and still respond to events, such as energy usage curtailment signals, generated in the network environment. In the event of a system failure, the Mediator may use its full journaling file system restores the data on the disk to its pre-failure configuration. It also recovers unsaved data and stores it in the location where it would have gone if the system had not failed, making it an important feature for mission-critical applications.

[0446] The mediator 1102 provides firewall capability by means of the Netfilter packet filtering subsystem built into the Linux operating system. The Secure Shell (SSH) protocol defines programs that allow users to securely log onto another computer over a network, execute commands remotely, and move files between machines. It provides strong authentication and secure communications over insecure networks such as the Internet. The mediator 1102 uses the OpenSSH implementation of the SSH protocol specification. SSL (Secure Socket Layer): the Operating System running on the mediator 1102 is configured to implement Secure Socket Layer (SSL). SSL is an open protocol to allow encrypted transmission of data between Web browsers and Web servers. SSL is based on public key encryption technology and provides data encryption, server authentication, message integrity, and client authentication for TCP/IP connections. IPSec: The mediator 1102 may use FreeS/WAN, an implementation of the IPSec protocol suite. The IPSec protocols provide security in network-to-network connections. It provides access control, data integrity, authentication, and confidentiality, allowing secure private communication across insecure public networks such as the Internet.

[0447] The mediator 1102 may keep logs of the following:

[0448] All system and kernel messages.

[0449] Each network connection, its originating IP address, length, and other data about attempts to enter the system.

[0450] Remote users file requests.

[0451] Repeated authentication failures.

[0452] In addition, the mediator 1102 may be configured with intrusion detection tools that take user-specified actions such as setting off an alarm when unauthorized entry is attempted.

[0453] The Mediator™'s MOE supports a broad range of networking capabilities, including:

[0454] Integrated Web server with HTTP, CGI, SSI, Secure Socket Layer (SSL) and HTTPS protocol support

[0455] Secure Shell (SSH) and Secure Copy (SCP)

[0456] Integrated IPSec (Virtual Private Networking) functionality

[0457] Routing

[0458] Packet filter firewall

[0459] Packet logging

[0460] Intrusion Detection

[0461] Quality of Service (QoS)

[0462] Network Address Translation (NAT)

[0463] Dynamic Host Configuration Protocol (DHCP)

[0464] Simple Network Management Protocol (SNMP)

[0465] The mediator 1102 provides a flexible array of IP-based services that can be used to integrate the various automation systems deployed within an Enterprise. These services include (but are not limited to) the following:

[0466] HTTP (AJAX): On-board tools allow the user to generate custom Web-pages that dynamically update and may be used to represent various equipment. This includes the ability to embed a Flash-based widget that can chart local log data.

[0467] XML-RPC: Large Enterprises typically have requirements for custom applications. The mediator 1102 provides an open XML-RPC based API that facilitates interaction with third-party applications.

[0468] MeterMail Exporter: The mediator 1102 supports the PML EEM log transport protocol, MeterMail. This facilitates information from a variety of meters to be incorporated into this application.

[0469] SNMP: Simple Network Management Protocol used in IT and Telephony communications.

[0470] RSS: Alarm\Event information may be subscribed to via RSS syndication.

[0471] FTP: Log information may be periodically sent to FTP servers.

[0472] SMTP: Alarm information may also be communicated via SMTP.

[0473] The system may store and generate 3-D renderings of buildings or building floor plans, e.g., modeled in Google SketchUp, imported into Google Warehouse, and accessed via Google Earth (GE). A geospatially accurate representation of a real estate portfolio coupled with customizable information overlays could potentially be implemented in the system as part of a building Management Intranet.

[0474] The system solution may facilitate Automatic Demand Response (ADR) offered by many utility providers. For example, Mediator™® listens 24/7 on the PGE DRAS server for pending ADR events. The mediator 1102 consumes the utilities ADR Web service, integrating this DR signal into mediator 1102 resident application logic and policies then driving building systems at the facility level like HVAC and lighting into reset, set point changes and dimming and /or turning off selected lighting loads. Mediator™® also provides M&V and ADR results via a PDF log FTP or other wise sent to the utility upon request and /or on board configuration.

[0475] The system's maintenance component may provide an open architecture to other applications and systems via SQL connections, CVS extracts, online viewing, FTP and Web services methods (XML/SOAP). This facilitates integration of prioritized analysis results into the company' business rules, dashboard, work order systems, or even payment system for payment control purposes, e.g., technician payments cannot be released until faults on the equipments they are responsible for are fixed. This platform is also tightly integrated with Mediator™® to utilize its MPX feature, enabling integration with energy, building, facility

service, asset & IT management applications such as CMMS, Archibus, MAXIMO®, SAP, Oracle, etc.

[0476] The mediator 1102 may support the major communications protocols most widely used in the Building Automation industry, but others may be developed and implemented.

[0477] The following is a list of the building management protocols and drivers that the mediator 1102 may implement

Modbus RTU	Carrier Dataport/Datalink
Modbus TCP	CSI MR
BACnet/Ethernet	CSI I-NET
BACnet/IP	Staefa Smartl and SmartII
Trane proprietary BACnet objects	YorkTalk
Barber Colman ASD protocol	McQuay Microtech #1/#2
Trane TRMI Tracer 100 Interface Module (COM3)	Barrington Microstar I and Microstar II
Trane TRMS Tracer Summit Interface Module. (COM4)	HSQ Misenet Field Interface Emulator
Johnson Controls Metasys N1	DNP3
Johnson Controls Metasys N2	Crossbow Wireless Sensor Network and motes
Dallas 1-Wire	Point Six wireless host protocol
PPP (Point-to-Point Protocol)	LonTalk
Andover proprietary	RZ Net
Capstone proprietary	Capstone Micro-turbine protocol
Point Six proprietary	Caterpillar CCM protocol
Siemens proprietary	Generic SOAP Host
Clipsal C-Bus	ASI Controls VAV, Fan Coil, Heat Pump, AHU and ASIC 2 devices

[0478] MEDIATOR™ OMEGA CONNECTION AND ANALYSIS TOOLS

[0479] The system 100 may include an Event Manager that provides a complete Web-based alarm management system that provides the means to manage alarms from cradle to grave. Every mediator 1102 within a configured cloud reports all locally identified alarm related events to each other, which creates a distributed, fault tolerant alarm management system that still has the ability to

present a system wide consistent view. Alarms may be communicated to a number of parties via RSS, e-mail, SMS and similar mechanisms.

[0480] Security Manager facilitates the ability to control user access to the system, including adding/removing users and passwords to the system, configuring and assigning roles and associating policies with those roles.

[0481] Trend Manager facilitates the integrator to add, configure logs in Flash graphics, so that end users can view the data and save it to a spreadsheet.

[0482] Web Scheduler is a complete scheduling engine for editing and maintaining schedules.

[0483] Web Site Builder facilitates the integrator to configure the look and feel of the end-user application. The integrator can use it to link pages together, create buttons, drop-down menus and other graphical elements in the GUI, choose colors, upload graphics, videos, and other elements for home page, etc.

[0484] Web Express facilitates the integrator to create Web pages on the fly. It provides widgets and other tools to graphically display information from the mediator 1102 — point values, logs, etc. In addition, the mediator 1102 has an onboard image library containing thousands of images that can be used in creating Web pages.

[0485] Configuration Tool is the tool the integrator uses to configure the mediator 1102 to communicate with the devices, equipment, and systems in a facility.

[0486] Node Browser provides the integrator with a graphic view of the nodes in an installation.

[0487] Cisco IPT is a tool for configuring the Cisco voice-over-IP telephone. It facilitates authorized users to communicate with the mediator 1102 over the telephone, and to view and change settings, logs, alarms, and other information from the Mediator™. The mediator 1102 may further include an enterprise connectivity system, such as Web Point.

[0488] Figure 18 shows dashboard screenshots 1800 for reporting screens that the system may generate.

[0489] Figure 19 shows a dashboard screenshot for an analytics reporting screen 1900 that the system may generate.

~~[0490] Figure 20 shows a dashboard screenshot for a trend reporting screen 2000 that the system may generate.~~

~~[0491] Figure 21 shows a dashboard screenshot for a monitoring reporting screen 2100 of historical energy comparison that the system may generate.~~

~~[0492] Figure 22 shows a dashboard screenshot for a monitoring reporting screen 2200 of actual energy usage versus budged amount that the system may generate.~~

~~[0493] Figure 23 shows a dashboard screenshot for a monitoring reporting screen 2300 of Interactive Automated Fault Detection and Diagnosis that the system may generate.~~

~~[0494] Figure 24 shows a sample reporting format for measuring and optimizing comfort, efficiency, and operations within each building space, including reporting on operations of building equipment and systems, specifically regarding Analysis Focused on Equipment Performance 2400.~~

~~[0486]~~[053] Figure ~~25~~ 3 shows one example of a particular machine 2500 that implements a system for building energy analysis. The machine 2500 may implement all or part of the network operations center 1106, for example. The machine 2500 includes a processor 2502, a memory 2504, and a display 2506. A communication interface 2508 connects the machine 2500 to energy data sources 2510, such as building sensors, utility company meters, weather centers, mediator devices (e.g., a Richards-Zeta Mediator), and other data sources. The display 2506 may present reports 2512, such as those described above or below, either locally or remotely to an operator interacting with the machine 2500.

~~[0486]~~[054] The machine 2500 also includes an energy database 2514. The energy database 2514 may store any data that the machine 2500 processes. As examples, the energy database 2514 may store sensor samples 2516 (e.g., samples of energy consumption or performance of building energy consuming devices), energy metrics 2518 (e.g., measured or computed metrics, optionally based on energy KPIs), utility bill data 2520 (e.g., cost per unit energy, energy consumed, total cost, and date), weather data 2522 (e.g., temperature ranges, dates, expected temperature or temperature variations at any desired interval), or

other data that helps the machine 2500 analyze energy consumption, cost, or history.

[0497][0555] The memory 2504 may store program instructions or other logic for execution by the processor 2502. For example, the memory 2504 may store energy analysis programs 2524 and energy reporting programs 2526. The energy analysis programs 2524 may gather, analyze, and otherwise process the sensor samples 2516 or other energy data (e.g., to produce control recommendations for building systems or identify data points for further study and analysis). The energy reporting programs 2526 may generate user interfaces including dashboards, charts, graphs, text displays, or other reporting information ~~as described above with regard to Figures 18—24, or as noted below~~.

[0498][0556] The machine 2500 may perform an energy analysis (e.g., as part of the network operations center) on the energy data in the energy database 2514 to produce an analysis result. To that end, as one example, the machine 2500 may include in the memory 2504 balance point determination logic 2528 (e.g., as one of the energy analysis programs 2524). The balance point determination logic 2528 may search for one balance point, or a set of multiple balance points (e.g., a pair of balance points) in the energy data. In one implementation, the energy data that is searched are triples of: date, temperature, and measured consumption data 2546, obtained from one or more energy data sources over any desired date range, such as from a building under analysis and a weather information center.

[0499][0557] The balance points may include a Heating Balance Point (HBP) 2530 and a Cooling Balance Point (CBP) 2532 to help identify the number of heating degree days (HDDs) and cooling degree days (CDDs). The HBP 2530 may be interpreted as the temperature above which the building is not heating, while the CBP 2532 may be interpreted as the temperature below which the building is not cooling. In one model, the building is neither heating nor cooling between the HBP 2530 and the CBP 2532. Thus, identifying both the HBP 2530 and CBP 2532 may significantly increase the accuracy of the count of the number of HDDs and CDDs for the building, particularly as compared to finding a single balance point for both heating and cooling, or compared to assuming a standard

and usually inaccurate balance point (e.g., 65 degrees F). The increased accuracy in the determination of HDDs and CDDs has positive effects in downstream technical analyses, such as obtaining a more accurate determination of the weather load on the building, and therefore a more accurate regression model of how the building responds to weather load. The more accurate regression model means more accurate measurement and verification of savings obtained when energy management strategies are implemented based on the downstream analyses.

[0600][058] In particular, the balance point determination logic 2528 may implement the logic 2600 shown in Figure 264. The logic 2600 may be implemented as executable instructions for the processor 2502, to determine either or both of a HBP 2530 and a CBP 2532 (i.e., as a computer implemented method). The balance point determination logic 2528 may obtain (2602) balance point parameters 2534 including, as examples, those shown below in Table Balance Point Parameters.

[0601][059] The balance point determination logic 2528 may obtain the balance point parameters 2534 from operator input, from pre-defined parameters stored in the memory 2504, or in other ways. With regard to the search window parameters, alternatively the balance point determination logic 2528 may search for the HBP 2530 and CBP 2532 over the entire temperature range (or some pre-defined portion of the whole range) represented in the energy data obtained for analysis.

Table: Balance Point Parameters	
Parameter	Comment
HBPMin	The lower end of the search window for the heating balance point, e.g., in degrees F or C.
HBPMax	The upper end of the search window for the heating balance point, e.g., in degrees F or C.
CBPMin	The lower end of the search window for the cooling balance point, e.g., in degrees F or C.

CBPMax	The upper end of the search window for the cooling balance point, e.g., in degrees F or C.
R^2Min	The minimum correlation coefficient value that the balance point determination logic 2528 will consider in its search for a HBP or CBP. Thus, R^2 values below R^2Min may be discarded or not considered in the search for the best fit R^2 in the analysis discussed below. In other implementations, the balance point determination logic 2528 may employ additional or different statistical tests or variables to determine which regression models to consider in its search for the HBP and CBP. Alternatively, all R^2 values may be considered.
Temperature Delta	A temperature increment (for the HBP) or decrement (for the CBP) that defines the number or size of steps through the heating balance point search window or cooling balance point search window. For example: an increment of 2 degrees and a decrement of 3 degrees, or an increment and a decrement of 1 degree.
Data Cleansing Parameters	Parameters used to identify and remove outlier data points in the energy data before searching for the HBP or CBP. For example, a number (e.g., 1.5) of standard deviations from the mean temperature or mean energy consumption that defines outlier data points in temperature or energy consumption to be removed.

[0502][0060] The balance point determination logic 2528 obtains energy data from the building under analysis (2604). As an example, the energy data may include date, temperature, and energy consumption (e.g., kWh) data for each date. The energy data may instead be kBTU consumption, occupancy, wind speed, relative humidity, or other energy data. The energy data may extend over any desired time period, such as one year, one quarter, or one month, and may be collected at any desired interval (e.g., every 15 minutes, 30 minutes, 60

minutes, or other interval), with the data subjected to any desired mathematical treatment (e.g., averaging of the data, or discarding outlier data) to obtain the energy data for a given date.

[0603][0611] The balance point determination logic 2528 optionally cleanses the energy data prior to analysis (2606). For example, the balance point determination logic 2528 may remove from consideration from the energy data: weekend data points, outlier data points, data points with errors in date or energy consumption data, or other non-representative data points. The outlier data points may be data points beyond a predefined outlier threshold (e.g., 2 standard deviations away from the mean) input as a balance point parameter. More specifically, the outlier data points may be determined by finding the average and standard deviation of the input data (e.g., the average of weekdays after data with invalid dates and energy data are discarded), then removing data points more than a pre-defined or operator specified multiple of the standard deviation away from the average).

[0604][0612] Given the input energy data, the balance point determination logic 2528 performs an analysis (e.g., a regression analysis) to determine a balance point set. The balance point set may include the HBP 2530 and the CBP 2532, as an example. One exemplary analysis is described below with continued reference to Figure 264. In the example given below, the balance point determination logic 2528 uses regression analysis to determine R^2 values. However, it is noted that the balance point determination logic 2528 may apply additional or different statistical tests or variables in its search of the energy data to find the HBP 2530 and CBP 2532.

[0605][0613] In particular, the balance point determination logic 2528 sorts the energy data according to temperature (e.g., in ascending order) (2608). An analysis bound, for finding the HBP 2530, is initially set to HBPMin (2610). For all the data points starting from the least temperature to the data point corresponding to HBPMin, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for that set of data points (2612). The balance point determination logic 2528 may determine the correlation coefficient by, in general,

performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable. The balance point determination logic 2528 then increments the analysis bound (e.g., by 1 degree, or another pre-defined temperature delta) and if HBPMax has not yet been exceeded, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for all data points from the least temperature to the incremented analysis bound. This way, the balance point determination logic 2528 returns to (2612) repeatedly to determine the next R^2 over the new set of data points extending to the incremented analysis bound until the incremented analysis bound reaches HBPMax. The balance point determination logic 2528 may save, display, analyze, plot or otherwise manipulate any or all of the R^2 values determined during the analysis. Once the balance point determination logic 2528 has determined the R^2 values at each increment delta over the window between HBPMin to HBPMax, the balance point determination logic 2528 determines the temperature at which the best R^2 fit is achieved (2616), e.g., as determined by the greatest R^2 value. That temperature is designated the HBP 2530.

[0606][0684] With regard to the CBP 2532, the balance point determination logic sorts the energy data according to decreasing temperature (2617) and sets a new analysis bound equal to CBPMax (2618). For the data points starting from the highest temperature to the data point corresponding to CBPMax, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption, for that set of data points (2620). The balance point determination logic 2528 then decrements the analysis bound (e.g., by 1 degree, or another pre-defined temperature delta) and if CBPMin has not yet been reached, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for all data points from the highest temperature to the decremented analysis bound. This way, the balance point determination logic 2528 returns to (2620) repeatedly to determine the next R^2 over the new set of data points extending to the decremented analysis bound until the decremented analysis bound reaches CBPMin. The balance point

determination logic 2528 may save, display, analyze, plot or otherwise manipulate any or all of the R^2 values determined during the analysis. Once the balance point determination logic 2528 has determined the R^2 values at each decrement delta over the window between CBPMmax to CBPMin, the balance point determination logic 2528 determines the temperature at which the best R^2 fit is achieved (2624), e.g., as determined by the greatest R^2 value. That temperature is designated the CBP 2530. The HBP and CBP may be displayed, saved, or otherwise manipulated (2626).

[0607][0685] Obtaining the balance point parameters noted above helps to focus the search for the balance points in specific windows. The results are faster and more efficient searches for the balance points. An exhaustive search of all the data points may still be performed, however, and in that regard, the balance point determination logic 2528 need not obtain specific balance point search window parameters before performing its analysis

[0608][0686] Once the balance point determination logic 2528 has obtained the HBP 2530 and CBP 2532, the machine 2500 may apply the HBP 2530 and CBP 2532 in many different types of analyses and reporting. For example, the measurement and verification (M&V) logic 2548 (or the balance point determination logic 2528) may calculate the number of HDD and CDD, present analysis plots on the display 2506, or take other actions. For example, the M&V logic 2548 may: plot the CBPMin to CBPMax with corresponding R^2; plot the HBPMin to HBPMax with corresponding R^2; determine whether any day was a CDD according to the CDD test: Min(Temperature recorded that day - CBP, 0) that returns non-zero for a CDD; determine whether any day was a HDD according to the HDD test: Min(HBP - Temperature recorded that day, 0) that returns non-zero for a HDD; extract the month from the date field for each data point (row) and sum the kWh consumption, kBTU consumption, CDD, HDD and the number of days in the data set belonging to each month and store or display the monthly figures; for monthly CDD and HDD, calculate Log CDD, Log HDD, CDD^2, HDD^2 and store or display the values for each month; for each month, calculate average Occupancy, Relative Humidity, Wind Speed, Global Solar

Radiation and store or display these for each month; or output other analysis result.

[0609][067] The M&V logic 2548 may define, execute, and display the results of regression analyses, given, as examples, the number of CDD or HDD, the HBP 2530 or CBP 2532, or other parameters. To that end, the M&V logic 2548 may obtain (e.g., from operator input or from pre-defined parameters in the memory 2504) M&V parameters 2550. The M&V parameters 2550 may include, as examples, company name, building name, an (optionally) unique building identifier, analysis start date, analysis end date, or other parameters. Additional M&V parameters 2550 may include: user-specified independent variables for use in regression analyses, such as CDD, HDD, number of days, CDD^2, HDD^2, Log CDD, Log HDD, occupancy, relative humidity, wind speed, and global solar radiation; and user-specified dependent variables for use in the regression analyses, such as kWh consumption, kBTU (i.e., natural gas) consumption.. Using the M&V parameters 2550, the M&V logic 2548 may calculate, store, display or otherwise perform a user-specified regression analysis. In particular, the M&V logic 2548 may determine the 'n' independent variables specified in the M&V parameters 2550, and from 'i'=1 to n, take 'i' of the variables at a time and create a regression model with the 'i' variables as independent variables and kWh (or kBTU, or other energy measurement chosen) as the dependent variable. Each of the regression models created may use a combination (subset) of the overall 'n' independent variables chosen. The M&V logic 2548 runs the regression based on the data (e.g., monthly, weekly, or daily data) for the dependent and independent variables, and may determine and store the R^2 value, significance F (e.g., from an F-test), or any other variables or test results, and the corresponding intercept and coefficient values for each of the 'i' independent variables.

[0610][068] The M&V logic 2548 may, if desired, for each independent variable chosen, disallow the certain pairs of variables in the regression analysis (e.g., transformations of the same variable may not be chosen together in the same regression model). As examples:

[0611][069] CDD and CDD^2 together may be disallowed;

[0512][070] CDD and Log CDD together may be disallowed;

[0513][071] Log CDD and CDD^2 together may be disallowed;

[0514][072] HDD and HDD^2 together may be disallowed;

[0515][073] HDD and Log HDD together may be disallowed;

[0516][074] Log HDD and HDD^2 together may be disallowed.

[0517][075] Once the combinations of regression outputs for 'i'=1 to n have been generated and stored, the M&V logic 2548 may sort the R^2 values for the regressions (e.g., by decreasing R^2) and output on the display 2506 the top results (e.g., the top 1, 2, or 3 results). Each result may, for example, report the R^2, Significance F, intercept and coefficients for each independent variable in the top regression results. Additionally, the M&V logic 2548, may use the intercept and the coefficients for each independent variable to create the regression equation for each of the top regression outputs.

[0518][076] In addition to those noted above, the M&V logic 2548 may generate a wide variety of analysis results as outputs on the display 2506. Examples are given below. With regard to the first two examples, the M&V logic 2548 may generate the displays using information obtained from the balance point determination logic 2528. Alternatively or additionally, the balance point determination logic 2528 may display the charts described using the information that it obtains in its analysis to find the balance points.

[0519][077] 1) a line chart showing temperature varying from HBPMin to HBPMax on the X axis and R^2 (the square of correlation for temperature and kWh) corresponding to each temperature on the Y axis;

[0520][078] 2) a line chart showing temperature varying from CBPMin to CBPMax on the X axis and R^2 (the square of correlation for temperature and kWh) corresponding to each temperature on the Y axis;

[0521][079] 3) tables containing the underlying data used to generate above two charts;

[0522][080] 4) a table showing monthly date in any desired (e.g., mm/yyyy) format, kWh consumption, kBTU consumption, monthly CDD, monthly HDD, monthly CDD^2, Log CDD, Log HDD, HDD^2, monthly average Occupancy,

monthly average Relative Humidity, monthly average Wind Speed, monthly average Global Solar Radiation, or other variables; and

[0623][0811] 5) a table which shows a summary of the top regression outputs, including R^2, Significance F, Regression Equation, Intercept and coefficients for each independent variable for each regression output.

[0624][0812] The machine 2500 may additionally or alternatively include comparison logic 2544 (e.g., as one of the energy analysis programs 2524). The comparison logic 2544 may include instructions that when executed by the processor 2502 cause the processor 2502 to perform a kilowatt hour consumption and exception rank analysis, for example. One example of a comparison analysis 2700 that results from the comparison logic 2544 is shown in Figure 275. The comparison analysis 2700 extends in 30 minute intervals over an entire day for a particular building under analysis, but the comparison logic 2544 may perform analyses over shorter or longer time periods at different intervals. Furthermore, the comparison may be done with respect to a single building (e.g., to compare energy consumption data historically for the building), or with respect to multiple buildings (e.g., to compare a building under analysis to a different control building). In addition, there may be multiple buildings in a control building group that each contribute energy data for defining (e.g., by averaging or according to another statistical treatment) the control building data described below.

[0625][0813] The comparison logic 2544 may compare control building data 2702 to a user-defined standard 2704. In the example shown in Figure 275, the control building data 2702 is daily average kWh consumption measured at 30 minute intervals over 15 different days in July, and the user-defined data is 2704 is daily average kWh consumption at 30 minute intervals over the month of January 2009 for a particular building under analysis. The control building data 2702 and user-defined data 2704 may be data points over any other time intervals, time spans, or obtained from any number of different buildings, or from the same building. Further, either the control building data 2702, the user-defined data 2704, or both, may capture desired or expected levels of building performance, may represent actually measured and optionally statistically treated (e.g., averaged)

consumption data from one or more buildings, or may represent other data automatically obtained or input by an operator. Thus, as another example, the control building data 2702 may be individual operator specified data points at 30 minute intervals that provide a baseline for comparison. The constitution of the control building data 2702 and the user-defined data 2704 may vary widely, as examples: average consumption at any desired interval on weekdays over a pre-defined time period (e.g., one week, three months, or one year), optionally excluding holidays, and/or outlier data points; average consumption at any desired interval on weekends over a predefined time period; average consumption at any desired interval on holidays over a predefined time period; or other consumption data.

[0626][0084] For the example shown in Figure 275, the comparison logic 2544 performs a comparison respect to energy consumption measured in kWh. However, other energy measurements may be used, such as cubic feet of natural gas consumption, gallons of water used, or measurements of other types of energy or resources.

[0627][0085] The comparison logic 2544 may determine and display exceptions 2706. The exceptions 2706 may identify noteworthy variations in consumption data for further review or analysis. Figure 27-5 illustrates an example in which 16 exception ranks 2708 are defined. As specific examples, the exception 2710 indicates a rank 3 exception and the exception 2712 indicates a rank 4 exception. The comparison logic 2544 may analyze the building control data 2702, the user-defined data 2704, or both to determine exceptions at any desired time interval, such as every second, every minute, every 15 minutes or every 30 minutes.

[0628][0086] The comparison logic 2544 may determine an exception rank for any interval in many different ways. For example, the exception rank may apply to the user-defined data 2704, with exception rank assigned based on the standard deviation of the user defined data 2704 (e.g., determined at each interval). Table Exception Ranks, below, shows one example definition of the exception ranks according to windows of standard deviations of the user-defined data 2704. The comparison logic 2544 may determine additional, fewer, or different exception ranks according to additional, fewer, or different standard

deviation windows, or using any other statistical criteria of interest that map the statistical criteria to one or more exception ranks.

Table: Exception Ranks					
Rank	1	2	3	4	5
Standard Deviations from the mean	-1 to +1	from: -1 to -1.5 and from: 1 to 1.5	from: -1.5 to -2 and from: 1.5 to 2	from: -2 to -2.5 and from: 2 to 2.5	from: -2.5 to -3 and from: 2.5 to 3

[0529][0871] More specifically, the comparison logic 2544 may determine the average (the control average) and standard deviation (the control standard deviation) of the energy data for each interval (e.g., the interval between 3 am and 3:30 am on a given day) in the building control data 2702. The comparison logic 2544 further determines the average (the user-defined average) of the data for each similar interval in the user-defined data 2704. The comparison logic 2544 then assigns an exception rank to the user-defined average for each interval in the user-defined data 2704 according to where the user-defined average falls within the control standard deviation determined from the building control data 2702 for the same interval. For example, in Figure 275, at 3:30 am the comparison logic 2544 determines an exception rank of 4 because the average consumption (7082.58 kWh) is between -2 and -2.5 standard deviations of the average consumption (7267.40) in the building control data 2702 in the same interval. At 3:30 pm, an exception rank of 3 applies because the average consumption (7526.81 kWh) of the user-defined data 2704 is between -1.5 and -2 standard deviations of the average consumption (8064.87) in the building control data 2702 in the same interval.

[0530][0888] The Table Comparison Data, below, shows for the comparison analysis 2700 the analysis data at 30 minute intervals for the control building data 2702 and the user-specified data 2704, including the determined exception rank determined according to Table Exception Ranks.

Table: Comparison Data				
	Control Range average by time slot	User Defined Range average by time slot	Exception Rank by time slot	Difference
12:30 AM	7348.93	7213.00	2.00	135.93
1:00 AM	7331.47	7218.42	1.00	113.05
1:30 AM	7310.67	7210.65	1.00	100.02
2:00 AM	7281.27	7204.10	0.00	77.17
2:30 AM	7285.67	7202.52	1.00	83.15
3:00 AM	7275.53	7194.45	1.00	81.08
3:30 AM	7267.40	7082.58	4.00	184.82
4:00 AM	7250.07	7086.48	4.00	163.58
4:30 AM	7248.60	7198.90	0.00	49.70
5:00 AM	7245.80	7206.10	0.00	39.70
5:30 AM	7323.53	7169.90	2.00	153.63
6:00 AM	7265.13	7259.00	0.00	6.13
6:30 AM	7285.67	7291.13	0.00	-5.46
7:00 AM	7413.67	7419.35	0.00	-5.69
7:30 AM	7448.87	7453.87	0.00	-5.00
8:00 AM	7526.47	7419.16	0.00	107.31
8:30 AM	7583.80	7443.19	0.00	140.61
9:00 AM	7673.47	7465.71	1.00	207.76
9:30 AM	7751.73	7499.58	1.00	252.15
10:00 AM	7835.53	7522.03	1.00	313.50
10:30 AM	7923.40	7550.65	2.00	372.75
11:00 AM	7952.73	7556.00	2.00	396.73
11:30 AM	7975.87	7537.77	2.00	438.09
12:00 PM	7994.87	7545.10	3.00	449.77
12:30 PM	8015.13	7557.58	2.00	457.55
1:00 PM	8016.80	7550.87	3.00	465.93
1:30 PM	8041.73	7556.03	3.00	485.70
2:00 PM	8057.87	7556.29	3.00	501.58
2:30 PM	8052.53	7600.32	2.00	452.21
3:00 PM	8043.93	7568.87	3.00	475.06
3:30 PM	8064.87	7526.81	3.00	538.06
4:00 PM	8050.93	7492.26	3.00	558.68
4:30 PM	8041.73	7506.42	4.00	535.31
5:00 PM	8010.40	7509.71	4.00	500.69

5:30 PM	7971.53	7496.00	3.00	475.53
6:00 PM	7935.40	7487.13	3.00	448.27
6:30 PM	7891.13	7462.32	3.00	428.81
7:00 PM	7859.20	7441.35	3.00	417.85
7:30 PM	7815.40	7436.06	3.00	379.34
8:00 PM	7783.07	7426.45	3.00	356.62
8:30 PM	7720.87	7415.61	2.00	305.25
9:00 PM	7703.20	7405.29	2.00	297.91
9:30 PM	7628.07	7392.23	1.00	235.84
10:00 PM	7492.53	7280.90	3.00	211.63
10:30 PM	7442.33	7267.32	2.00	175.01
11:00 PM	7423.47	7257.65	2.00	165.82
11:30 PM	7371.53	7224.42	2.00	147.11
12:00 AM	7349.53	7219.74	2.00	129.79
Total KWH	367583.33	354587.29	3.00	12996.04

[0631][0689] Figure ~~28~~ 6 shows the logic that the comparison logic 2544 may implement, e.g., as processor executable instructions (i.e., as a computer implemented method). The comparison logic 2544 obtains background information, such as company name, building and company location, an (optionally) unique building identifier, or other data (2802). The comparison logic 2544 gathers overall time of use consumption data at any desired interval (e.g., every 30 minutes) (2804). The operator may specify a date range for exception rank analysis (2806) and for the control range (2808). For example, the operator may specify a particular month in 2006 as the control range, and a particular month in 2010 as the date range for exception rank analysis. Optionally, the operator may directly specify the consumption data for either the control range or exception rank analysis range.

[0632][0690] The comparison logic 2544 obtains or establishes exception rank definitions (2810). Examples of exception rank definitions are shown in Table: Exception Ranks, but the definitions may vary widely in implementation to take into consideration any statistical parameter desired. The comparison logic 2544 optionally cleanses any of the input consumption data (2812). To that end, the comparison logic 2544 may remove data rows for which no consumption data is

available, for which erroneous data is present, or for which the consumption data is anomalous (e.g., exceeding the mean consumption data by more than a pre-defined threshold).

[0533][091] The exception analysis may be run against all the data, weekdays, weekends, holidays, or any other subset of the overall data. Thus, the comparison logic 2544 identifies and determines the number of weekdays, weekends, holidays, or other particular days in the overall data (2814). Similarly, the comparison logic 2544 determines overall and monthly average consumption data at each interval for weekdays, weekends, holiday, and all days in each month (2816).

[0534][092] For each interval in the control range (e.g., daily, every 30 minutes), the comparison logic 2544 determines the average and standard deviation of the data for that interval (2818). Similarly, the comparison logic 2544 determines the average consumption in each interval in the user-defined date range for the exception rank analysis (2820). The comparison logic 2544, with reference to the exception rank definitions, assigns an exception rank for each interval, using the average consumption from the user-defined date range with reference to the average and standard deviation determined form the corresponding interval in the control range (2822). The comparison logic 2544 may generate and display the resulting comparison analysis 2700 (2824). While Figure 27-5 shows an analysis of daily consumption at 30 minute intervals, the comparison logic 2544 may analyze other time windows at other intervals (e.g., one day intervals over one month, or one day intervals over one year).

[0535][093] Exception ranks may be determined in ways other than that described above, however. As another example, the comparison logic 2544 may determine the exception rank according to the magnitude of the difference in consumption between the control building data 2702 and the user-defined data 2704, with individual thresholds or ranges defined to determine which difference magnitude maps to which exception rank. Furthermore, the difference may be shaded or otherwise highlighted in the comparison analysis 2700 to help visualize the difference.

[0536][0094] The machine 2500 may employ the comparison analysis 2700 to rank or gauge how well a building is performing. The ranking may be output on the display 2506 as an analysis result. For example, a building with more than a threshold number of exceptions of greater than a pre-defined exception rank (or some other function of the exception ranks) may be flagged and displayed as a building that needs special attention with regard to its energy consumption. To that end, the comparison logic 2544 may implement any desired ranking rules based on the comparison analysis 2700 to determine how well a building is performing, and responsively take action, e.g., by notifying a building supervisor, outputting notification or warning messages on the display 2506, or taking other action when the rule fires.

[0537][0095] In addition, the machine 2500 may implement building level alerts. The alerts may be defined in the memory 2504 using alert rules 2536. Alert logic 2538, shown in Figure 29, may run at any desired interval. The alert logic 2538 may include instructions that when executed by the processor 2502, read the alert rules 2536 (2902) and energy data from the energy database 2514 (2904). The instructions may further processes the alert rules 2536 to determine based on any of the energy data whether any of the alert rules 2536 should fire (2906). If so, the alert logic 2538 determines the analysis result (2908) based on the alert rule and displays the analysis result (2910). In that regard, the machine 2500 may output a message, display any desired indicia, or take any other pre-defined action when the alert rule fires, as defined in each alert rule 2536. Further, the alert rules 2536 may specify the analysis result (e.g., display a warning message), the analysis results may be pre-determined (e.g., for any rule that fires, send a message to an operator), or the analysis results may be determined in other ways. The alert rules 2536 may vary widely in implementation, and may take into consideration any of the variables obtained from the building or any other source, such as kWh consumption, temperature, time, date, balance points, or other variables. Examples of alert rules 2536 are shown below in Table: Alerts.

Table: Alerts

Alert Category	Alert Name	Alert Rule	Notes
Demand kilowatts(kw)	1. Demand Exceeded Peak Threshold	Building kw demand compared at any desired interval against a user defined kw threshold.	Example: If kw demand reaches over 500kw, then issue alert.
	2. Demand Exceeded Historic Threshold (not normalized)	Building kw demand continuously or at any desired interval (e.g., daily, monthly) compared against historical demand for the building. Analysis Result: Send warning message to building operator.	Example: Daily kw demand is compared to the same day in previous years. Issue alert if demand is greater or less than historical demand by a pre-selected threshold.
	3. Demand Exceeded Baseline Threshold (normalized)	Building kw demand is continuously or at any desired interval (e.g., daily, monthly) compared against historical baseline regression model	Example: Daily kw demand is compared to the same or a similar day (as defined by any desired regression on variables such as HDD, CDD, Humidity, Occupancy, or other variables).
	4. Significant Change (Increase or Decrease) in Demand	Building kw demand is monitored continuously or at any desired	Example: Demand goes from 700kw at 10am to 500kw 10:15 (the next interval). This could either be a result of a

		interval for changes up or down that exceed a pre-defined threshold.	demand / response event or some problem with equipment or behavior changes.
	5. Demand Exceeded Comparable Building Threshold	Building kw demand is continuously or at any desired interval compared against a user-defined comparable/similar building.	Example: Building 1 demand exceeds Building 7 kw demand (Building 7 is the baseline or control building against which other buildings are compared).
Consumption (kwh)	1. Consumption Exceeded Historic Threshold (not normalized)	Building kwh consumption at any desired interval (e.g., hourly, daily, monthly) compared against historical consumption for the building.	Example: Daily kwh consumption is compared to the same day in previous years. Issue alert if consumption is greater or less than historical consumption by a pre-selected threshold.
	2. Consumption Exceeded Baseline Threshold (normalized)	Building kwh consumption is compared at any desired interval (e.g., daily, monthly) against historical baseline regression model	Example: Daily kwh consumption is compared to the same or a similar day (as defined by regression variables such as HDD, CDD, Humidity, Occupancy, or other variables).
	3. Significant Change (Increase or Decrease) in Consumption	Building kwh consumption is monitored at any desired interval for	Example: Consumption goes from 900kwh between 10 am and 11 am to 500kwh between

		changes up or down that exceed a pre-defined threshold.	11 am and 12 noon. This could either be a result of a demand / response event or some problem with equipment or behavior changes.
	4. Consumption Exceeded Comparable Building Threshold	Building kwh consumption is compared at any desired interval against a user-defined comparable/similar building.	Example: Building 1 consumption exceeds Building 7 kwh consumption (Building 7 is the baseline or control building against which other buildings are compared).

[0638][0961] The alerts discussed above are building level alerts with regard to consumption and demand. However, the alert rules may define alerts based on any energy consumption parameters that are directly measured, statistically derived, or otherwise obtained. The machine 2500 may also implement more complex analyses. As one example, the machine 2500 may include event logic 2542 that analyzes equipment data to detect or infer events of interest based on event rules 2540. Such event rules 2540 may help define when demand / response events occur, when equipment has failed or has been fixed, or other events. When the event logic 2542 identifies an event, the event logic 2542 may responsively execute a pre-defined action, for example as specified in the event rules 2540.

[0639][0971] The machine 2500 or any of the systems described above may be implemented with additional, different, or fewer components. As one example, a processor may be implemented as a microprocessor, a microcontroller, a DSP, an application specific integrated circuit (ASIC), discrete logic, or a combination of other types of circuits or logic. As another example, memories may be DRAM, SRAM, Flash or any other type of memory. The processing capability of the system may be distributed among multiple components, such as among multiple processors and memories, optionally including multiple distributed processing

systems. Parameters, databases, and other data structures may be separately stored and managed, may be incorporated into a single memory or database, may be logically and physically organized in many different ways, and may implemented with different types of data structures such as linked lists, hash tables, or implicit storage mechanisms.

[0540][098] Logic, such as programs or circuitry, may be combined or split among multiple programs, distributed across several memories and processors, and may be implemented in a library, such as a shared library (e.g., a dynamic link library (DLL)). The DLL, for example, may store code that analyzes energy expenditure or that prepares energy reports. As another example, the DLL may itself provide all or some of the functionality of the machine 2500. The programs may be stored on a computer readable medium, such as a CDROM, hard drive, floppy disk, flash memory, or other computer readable medium. Thus, a computer program product may include computer readable instructions, which when loaded and run in a computer and/or computer network system, cause the computer system and/or the computer network system to perform operations according to any of the claims below, and in particular to perform any of the logic and methods illustrated in Figures 264, 286, and 297, as examples.

[0541][098] While various embodiments of the invention have been described, it will be apparent to those of ordinary skill in the art that many more embodiments and implementations are possible within the scope of the invention. Accordingly, the invention is not to be restricted except in light of the attached claims and their equivalents.

CLEAN VERSION OF SPECIFICATION

BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

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BACKGROUND OF THE INVENTION

1. Cross Reference to Related Applications

[001] This application claims priority to U.S. provisional patent application serial numbers 61/176,855 and 61/176,790, both filed 8-May-2009 and titled Building Sensor Operational Data Analysis for Energy Saving System Control.

2. Technical Field.

[002] This disclosure relates to obtaining and analyzing building energy data. This disclosure also relates to engaging in an energy analysis to determine analysis results, and optionally responsively controlling building systems, such as lighting, heating, air-conditioning, and other energy consuming systems.

3. Related Art.

[003] Energy consumption, monitoring, and management are crucial components of sustainable, eco-friendly infrastructures now and into the future. In the past, energy monitoring systems, such as those available from Sensus Machine Intelligence, have obtained and analyzed energy data from individual pieces of equipment in a building. A need exists to provide energy data focused analysis results to accurately determine building energy expenditures, performance and costs.

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SUMMARY

[004] An energy analysis system provides energy analysis results. The energy analysis system may include a processor, a communication interface coupled to the processor, and a memory coupled to the processor. The memory may include energy analysis logic that, when executed by the processor, causes an energy analysis system to: establish a data connection from a network operations center through an energy data connectivity interface to an energy data source, obtain energy data at the network operations center through the data connection to the energy data source, and perform an energy analysis in the network operations center on the energy data to produce an analysis result.

[005] The energy analysis may include: determining building comparison baseline data within the energy data, determining actual consumption data within the energy data, and determining, as the analysis result, an exception rank by determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data, and comparing the comparison standard deviation and the actual consumption data. The exception rank may identify specific data in the actual consumption data for further review.

[006] As another example, the energy analysis may include: determining a balance point set from the energy data as the analysis result. The balance point set may include both a heating balance point and a cooling balance point. The system may display any analysis result in a user interface on a display.

[007] Other systems, methods, features and advantages will be, or will become, apparent to one with skill in the art upon examination of the following figures and detailed description. It is intended that all such additional systems, methods, features and advantages be included within this description, be within the scope of the invention, and be protected by the following claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[008] The systems and methods may be better understood with reference to the following drawings and description. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the

principles of the invention. Moreover, in the figures, like referenced numerals designate corresponding parts throughout the different views.

[009] Figure 1 shows an example of a development framework for a system for building energy analysis.

[010] Figures 2A and 2B show a system architecture for building energy analysis.

[011] Figure 3 shows an example of a particular machine for implementing the system for building energy analysis.

[012] Figure 4 shows balance point determination logic.

[013] Figure 5 shows a kilowatt hour consumption and exception ranks analysis.

[014] Figure 6 shows comparison logic for determining exception ranks.

[015] Figure 7 shows alert logic for determining building level alerts.

DETAILED DESCRIPTION

[016] Figure 1 shows an example of a development framework 1000 for a system for building energy analysis. The following may be undertaken with regard to developing the system:

[017] Create the strategy and roadmap for co-developing the Energy Management Framework (EMF).

[018] Internally pilot the SMART Buildings platform to be the proving grounds of the EMF and serve as the credential for the EMF and its premier energy management application.

[019] Co-develop the EMF to lead the industry in defining a unique platform to develop, deployed, and manage energy related applications.

[020] Deploy the EMF using, e.g., cloud services OS to manage advanced engineering calculations and data management requirements.

[021] Investigate leading technologies for building system connectivity and integration and help scale additional drivers, scalability, and security with a platform for any company to leverage.

[022] Further define the strategy of the EMF to leverage additional technologies as the market develops.

[023] Integrate into existing Energy systems and technologies.

[024] Align with utility companies to leverage specific solutions as part of the world's energy / carbon dashboards (SMART Grid, INDE, demand response programs, carbon tracking/management/trading, SMART City).

[025] Figures 2A and 2B show an architecture 1100 for the system. The system may provide an energy data focused approach based on data management and analytics of existing systems and equipment versus a capital intensive approach. The system may connect and integrate in a hardware and software agnostic way with multiple vendor solutions & protocols. The system may provide an open IP-based two way (read/write) infrastructure connecting one or more buildings in a portfolio to a network operations center with web-based control capabilities. The system may, as examples:

[026] 1) deliver continuous re-commissioning through setpoint control and schedule optimization;

[027] 2) deliver 24 hours a day x 7 days a week (24x7) automated equipment fault detection and diagnosis down to one-minute intervals and prioritized by user defined options: rank, severity, cost of fault, location, and others;

[028] 3) establish operational guidelines for setpoints and schedules across all equipment and BAS data for a portfolio of buildings, managed through a central command center;

[029] 4) deliver measurable calculated monthly results tracking energy reductions: (10% min in year 1);

[030] 5) integrate to existing Maintenance Repair & Operations applications and Energy Management systems;

[031] 6) include the ability to install, connect, and integrate additional meters, sub-meters, sensors into the common platform as required;

[032] 7) be supported by world class project management, change management, and training organization; and

[033] 8) be delivered on a scalable architecture to easily and securely scale with the client's needs.

[034] With reference still to Figures 2A and 2B, the architecture 1000 includes:

[035] At the building (e.g., company facility): middleware 1102 provides a connectivity interface for connecting to one or more meters and sub-systems in a facility. The meters may include utility meters as well as any Building Automation System (BAS), lighting or security control system, or other systems.

[036] Site Web Services 1104: The middleware 1102 communicates the data it collects to the System Network Operations Center (NOC) 1106. The middleware 1102 may received the energy data from web services 1104 installed onsite at any desired facilities. In other words, the web services 1104 may establish a data connection to the middleware 1102 and send building energy data to the middleware 1102. However, any other type of connectivity interface as a data transmission mechanism may be employed to communicate data to the middleware 1102, including file transfer, message passing (whether web services based or not), shared memories, or other data transfer mechanisms.

[037] System NOC 1106: The NOC 1106 may use a Service-Oriented Architecture (SOA) to aggregate data across all facilities. Its core services provide analytics and other data management services to the user via a Web-based portal, or Rich Internet Application (RIA). Examples of the specific implementation of the NOC 1106 and the analysis results that the NOC 1106 may provide are discussed below, and in particular with regard to Figures 3-6.

[038] External Data sources 1108: In addition, the NOC collects relevant data from external data sources, such as the National Weather Service, and may also obtain reports on regional energy prices and 3rd-party or company systems.

[039] Additional Services 1110: Because of the versatility of the system 100 infrastructure, additional services may be layered onto the core. The middleware 1102 has 2-way communication that supports Demand Response programs. Additional services also include a collaborative social network in which company facility managers and operators can share information on operations. They may also drive LEED certification of company buildings, perform carbon tracking and mitigation services, and others.

[040] The system energy management data services offer a unique approach at delivering a comprehensive view of a facility's operations. The system may implement continuous optimized control through real time/interval data acquisition

and analysis of all relevant facility data. The System Enterprise Energy Management System (EEMS) may include or involve: (1) a physical site assessment, (2) historical utility bill analysis, (3) utility meter interval data analysis, (4) holistic facility controls analysis, (5) real-time automated equipment fault detection and (6) energy sourcing and demand-response energy management. From these inputs the System energy management system generates insight in the form of reports, dashboards, and alerts that provide actionable information that leads to realized energy reduction and cost savings.

[041] The system may begin with a detailed audit of the facility premises. Facilities are surveyed to fully document machine type, layout and building structure, operating hours, building automation capabilities and potential need for additional metering and sub-metering. Specific care is given to observe the unique properties of each building. The walkthrough provides critical baseline information on the premises' layout, engineering, and operational health.

[042] Historical utility bill analysis is the next phase of the system implementation. The historical utility bill analysis provides an in-depth look at utility bill trends over time, including general or seasonal trends energy trends. This information is crucial to understanding the way a building has been operating so energy saving opportunities can be recognized. It also provides a benchmark against which later energy saving measures can be compared. Additionally, it is common to find billing errors during this phase, which are immediate opportunities for savings.

[043] Meter interval data analysis is a third phase of the system solution. To obtain data about energy consumption, an energy data middleware 1102 is installed and connected to on-site utility meters. The middleware 1102 is used to collect utility data from each of the meters and sub-meters in a building, including the building automation system. This data is then cleansed and collected to get a consumption breakdown by building, section or floor and can be viewed in the robust EEMS tool. Much like the billing analysis, this information is used to spot trends and benchmark future energy saving strategies.

[044] The middleware 1102 extracts data from each building system and piece of equipment in the building. This data is tracked over time to observe subtle

features in the way the equipment works and the building operates as a whole. As months and even years of data are collected, macro-scale trends related to seasonality, occupancy, and utilization rates all emerge. These trends help contextualize power usage and other metrics, allowing for even greater insight into building operations and further opportunities for savings.

[045] The system solution utilizes data captured by the middleware 1102 on a per-minute basis. This fine level of granularity facilitates the System solution to identify real-time trends and problems which were previously undetectable. Additionally, it provides real-time actionable reporting that prioritizes problems and suggests a tangible cost to their continued neglect or systematic inefficiencies. Automatic fault detection begins with as little as three weeks of collected data, and continues for the life of the System contract.

[046] The middleware 1102 provides for bi-directional (read/write) capability with any integrated system. This facilitates for 24/7 continuous optimized control of the systems connected to it. The middleware 1102 has an intelligence layer allowing for full closed loop advanced math and logic between any of the previously disparate systems. The middleware 1102 also sends and consumes Web services. An example Web service would be an Automated Demand Response (ADR) notice and pricing level signal from Constellation New Energy (CNE) triggering the middleware 1102 on board logic and control to automatically shed electrical loads by turning off non essential lighting and changing set points on chilled water and HVAC zones.

[047] Thus, the system and NOC 1106 may establish a data connection from the network operations center 1106 through an energy data middleware 1102 to an energy data source 1104. They may then obtain energy data at the network operations center 1106 through the data connection to the energy data source 1104. The system and NOC 1106 may also perform an energy analysis in the network operations center 1106 on the energy data to produce an analysis result, as described below, for example in connection with Figures 3-6.

[048] Another component of the system solution is the strategic energy sourcing and demand-response energy planning. Energy sourcing experts will help each facility to find the lowest cost and/or greenest power available in that market.

Green options include offsetting a facility's energy requirements with renewable sources of energy, including wind, small hydroelectric, landfill gas, and biomass, providing an electricity choice that can directly support the building of new renewable power plants. The system demand response solution is an additional service that can provide direct revenue to a facility. Facilities sign up with the regional ISO's demand response program and receive annual payment for participation, in exchange for agreeing to shed load an agreed number of times. System helps to engineer a demand response solution that minimizes impact on facility operations. Both energy sourcing and demand response are administered to meet regional regulations while delivering value to the customer.

[049] The system solution achieves cost savings on several fronts. Most notably, savings are realized through reductions in total energy consumption and decreases in both scheduled and unscheduled maintenance.

[050] Energy savings occur when building control sequences are optimized to run in the most economic fashion. Wasteful situations like running an unoccupied building at/near full capacity are easily eliminated. More subtle improvements can be identified through system analytic solutions which identify mis-configured and even machines needing repairs. The system solution's automatic fault detection and diagnosis tool not only provides a clear understanding of a problem, but suggests a financial consequence with letting the problem go unresolved. The EEMS' reporting gives a level of detail which requires less man-hours to investigate – freeing the facility team to address the most promising energy saving opportunities rather than simply assessing the state of the building.

[051] Efficient building operations leads to decreases in scheduled maintenance costs. This increases the lifespan of the equipment and decreasing the replacement frequency, thus allowing a facility to optimize its operations with the equipment it has, rather than recommending new capital purchases. Unscheduled maintenance costs also decrease based on detection of inefficient machines. Some machines may achieve the desired end result (say, cooling a room to 72 degrees), but do so in a highly inefficient manner which cuts its lifespan by as much as half. As an example, a machine which is operating in both heating and cooling mode may be able to achieve a final temperature of 72

degrees by mixing hot and cold air. However, this is highly inefficient and could cause the machine to break unexpectedly.

[052] Altogether, the system solution provides direct, continuous, and reliable energy savings without requiring major capital purchases. The system solution helps a facility makes the best use of the equipment it already has, by optimizing energy consumption and maximizing the lifespan of the equipment. Through its data-driven solution, the system provides an approach that is unique in the marketplace for bringing an information-technology-driven business intelligence capability to the world of facility energy management.

[053] Figure 3 shows one example of a particular machine 2500 that implements a system for building energy analysis. The machine 2500 may implement all or part of the network operations center 1106, for example. The machine 2500 includes a processor 2502, a memory 2504, and a display 2506. A communication interface 2508 connects the machine 2500 to energy data sources 2510, such as building sensors, utility company meters, weather centers, mediator devices (e.g., a Richards-Zeta Mediator), and other data sources. The display 2506 may present reports 2512, such as those described above or below, either locally or remotely to an operator interacting with the machine 2500.

[054] The machine 2500 also includes an energy database 2514. The energy database 2514 may store any data that the machine 2500 processes. As examples, the energy database 2514 may store sensor samples 2516 (e.g., samples of energy consumption or performance of building energy consuming devices), energy metrics 2518 (e.g., measured or computed metrics, optionally based on energy KPIs), utility bill data 2520 (e.g., cost per unit energy, energy consumed, total cost, and date), weather data 2522 (e.g., temperature ranges, dates, expected temperature or temperature variations at any desired interval), or other data that helps the machine 2500 analyze energy consumption, cost, or history.

[055] The memory 2504 may store program instructions or other logic for execution by the processor 2502. For example, the memory 2504 may store energy analysis programs 2524 and energy reporting programs 2526. The energy analysis programs 2524 may gather, analyze, and otherwise process the

sensor samples 2516 or other energy data (e.g., to produce control recommendations for building systems or identify data points for further study and analysis). The energy reporting programs 2526 may generate user interfaces including dashboards, charts, graphs, text displays, or other reporting information.

[056] The machine 2500 may perform an energy analysis (e.g., as part of the network operations center) on the energy data in the energy database 2514 to produce an analysis result. To that end, as one example, the machine 2500 may include in the memory 2504 balance point determination logic 2528 (e.g., as one of the energy analysis programs 2524). The balance point determination logic 2528 may search for one balance point, or a set of multiple balance points (e.g., a pair of balance points) in the energy data. In one implementation, the energy data that is searched are triples of: date, temperature, and measured consumption data 2546, obtained from one or more energy data sources over any desired date range, such as from a building under analysis and a weather information center.

[057] The balance points may include a Heating Balance Point (HBP) 2530 and a Cooling Balance Point (CBP) 2532 to help identify the number of heating degree days (HDDs) and cooling degree days (CDDs). The HBP 2530 may be interpreted as the temperature above which the building is not heating, while the CBP 2532 may be interpreted as the temperature below which the building is not cooling. In one model, the building is neither heating nor cooling between the HBP 2530 and the CBP 2532. Thus, identifying both the HBP 2530 and CBP 2532 may significantly increase the accuracy of the count of the number of HDDs and CDDs for the building, particularly as compared to finding a single balance point for both heating and cooling, or compared to assuming a standard and usually inaccurate balance point (e.g., 65 degrees F). The increased accuracy in the determination of HDDs and CDDs has positive effects in downstream technical analyses, such as obtaining a more accurate determination of the weather load on the building, and therefore a more accurate regression model of how the building responds to weather load. The more accurate regression model means more accurate measurement and verification of savings obtained when

energy management strategies are implemented based on the downstream analyses.

[058] In particular, the balance point determination logic 2528 may implement the logic 2600 shown in Figure 4. The logic 2600 may be implemented as executable instructions for the processor 2502, to determine either or both of a HBP 2530 and a CBP 2532 (i.e., as a computer implemented method). The balance point determination logic 2528 may obtain (2602) balance point parameters 2534 including, as examples, those shown below in Table Balance Point Parameters.

[059] The balance point determination logic 2528 may obtain the balance point parameters 2534 from operator input, from pre-defined parameters stored in the memory 2504, or in other ways. With regard to the search window parameters, alternatively the balance point determination logic 2528 may search for the HBP 2530 and CBP 2532 over the entire temperature range (or some pre-defined portion of the whole range) represented in the energy data obtained for analysis.

Table: Balance Point Parameters

Parameter	Comment
HBPMin	The lower end of the search window for the heating balance point, e.g., in degrees F or C.
HBPMax	The upper end of the search window for the heating balance point, e.g., in degrees F or C.
CBPMin	The lower end of the search window for the cooling balance point, e.g., in degrees F or C.
CBPMax	The upper end of the search window for the cooling balance point, e.g., in degrees F or C.
R^2Min	The minimum correlation coefficient value that the balance point determination logic 2528 will consider in its search for a HBP or CBP. Thus, R^2 values below R^2Min may be discarded or not considered in the search for the best fit R^2 in the analysis discussed below. In other

	implementations, the balance point determination logic 2528 may employ additional or different statistical tests or variables to determine which regression models to consider in its search for the HBP and CBP. Alternatively, all R^2 values may be considered.
Temperature Delta	A temperature increment (for the HBP) or decrement (for the CBP) that defines the number or size of steps through the heating balance point search window or cooling balance point search window. For example: an increment of 2 degrees and a decrement of 3 degrees, or an increment and a decrement of 1 degree.
Data Cleansing Parameters	Parameters used to identify and remove outlier data points in the energy data before searching for the HBP or CBP. For example, a number (e.g., 1.5) of standard deviations from the mean temperature or mean energy consumption that defines outlier data points in temperature or energy consumption to be removed.

[060] The balance point determination logic 2528 obtains energy data from the building under analysis (2604). As an example, the energy data may include date, temperature, and energy consumption (e.g., kWh) data for each date. The energy data may instead be kBTU consumption, occupancy, wind speed, relative humidity, or other energy data. The energy data may extend over any desired time period, such as one year, one quarter, or one month, and may be collected at any desired interval (e.g., every 15 minutes, 30 minutes, 60 minutes, or other interval), with the data subjected to any desired mathematical treatment (e.g., averaging of the data, or discarding outlier data) to obtain the energy data for a given date.

[061] The balance point determination logic 2528 optionally cleanses the energy data prior to analysis (2606). For example, the balance point determination logic 2528 may remove from consideration from the energy data: weekend data points, outlier data points, data points with errors in date or energy consumption data, or

other non-representative data points. The outlier data points may be data points beyond a predefined outlier threshold (e.g., 2 standard deviations away from the mean) input as a balance point parameter. More specifically, the outlier data points may be determined by finding the average and standard deviation of the input data (e.g., the average of weekdays after data with invalid dates and energy data are discarded), then removing data points more than a pre-defined or operator specified multiple of the standard deviation away from the average).

[062] Given the input energy data, the balance point determination logic 2528 performs an analysis (e.g., a regression analysis) to determine a balance point set. The balance point set may include the HBP 2530 and the CBP 2532, as an example. One exemplary analysis is described below with continued reference to Figure 4. In the example given below, the balance point determination logic 2528 uses regression analysis to determine R^2 values. However, it is noted that the balance point determination logic 2528 may apply additional or different statistical tests or variables in its search of the energy data to find the HBP 2530 and CBP 2532.

[063] In particular, the balance point determination logic 2528 sorts the energy data according to temperature (e.g., in ascending order) (2608). An analysis bound, for finding the HBP 2530, is initially set to HBPMin (2610). For all the data points starting from the least temperature to the data point corresponding to HBPMin, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for that set of data points (2612). The balance point determination logic 2528 may determine the correlation coefficient by, in general, performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable. The balance point determination logic 2528 then increments the analysis bound (e.g., by 1 degree, or another pre-defined temperature delta) and if HBPMax has not yet been exceeded, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for all data points from the least temperature to the incremented analysis bound. This way, the balance point determination logic 2528 returns to (2612) repeatedly to determine the next R^2

over the new set of data points extending to the incremented analysis bound until the incremented analysis bound reaches HBPMax. The balance point determination logic 2528 may save, display, analyze, plot or otherwise manipulate any or all of the R^2 values determined during the analysis. Once the balance point determination logic 2528 has determined the R^2 values at each increment delta over the window between HBPMin to HBPMax, the balance point determination logic 2528 determines the temperature at which the best R^2 fit is achieved (2616), e.g., as determined by the greatest R^2 value. That temperature is designated the HBP 2530.

[064] With regard to the CBP 2532, the balance point determination logic sorts the energy data according to decreasing temperature (2617) and sets a new analysis bound equal to CBPMax (2618). For the data points starting from the highest temperature to the data point corresponding to CBPMax, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption, for that set of data points (2620). The balance point determination logic 2528 then decrements the analysis bound (e.g., by 1 degree, or another pre-defined temperature delta) and if CBPMin has not yet been reached, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for all data points from the highest temperature to the decremented analysis bound. This way, the balance point determination logic 2528 returns to (2620) repeatedly to determine the next R^2 over the new set of data points extending to the decremented analysis bound until the decremented analysis bound reaches CBPMin. The balance point determination logic 2528 may save, display, analyze, plot or otherwise manipulate any or all of the R^2 values determined during the analysis. Once the balance point determination logic 2528 has determined the R^2 values at each decrement delta over the window between CBPMmax to CBPMin, the balance point determination logic 2528 determines the temperature at which the best R^2 fit is achieved (2624), e.g., as determined by the greatest R^2 value. That temperature is designated the CBP 2530. The HBP and CBP may be displayed, saved, or otherwise manipulated (2626).

[065] Obtaining the balance point parameters noted above helps to focus the search for the balance points in specific windows. The results are faster and more efficient searches for the balance points. An exhaustive search of all the data points may still be performed, however, and in that regard, the balance point determination logic 2528 need not obtain specific balance point search window parameters before performing its analysis

[066] Once the balance point determination logic 2528 has obtained the HBP 2530 and CBP 2532, the machine 2500 may apply the HBP 2530 and CBP 2532 in many different types of analyses and reporting. For example, the measurement and verification (M&V) logic 2548 (or the balance point determination logic 2528) may calculate the number of HDD and CDD, present analysis plots on the display 2506, or take other actions. For example, the M&V logic 2548 may: plot the CBPMin to CBPMax with corresponding R^2; plot the HBPMin to HBPMax with corresponding R^2; determine whether any day was a CDD according to the CDD test: Min(Temperature recorded that day - CBP, 0) that returns non-zero for a CDD; determine whether any day was a HDD according to the HDD test: Min(HBP - Temperature recorded that day, 0) that returns non-zero for a HDD; extract the month from the date field for each data point (row) and sum the kWh consumption, kBTU consumption, CDD, HDD and the number of days in the data set belonging to each month and store or display the monthly figures; for monthly CDD and HDD, calculate Log CDD, Log HDD, CDD^2, HDD^2 and store or display the values for each month; for each month, calculate average Occupancy, Relative Humidity, Wind Speed, Global Solar Radiation and store or display these for each month; or output other analysis result.

[067] The M&V logic 2548 may define, execute, and display the results of regression analyses, given, as examples, the number of CDD or HDD, the HBP 2530 or CBP 2532, or other parameters. To that end, the M&V logic 2548 may obtain (e.g., from operator input or from pre-defined parameters in the memory 2504) M&V parameters 2550. The M&V parameters 2550 may include, as examples, company name, building name, an (optionally) unique building identifier, analysis start date, analysis end date, or other parameters. Additional

M&V parameters 2550 may include: user-specified independent variables for use in regression analyses, such as CDD, HDD, number of days, CDD^2, HDD^2, Log CDD, Log HDD, occupancy, relative humidity, wind speed, and global solar radiation; and user-specified dependent variables for use in the regression analyses, such as kWh consumption, kBTU (i.e., natural gas) consumption.. Using the M&V parameters 2550, the M&V logic 2548 may calculate, store, display or otherwise perform a user-specified regression analysis. In particular, the M&V logic 2548 may determine the 'n' independent variables specified in the M&V parameters 2550, and from 'i'=1 to n, take 'i' of the variables at a time and create a regression model with the 'i' variables as independent variables and kWh (or kBTU, or other energy measurement chosen) as the dependent variable. Each of the regression models created may use a combination (subset) of the overall 'n' independent variables chosen. The M&V logic 2548 runs the regression based on the data (e.g., monthly, weekly, or daily data) for the dependent and independent variables, and may determine and store the R^2 value, significance F (e.g., from an F-test), or any other variables or test results, and the corresponding intercept and coefficient values for each of the 'i' independent variables.

[068] The M&V logic 2548 may, if desired, for each independent variable chosen, disallow the certain pairs of variables in the regression analysis (e.g., transformations of the same variable may not be chosen together in the same regression model). As examples:

[069] CDD and CDD^2 together may be disallowed;

[070] CDD and Log CDD together may be disallowed;

[071] Log CDD and CDD^2 together may be disallowed;

[072] HDD and HDD^2 together may be disallowed;

[073] HDD and Log HDD together may be disallowed;

[074] Log HDD and HDD^2 together may be disallowed.

[075] Once the combinations of regression outputs for 'i'=1 to n have been generated and stored, the M&V logic 2548 may sort the R^2 values for the regressions (e.g., by decreasing R^2) and output on the display 2506 the top results (e.g., the top 1, 2, or 3 results). Each result may, for example, report the

R^2, Significance F, intercept and coefficients for each independent variable in the top regression results. Additionally, the M&V logic 2548, may use the intercept and the coefficients for each independent variable to create the regression equation for each of the top regression outputs.

[076] In addition to those noted above, the M&V logic 2548 may generate a wide variety of analysis results as outputs on the display 2506. Examples are given below. With regard to the first two examples, the M&V logic 2548 may generate the displays using information obtained from the balance point determination logic 2528. Alternatively or additionally, the balance point determination logic 2528 may display the charts described using the information that it obtains in its analysis to find the balance points.

[077] 1) a line chart showing temperature varying from HBPMin to HBPMax on the X axis and R^2 (the square of correlation for temperature and kWh) corresponding to each temperature on the Y axis;

[078] 2) a line chart showing temperature varying from CBPMin to CBPMax on the X axis and R^2 (the square of correlation for temperature and kWh) corresponding to each temperature on the Y axis;

[079] 3) tables containing the underlying data used to generate above two charts;

[080] 4) a table showing monthly date in any desired (e.g., mm/yyyy) format, kWh consumption, kBTU consumption, monthly CDD, monthly HDD, monthly CDD^2, Log CDD, Log HDD, HDD^2, monthly average Occupancy, monthly average Relative Humidity, monthly average Wind Speed, monthly average Global Solar Radiation, or other variables; and

[081] 5) a table which shows a summary of the top regression outputs, including R^2, Significance F, Regression Equation, Intercept and coefficients for each independent variable for each regression output.

[082] The machine 2500 may additionally or alternatively include comparison logic 2544 (e.g., as one of the energy analysis programs 2524). The comparison logic 2544 may include instructions that when executed by the processor 2502 cause the processor 2502 to perform a kilowatt hour consumption and exception rank analysis, for example. One example of a comparison analysis 2700 that

results from the comparison logic 2544 is shown in Figure 5. The comparison analysis 2700 extends in 30 minute intervals over an entire day for a particular building under analysis, but the comparison logic 2544 may perform analyses over shorter or longer time periods at different intervals. Furthermore, the comparison may be done with respect to a single building (e.g., to compare energy consumption data historically for the building), or with respect to multiple buildings (e.g., to compare a building under analysis to a different control building). In addition, there may be multiple buildings in a control building group that each contribute energy data for defining (e.g., by averaging or according to another statistical treatment) the control building data described below.

[083] The comparison logic 2544 may compare control building data 2702 to a user-defined standard 2704. In the example shown in Figure 5, the control building data 2702 is daily average kWh consumption measured at 30 minute intervals over 15 different days in July, and the user-defined data is 2704 is daily average kWh consumption at 30 minute intervals over the month of January 2009 for a particular building under analysis. The control building data 2702 and user-defined data 2704 may be data points over any other time intervals, time spans, or obtained from any number of different buildings, or from the same building. Further, either the control building data 2702, the user-defined data 2704, or both, may capture desired or expected levels of building performance, may represent actually measured and optionally statistically treated (e.g., averaged) consumption data from one or more buildings, or may represent other data automatically obtained or input by an operator. Thus, as another example, the control building data 2702 may be individual operator specified data points at 30 minute intervals that provide a baseline for comparison. The constitution of the control building data 2702 and the user-defined data 2704 may vary widely, as examples: average consumption at any desired interval on weekdays over a pre-defined time period (e.g., one week, three months, or one year), optionally excluding holidays, and/or outlier data points; average consumption at any desired interval on weekends over a predefined time period; average consumption at any desired interval on holidays over a predefined time period; or other consumption data.

[084] For the example shown in Figure 5, the comparison logic 2544 performs a comparison respect to energy consumption measured in kWh. However, other energy measurements may be used, such as cubic feet of natural gas consumption, gallons of water used, or measurements of other types of energy or resources.

[085] The comparison logic 2544 may determine and display exceptions 2706. The exceptions 2706 may identify noteworthy variations in consumption data for further review or analysis. Figure 5 illustrates an example in which 16 exception ranks 2708 are defined. As specific examples, the exception 2710 indicates a rank 3 exception and the exception 2712 indicates a rank 4 exception. The comparison logic 2544 may analyze the building control data 2702, the user-defined data 2704, or both to determine exceptions at any desired time interval, such as every second, every minute, every 15 minutes or every 30 minutes.

[086] The comparison logic 2544 may determine an exception rank for any interval in many different ways. For example, the exception rank may apply to the user-defined data 2704, with exception rank assigned based on the standard deviation of the user defined data 2704 (e.g., determined at each interval). Table Exception Ranks, below, shows one example definition of the exception ranks according to windows of standard deviations of the user-defined data 2704. The comparison logic 2544 may determine additional, fewer, or different exception ranks according to additional, fewer, or different standard deviation windows, or using any other statistical criteria of interest that map the statistical criteria to one or more exception ranks.

Table: Exception Ranks

Rank	1	2	3	4	5
Standard Deviations from the mean	-1 to +1	from: -1 to -1.5 and from: 1 to 1.5	from: -1.5 to -2 and from: 1.5 to 2	from: -2 to -2.5 and from: 2 to 2.5	from: -2.5 to -3 and from: 2.5 to 3

[087] More specifically, the comparison logic 2544 may determine the average (the control average) and standard deviation (the control standard deviation) of the energy data for each interval (e.g., the interval between 3 am and 3:30 am on a given day) in the building control data 2702. The comparison logic 2544 further determines the average (the user-defined average) of the data for each similar interval in the user-defined data 2704. The comparison logic 2544 then assigns an exception rank to the user-defined average for each interval in the user-defined data 2704 according to where the user-defined average falls within the control standard deviation determined from the building control data 2702 for the same interval. For example, in Figure 5, at 3:30 am the comparison logic 2544 determines an exception rank of 4 because the average consumption (7082.58 kWh) is between -2 and -2.5 standard deviations of the average consumption (7267.40) in the building control data 2702 in the same interval. At 3:30 pm, an exception rank of 3 applies because the average consumption (7526.81 kWh) of the user-defined data 2704 is between -1.5 and -2 standard deviations of the average consumption (8064.87) in the building control data 2702 in the same interval.

[088] The Table Comparison Data, below, shows for the comparison analysis 2700 the analysis data at 30 minute intervals for the control building data 2702 and the user-specified data 2704, including the determined exception rank determined according to Table Exception Ranks.

Table: Comparison Data

	Control Range average by time slot	User Defined Range average by time slot	Exception Rank by time slot	Difference
12:30 AM	7348.93	7213.00	2.00	135.93
1:00 AM	7331.47	7218.42	1.00	113.05
1:30 AM	7310.67	7210.65	1.00	100.02
2:00 AM	7281.27	7204.10	0.00	77.17
2:30 AM	7285.67	7202.52	1.00	83.15
3:00 AM	7275.53	7194.45	1.00	81.08
3:30 AM	7267.40	7082.58	4.00	184.82
4:00 AM	7250.07	7086.48	4.00	163.58

4:30 AM	7248.60	7198.90	0.00	49.70
5:00 AM	7245.80	7206.10	0.00	39.70
5:30 AM	7323.53	7169.90	2.00	153.63
6:00 AM	7265.13	7259.00	0.00	6.13
6:30 AM	7285.67	7291.13	0.00	-5.46
7:00 AM	7413.67	7419.35	0.00	-5.69
7:30 AM	7448.87	7453.87	0.00	-5.00
8:00 AM	7526.47	7419.16	0.00	107.31
8:30 AM	7583.80	7443.19	0.00	140.61
9:00 AM	7673.47	7465.71	1.00	207.76
9:30 AM	7751.73	7499.58	1.00	252.15
10:00 AM	7835.53	7522.03	1.00	313.50
10:30 AM	7923.40	7550.65	2.00	372.75
11:00 AM	7952.73	7556.00	2.00	396.73
11:30 AM	7975.87	7537.77	2.00	438.09
12:00 PM	7994.87	7545.10	3.00	449.77
12:30 PM	8015.13	7557.58	2.00	457.55
1:00 PM	8016.80	7550.87	3.00	465.93
1:30 PM	8041.73	7556.03	3.00	485.70
2:00 PM	8057.87	7556.29	3.00	501.58
2:30 PM	8052.53	7600.32	2.00	452.21
3:00 PM	8043.93	7568.87	3.00	475.06
3:30 PM	8064.87	7526.81	3.00	538.06
4:00 PM	8050.93	7492.26	3.00	558.68
4:30 PM	8041.73	7506.42	4.00	535.31
5:00 PM	8010.40	7509.71	4.00	500.69
5:30 PM	7971.53	7496.00	3.00	475.53
6:00 PM	7935.40	7487.13	3.00	448.27
6:30 PM	7891.13	7462.32	3.00	428.81
7:00 PM	7859.20	7441.35	3.00	417.85
7:30 PM	7815.40	7436.06	3.00	379.34
8:00 PM	7783.07	7426.45	3.00	356.62
8:30 PM	7720.87	7415.61	2.00	305.25
9:00 PM	7703.20	7405.29	2.00	297.91
9:30 PM	7628.07	7392.23	1.00	235.84
10:00 PM	7492.53	7280.90	3.00	211.63
10:30 PM	7442.33	7267.32	2.00	175.01
11:00 PM	7423.47	7257.65	2.00	165.82

11:30 PM	7371.53	7224.42	2.00	147.11
12:00 AM	7349.53	7219.74	2.00	129.79
Total KWH	367583.33	354587.29	3.00	12996.04

[089] Figure 6 shows the logic that the comparison logic 2544 may implement, e.g., as processor executable instructions (i.e., as a computer implemented method). The comparison logic 2544 obtains background information, such as company name, building and company location, an (optionally) unique building identifier, or other data (2802). The comparison logic 2544 gathers overall time of use consumption data at any desired interval (e.g., every 30 minutes) (2804). The operator may specify a date range for exception rank analysis (2806) and for the control range (2808). For example, the operator may specify a particular month in 2006 as the control range, and a particular month in 2010 as the date range for exception rank analysis. Optionally, the operator may directly specify the consumption data for either the control range or exception rank analysis range.

[090] The comparison logic 2544 obtains or establishes exception rank definitions (2810). Examples of exception rank definitions are shown in Table: Exception Ranks, but the definitions may vary widely in implementation to take into consideration any statistical parameter desired. The comparison logic 2544 optionally cleanses any of the input consumption data (2812). To that end, the comparison logic 2544 may remove data rows for which no consumption data is available, for which erroneous data is present, or for which the consumption data is anomalous (e.g., exceeding the mean consumption data by more than a pre-defined threshold).

[091] The exception analysis may be run against all the data, weekdays, weekends, holidays, or any other subset of the overall data. Thus, the comparison logic 2544 identifies and determines the number of weekdays, weekends, holidays, or other particular days in the overall data (2814). Similarly, the comparison logic 2544 determines overall and monthly average consumption data at each interval for weekdays, weekends, holiday, and all days in each month (2816).

[092] For each interval in the control range (e.g., daily, every 30 minutes), the comparison logic 2544 determines the average and standard deviation of the data for that interval (2818). Similarly, the comparison logic 2544 determines the average consumption in each interval in the user-defined date range for the exception rank analysis (2820). The comparison logic 2544, with reference to the exception rank definitions, assigns an exception rank for each interval, using the average consumption from the user-defined date range with reference to the average and standard deviation determined form the corresponding interval in the control range (2822). The comparison logic 2544 may generate and display the resulting comparison analysis 2700 (2824). While Figure 5 shows an analysis of daily consumption at 30 minute intervals, the comparison logic 2544 may analyze other time windows at other intervals (e.g., one day intervals over one month, or one day intervals over one year).

[093] Exception ranks may be determined in ways other than that described above, however. As another example, the comparison logic 2544 may determine the exception rank according to the magnitude of the difference in consumption between the control building data 2702 and the user-defined data 2704, with individual thresholds or ranges defined to determine which difference magnitude maps to which exception rank. Furthermore, the difference may be shaded or otherwise highlighted in the comparison analysis 2700 to help visualize the difference.

[094] The machine 2500 may employ the comparison analysis 2700 to rank or gauge how well a building is performing. The ranking may be output on the display 2506 as an analysis result. For example, a building with more than a threshold number of exceptions of greater than a pre-defined exception rank (or some other function of the exception ranks) may be flagged and displayed as a building that needs special attention with regard to its energy consumption. To that end, the comparison logic 2544 may implement any desired ranking rules based on the comparison analysis 2700 to determine how well a building is performing, and responsively take action, e.g., by notifying a building supervisor, outputting notification or warning messages on the display 2506, or taking other action when the rule fires.

[095] In addition, the machine 2500 may implement building level alerts. The alerts may be defined in the memory 2504 using alert rules 2536. Alert logic 2538, shown in Figure 7, may run at any desired interval. The alert logic 2538 may include instructions that when executed by the processor 2502, read the alert rules 2536 (2902) and energy data from the energy database 2514 (2904). The instructions may further processes the alert rules 2536 to determine based on any of the energy data whether any of the alert rules 2536 should fire (2906). If so, the alert logic 2538 determines the analysis result (2908) based on the alert rule and displays the analysis result (2910). In that regard, the machine 2500 may output a message, display any desired indicia, or take any other pre-defined action when the alert rule fires, as defined in each alert rule 2536. Further, the alert rules 2536 may specify the analysis result (e.g., display a warning message), the analysis results may be pre-determined (e.g., for any rule that fires, send a message to an operator), or the analysis results may be determined in other ways. The alert rules 2536 may vary widely in implementation, and may take into consideration any of the variables obtained from the building or any other source, such as kWh consumption, temperature, time, date, balance points, or other variables. Examples of alert rules 2536 are shown below in Table: Alerts.

Table: Alerts

Alert Category	Alert Name	Alert Rule	Notes
Demand kilowatts(kw)	1. Demand Exceeded Peak Threshold	Building kw demand compared at any desired interval against a user defined kw threshold.	Example: If kw demand reaches over 500kw, then issue alert.
	2. Demand Exceeded Historic Threshold (not normalized)	Building kw demand continuously or at any desired	Example: Daily kw demand is compared to the same day in previous years. Issue alert if

		interval (e.g., daily, monthly) compared against historical demand for the building. Analysis Result: Send warning message to building operator.	demand is greater or less than historical demand by a pre-selected threshold.
	3. Demand Exceeded Baseline Threshold (normalized)	Building kw demand is continuously or at any desired interval (e.g., daily, monthly) compared against historical baseline regression model	Example: Daily kw demand is compared to the same or a similar day (as defined by any desired regression on variables such as HDD, CDD, Humidity, Occupancy, or other variables).
	4. Significant Change (Increase or Decrease) in Demand	Building kw demand is monitored continuously or at any desired interval for changes up or down that exceed a pre-defined threshold.	Example: Demand goes from 700kw at 10am to 500kw 10:15 (the next interval). This could either be a result of a demand / response event or some problem with equipment or behavior changes.
	5. Demand Exceeded Comparable Building Threshold	Building kw demand is continuously or at any desired interval compared against a user-defined	Example: Building 1 demand exceeds Building 7 kw demand (Building 7 is the baseline or control building against which other buildings are

		comparable/similar building.	compared).
Consumption (kwh)	1. Consumption Exceeded Historic Threshold (not normalized)	Building kwh consumption at any desired interval (e.g., hourly, daily, monthly) compared against historical consumption for the building.	Example: Daily kwh consumption is compared to the same day in previous years. Issue alert if consumption is greater or less than historical consumption by a pre-selected threshold.
	2. Consumption Exceeded Baseline Threshold (normalized)	Building kwh consumption is compared at any desired interval (e.g., daily, monthly) against historical baseline regression model	Example: Daily kwh consumption is compared to the same or a similar day (as defined by regression variables such as HDD, CDD, Humidity, Occupancy, or other variables).
	3. Significant Change (Increase or Decrease) in Consumption	Building kwh consumption is monitored at any desired interval for changes up or down that exceed a pre-defined threshold.	Example: Consumption goes from 900kwh between 10 am and 11 am to 500kwh between 11 am and 12 noon. This could either be a result of a demand / response event or some problem with equipment or behavior changes.
	4. Consumption Exceeded Comparable Building Threshold	Building kwh consumption is compared at any desired interval against a user-defined	Example: Building 1 consumption exceeds Building 7 kwh consumption (Building 7 is the baseline or control building against which

		comparable/similar building.	other buildings are compared).

[096] The alerts discussed above are building level alerts with regard to consumption and demand. However, the alert rules may define alerts based on any energy consumption parameters that are directly measured, statistically derived, or otherwise obtained. The machine 2500 may also implement more complex analyses. As one example, the machine 2500 may include event logic 2542 that analyzes equipment data to detect or infer events of interest based on event rules 2540. Such event rules 2540 may help define when demand / response events occur, when equipment has failed or has been fixed, or other events. When the event logic 2542 identifies an event, the event logic 2542 may responsively execute a pre-defined action, for example as specified in the event rules 2540.

[097] The machine 2500 or any of the systems described above may be implemented with additional, different, or fewer components. As one example, a processor may be implemented as a microprocessor, a microcontroller, a DSP, an application specific integrated circuit (ASIC), discrete logic, or a combination of other types of circuits or logic. As another example, memories may be DRAM, SRAM, Flash or any other type of memory. The processing capability of the system may be distributed among multiple components, such as among multiple processors and memories, optionally including multiple distributed processing systems. Parameters, databases, and other data structures may be separately stored and managed, may be incorporated into a single memory or database, may be logically and physically organized in many different ways, and may implemented with different types of data structures such as linked lists, hash tables, or implicit storage mechanisms.

[098] Logic, such as programs or circuitry, may be combined or split among multiple programs, distributed across several memories and processors, and may be implemented in a library, such as a shared library (e.g., a dynamic link library (DLL)). The DLL, for example, may store code that analyzes energy expenditure or that prepares energy reports. As another example, the DLL may itself provide

all or some of the functionality of the machine 2500. The programs may be stored on a computer readable medium, such as a CDROM, hard drive, floppy disk, flash memory, or other computer readable medium. Thus, a computer program product may include computer readable instructions, which when loaded and run in a computer and/or computer network system, cause the computer system and/or the computer network system to perform operations according to any of the claims below, and in particular to perform any of the logic and methods illustrated in Figures 4, 6, and 7, as examples.

[099] While various embodiments of the invention have been described, it will be apparent to those of ordinary skill in the art that many more embodiments and implementations are possible within the scope of the invention. Accordingly, the invention is not to be restricted except in light of the attached claims and their equivalents.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

This correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: September 9, 2011 Name: John F. Nethery, Reg. No. 42,298 Signature: 

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay E. Hedley et al.	
Appln. No.:	12/776,159	Examiner: Andrew M. Schechter
Filed:	May 7, 2010	Art Unit: 2882
For:	Building Energy Consumption Analysis System	Conf. No.: 1676
Attorney Docket No:	10022/1726	

REQUEST FOR REPUBLICATION UNDER 37 CFR 1.221(a)

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Assignee requests republication of U.S. Patent Application Serial Number 12/776,159 using the attached specification, claims and drawings that were submitted as a substitute specification, claim amendments, and amended drawings on the same date as this request. In support of Assignee's request, enclosed is a substitute specification and 8 sheets of replacement drawings for Figures 1-7. This Request is submitted with the publication fee of $300.00 under 37 CFR §1.18(d) and the processing fee of $130.00 under 37 CFR §1.17(i).

Assignee has authorized charging the fees to a deposit account, as indicated in the Transmittal accompanying this filing.

Respectfully submitted,

Dated: September 9, 2011

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BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

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BACKGROUND OF THE INVENTION

1. Cross Reference to Related Applications

[001] This application claims priority to U.S. provisional patent application serial numbers 61/176,855 and 61/176,790, both filed 8-May-2009 and titled Building Sensor Operational Data Analysis for Energy Saving System Control.

2. Technical Field.

[002] This disclosure relates to obtaining and analyzing building energy data. This disclosure also relates to engaging in an energy analysis to determine analysis results, and optionally responsively controlling building systems, such as lighting, heating, air-conditioning, and other energy consuming systems.

3. Related Art.

[003] Energy consumption, monitoring, and management are crucial components of sustainable, eco-friendly infrastructures now and into the future. In the past, energy monitoring systems, such as those available from Sensus Machine Intelligence, have obtained and analyzed energy data from individual pieces of equipment in a building. A need exists to provide energy data focused analysis results to accurately determine building energy expenditures, performance and costs.

WILLOW TECH. EX. 1005
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SUMMARY

[004] An energy analysis system provides energy analysis results. The energy analysis system may include a processor, a communication interface coupled to the processor, and a memory coupled to the processor. The memory may include energy analysis logic that, when executed by the processor, causes an energy analysis system to: establish a data connection from a network operations center through an energy data connectivity interface to an energy data source, obtain energy data at the network operations center through the data connection to the energy data source, and perform an energy analysis in the network operations center on the energy data to produce an analysis result.

[005] The energy analysis may include: determining building comparison baseline data within the energy data, determining actual consumption data within the energy data, and determining, as the analysis result, an exception rank by determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data, and comparing the comparison standard deviation and the actual consumption data. The exception rank may identify specific data in the actual consumption data for further review.

[006] As another example, the energy analysis may include: determining a balance point set from the energy data as the analysis result. The balance point set may include both a heating balance point and a cooling balance point. The system may display any analysis result in a user interface on a display.

[007] Other systems, methods, features and advantages will be, or will become, apparent to one with skill in the art upon examination of the following figures and detailed description. It is intended that all such additional systems, methods, features and advantages be included within this description, be within the scope of the invention, and be protected by the following claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[008] The systems and methods may be better understood with reference to the following drawings and description. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the

principles of the invention. Moreover, in the figures, like referenced numerals designate corresponding parts throughout the different views.

[009] Figure 1 shows an example of a development framework for a system for building energy analysis.

[010] Figures 2A and 2B show a system architecture for building energy analysis.

[011] Figure 3 shows an example of a particular machine for implementing the system for building energy analysis.

[012] Figure 4 shows balance point determination logic.

[013] Figure 5 shows a kilowatt hour consumption and exception ranks analysis.

[014] Figure 6 shows comparison logic for determining exception ranks.

[015] Figure 7 shows alert logic for determining building level alerts.

DETAILED DESCRIPTION

[016] Figure 1 shows an example of a development framework 1000 for a system for building energy analysis. The following may be undertaken with regard to developing the system:

[017] Create the strategy and roadmap for co-developing the Energy Management Framework (EMF).

[018] Internally pilot the SMART Buildings platform to be the proving grounds of the EMF and serve as the credential for the EMF and its premier energy management application.

[019] Co-develop the EMF to lead the industry in defining a unique platform to develop, deployed, and manage energy related applications.

[020] Deploy the EMF using, e.g., cloud services OS to manage advanced engineering calculations and data management requirements.

[021] Investigate leading technologies for building system connectivity and integration and help scale additional drivers, scalability, and security with a platform for any company to leverage.

[022] Further define the strategy of the EMF to leverage additional technologies as the market develops.

[023] Integrate into existing Energy systems and technologies.

[024] Align with utility companies to leverage specific solutions as part of the world's energy / carbon dashboards (SMART Grid, INDE, demand response programs, carbon tracking/management/trading, SMART City).

[025] Figures 2A and 2B show an architecture 1100 for the system. The system may provide an energy data focused approach based on data management and analytics of existing systems and equipment versus a capital intensive approach. The system may connect and integrate in a hardware and software agnostic way with multiple vendor solutions & protocols. The system may provide an open IP-based two way (read/write) infrastructure connecting one or more buildings in a portfolio to a network operations center with web-based control capabilities. The system may, as examples:

[026] 1) deliver continuous re-commissioning through setpoint control and schedule optimization;

[027] 2) deliver 24 hours a day x 7 days a week (24x7) automated equipment fault detection and diagnosis down to one-minute intervals and prioritized by user defined options: rank, severity, cost of fault, location, and others;

[028] 3) establish operational guidelines for setpoints and schedules across all equipment and BAS data for a portfolio of buildings, managed through a central command center;

[029] 4) deliver measurable calculated monthly results tracking energy reductions: (10% min in year 1);

[030] 5) integrate to existing Maintenance Repair & Operations applications and Energy Management systems;

[031] 6) include the ability to install, connect, and integrate additional meters, sub-meters, sensors into the common platform as required;

[032] 7) be supported by world class project management, change management, and training organization; and

[033] 8) be delivered on a scalable architecture to easily and securely scale with the client's needs.

[034] With reference still to Figures 2A and 2B, the architecture 1000 includes:

[035] At the building (e.g., company facility): middleware 1102 provides a connectivity interface for connecting to one or more meters and sub-systems in a facility. The meters may include utility meters as well as any Building Automation System (BAS), lighting or security control system, or other systems.

[036] Site Web Services 1104: The middleware 1102 communicates the data it collects to the System Network Operations Center (NOC) 1106. The middleware 1102 may received the energy data from web services 1104 installed onsite at any desired facilities. In other words, the web services 1104 may establish a data connection to the middleware 1102 and send building energy data to the middleware 1102. However, any other type of connectivity interface as a data transmission mechanism may be employed to communicate data to the middleware 1102, including file transfer, message passing (whether web services based or not), shared memories, or other data transfer mechanisms.

[037] System NOC 1106: The NOC 1106 may use a Service-Oriented Architecture (SOA) to aggregate data across all facilities. Its core services provide analytics and other data management services to the user via a Web-based portal, or Rich Internet Application (RIA). Examples of the specific implementation of the NOC 1106 and the analysis results that the NOC 1106 may provide are discussed below, and in particular with regard to Figures 3-6.

[038] External Data sources 1108: In addition, the NOC collects relevant data from external data sources, such as the National Weather Service, and may also obtain reports on regional energy prices and 3rd-party or company systems.

[039] Additional Services 1110: Because of the versatility of the system 100 infrastructure, additional services may be layered onto the core. The middleware 1102 has 2-way communication that supports Demand Response programs. Additional services also include a collaborative social network in which company facility managers and operators can share information on operations. They may also drive LEED certification of company buildings, perform carbon tracking and mitigation services, and others.

[040] The system energy management data services offer a unique approach at delivering a comprehensive view of a facility's operations. The system may implement continuous optimized control through real time/interval data acquisition

and analysis of all relevant facility data. The System Enterprise Energy Management System (EEMS) may include or involve: (1) a physical site assessment, (2) historical utility bill analysis, (3) utility meter interval data analysis, (4) holistic facility controls analysis, (5) real-time automated equipment fault detection and (6) energy sourcing and demand-response energy management. From these inputs the System energy management system generates insight in the form of reports, dashboards, and alerts that provide actionable information that leads to realized energy reduction and cost savings.

[041] The system may begin with a detailed audit of the facility premises. Facilities are surveyed to fully document machine type, layout and building structure, operating hours, building automation capabilities and potential need for additional metering and sub-metering. Specific care is given to observe the unique properties of each building. The walkthrough provides critical baseline information on the premises' layout, engineering, and operational health.

[042] Historical utility bill analysis is the next phase of the system implementation. The historical utility bill analysis provides an in-depth look at utility bill trends over time, including general or seasonal trends energy trends. This information is crucial to understanding the way a building has been operating so energy saving opportunities can be recognized. It also provides a benchmark against which later energy saving measures can be compared. Additionally, it is common to find billing errors during this phase, which are immediate opportunities for savings.

[043] Meter interval data analysis is a third phase of the system solution. To obtain data about energy consumption, an energy data middleware 1102 is installed and connected to on-site utility meters. The middleware 1102 is used to collect utility data from each of the meters and sub-meters in a building, including the building automation system. This data is then cleansed and collected to get a consumption breakdown by building, section or floor and can be viewed in the robust EEMS tool. Much like the billing analysis, this information is used to spot trends and benchmark future energy saving strategies.

[044] The middleware 1102 extracts data from each building system and piece of equipment in the building. This data is tracked over time to observe subtle

features in the way the equipment works and the building operates as a whole. As months and even years of data are collected, macro-scale trends related to seasonality, occupancy, and utilization rates all emerge. These trends help contextualize power usage and other metrics, allowing for even greater insight into building operations and further opportunities for savings.

[045] The system solution utilizes data captured by the middleware 1102 on a per-minute basis. This fine level of granularity facilitates the System solution to identify real-time trends and problems which were previously undetectable. Additionally, it provides real-time actionable reporting that prioritizes problems and suggests a tangible cost to their continued neglect or systematic inefficiencies. Automatic fault detection begins with as little as three weeks of collected data, and continues for the life of the System contract.

[046] The middleware 1102 provides for bi-directional (read/write) capability with any integrated system. This facilitates for 24/7 continuous optimized control of the systems connected to it. The middleware 1102 has an intelligence layer allowing for full closed loop advanced math and logic between any of the previously disparate systems. The middleware 1102 also sends and consumes Web services. An example Web service would be an Automated Demand Response (ADR) notice and pricing level signal from Constellation New Energy (CNE) triggering the middleware 1102 on board logic and control to automatically shed electrical loads by turning off non essential lighting and changing set points on chilled water and HVAC zones.

[047] Thus, the system and NOC 1106 may establish a data connection from the network operations center 1106 through an energy data middleware 1102 to an energy data source 1104. They may then obtain energy data at the network operations center 1106 through the data connection to the energy data source 1104. The system and NOC 1106 may also perform an energy analysis in the network operations center 1106 on the energy data to produce an analysis result, as described below, for example in connection with Figures 3-6.

[048] Another component of the system solution is the strategic energy sourcing and demand-response energy planning. Energy sourcing experts will help each facility to find the lowest cost and/or greenest power available in that market.

Green options include offsetting a facility's energy requirements with renewable sources of energy, including wind, small hydroelectric, landfill gas, and biomass, providing an electricity choice that can directly support the building of new renewable power plants. The system demand response solution is an additional service that can provide direct revenue to a facility. Facilities sign up with the regional ISO's demand response program and receive annual payment for participation, in exchange for agreeing to shed load an agreed number of times. System helps to engineer a demand response solution that minimizes impact on facility operations. Both energy sourcing and demand response are administered to meet regional regulations while delivering value to the customer.

[049] The system solution achieves cost savings on several fronts. Most notably, savings are realized through reductions in total energy consumption and decreases in both scheduled and unscheduled maintenance.

[050] Energy savings occur when building control sequences are optimized to run in the most economic fashion. Wasteful situations like running an unoccupied building at/near full capacity are easily eliminated. More subtle improvements can be identified through system analytic solutions which identify mis-configured and even machines needing repairs. The system solution's automatic fault detection and diagnosis tool not only provides a clear understanding of a problem, but suggests a financial consequence with letting the problem go unresolved. The EEMS' reporting gives a level of detail which requires less man-hours to investigate – freeing the facility team to address the most promising energy saving opportunities rather than simply assessing the state of the building.

[051] Efficient building operations leads to decreases in scheduled maintenance costs. This increases the lifespan of the equipment and decreasing the replacement frequency, thus allowing a facility to optimize its operations with the equipment it has, rather than recommending new capital purchases. Unscheduled maintenance costs also decrease based on detection of inefficient machines. Some machines may achieve the desired end result (say, cooling a room to 72 degrees), but do so in a highly inefficient manner which cuts its lifespan by as much as half. As an example, a machine which is operating in both heating and cooling mode may be able to achieve a final temperature of 72

degrees by mixing hot and cold air. However, this is highly inefficient and could cause the machine to break unexpectedly.

[052] Altogether, the system solution provides direct, continuous, and reliable energy savings without requiring major capital purchases. The system solution helps a facility makes the best use of the equipment it already has, by optimizing energy consumption and maximizing the lifespan of the equipment. Through its data-driven solution, the system provides an approach that is unique in the marketplace for bringing an information-technology-driven business intelligence capability to the world of facility energy management.

[053] Figure 3 shows one example of a particular machine 2500 that implements a system for building energy analysis. The machine 2500 may implement all or part of the network operations center 1106, for example. The machine 2500 includes a processor 2502, a memory 2504, and a display 2506. A communication interface 2508 connects the machine 2500 to energy data sources 2510, such as building sensors, utility company meters, weather centers, mediator devices (e.g., a Richards-Zeta Mediator), and other data sources. The display 2506 may present reports 2512, such as those described above or below, either locally or remotely to an operator interacting with the machine 2500.

[054] The machine 2500 also includes an energy database 2514. The energy database 2514 may store any data that the machine 2500 processes. As examples, the energy database 2514 may store sensor samples 2516 (e.g., samples of energy consumption or performance of building energy consuming devices), energy metrics 2518 (e.g., measured or computed metrics, optionally based on energy KPIs), utility bill data 2520 (e.g., cost per unit energy, energy consumed, total cost, and date), weather data 2522 (e.g., temperature ranges, dates, expected temperature or temperature variations at any desired interval), or other data that helps the machine 2500 analyze energy consumption, cost, or history.

[055] The memory 2504 may store program instructions or other logic for execution by the processor 2502. For example, the memory 2504 may store energy analysis programs 2524 and energy reporting programs 2526. The energy analysis programs 2524 may gather, analyze, and otherwise process the

sensor samples 2516 or other energy data (e.g., to produce control recommendations for building systems or identify data points for further study and analysis). The energy reporting programs 2526 may generate user interfaces including dashboards, charts, graphs, text displays, or other reporting information.

[056] The machine 2500 may perform an energy analysis (e.g., as part of the network operations center) on the energy data in the energy database 2514 to produce an analysis result. To that end, as one example, the machine 2500 may include in the memory 2504 balance point determination logic 2528 (e.g., as one of the energy analysis programs 2524). The balance point determination logic 2528 may search for one balance point, or a set of multiple balance points (e.g., a pair of balance points) in the energy data. In one implementation, the energy data that is searched are triples of: date, temperature, and measured consumption data 2546, obtained from one or more energy data sources over any desired date range, such as from a building under analysis and a weather information center.

[057] The balance points may include a Heating Balance Point (HBP) 2530 and a Cooling Balance Point (CBP) 2532 to help identify the number of heating degree days (HDDs) and cooling degree days (CDDs). The HBP 2530 may be interpreted as the temperature above which the building is not heating, while the CBP 2532 may be interpreted as the temperature below which the building is not cooling. In one model, the building is neither heating nor cooling between the HBP 2530 and the CBP 2532. Thus, identifying both the HBP 2530 and CBP 2532 may significantly increase the accuracy of the count of the number of HDDs and CDDs for the building, particularly as compared to finding a single balance point for both heating and cooling, or compared to assuming a standard and usually inaccurate balance point (e.g., 65 degrees F). The increased accuracy in the determination of HDDs and CDDs has positive effects in downstream technical analyses, such as obtaining a more accurate determination of the weather load on the building, and therefore a more accurate regression model of how the building responds to weather load. The more accurate regression model means more accurate measurement and verification of savings obtained when

energy management strategies are implemented based on the downstream analyses.

[058] In particular, the balance point determination logic 2528 may implement the logic 2600 shown in Figure 4. The logic 2600 may be implemented as executable instructions for the processor 2502, to determine either or both of a HBP 2530 and a CBP 2532 (i.e., as a computer implemented method). The balance point determination logic 2528 may obtain (2602) balance point parameters 2534 including, as examples, those shown below in Table Balance Point Parameters.

[059] The balance point determination logic 2528 may obtain the balance point parameters 2534 from operator input, from pre-defined parameters stored in the memory 2504, or in other ways. With regard to the search window parameters, alternatively the balance point determination logic 2528 may search for the HBP 2530 and CBP 2532 over the entire temperature range (or some pre-defined portion of the whole range) represented in the energy data obtained for analysis.

Table: Balance Point Parameters

Parameter	Comment
HBPMin	The lower end of the search window for the heating balance point, e.g., in degrees F or C.
HBPMax	The upper end of the search window for the heating balance point, e.g., in degrees F or C.
CBPMin	The lower end of the search window for the cooling balance point, e.g., in degrees F or C.
CBPMax	The upper end of the search window for the cooling balance point, e.g., in degrees F or C.
R^2Min	The minimum correlation coefficient value that the balance point determination logic 2528 will consider in its search for a HBP or CBP. Thus, R^2 values below R^2Min may be discarded or not considered in the search for the best fit R^2 in the analysis discussed below. In other

	implementations, the balance point determination logic 2528 may employ additional or different statistical tests or variables to determine which regression models to consider in its search for the HBP and CBP. Alternatively, all R^2 values may be considered.
Temperature Delta	A temperature increment (for the HBP) or decrement (for the CBP) that defines the number or size of steps through the heating balance point search window or cooling balance point search window. For example: an increment of 2 degrees and a decrement of 3 degrees, or an increment and a decrement of 1 degree.
Data Cleansing Parameters	Parameters used to identify and remove outlier data points in the energy data before searching for the HBP or CBP. For example, a number (e.g., 1.5) of standard deviations from the mean temperature or mean energy consumption that defines outlier data points in temperature or energy consumption to be removed.

[060] The balance point determination logic 2528 obtains energy data from the building under analysis (2604). As an example, the energy data may include date, temperature, and energy consumption (e.g., kWh) data for each date. The energy data may instead be kBTU consumption, occupancy, wind speed, relative humidity, or other energy data. The energy data may extend over any desired time period, such as one year, one quarter, or one month, and may be collected at any desired interval (e.g., every 15 minutes, 30 minutes, 60 minutes, or other interval), with the data subjected to any desired mathematical treatment (e.g., averaging of the data, or discarding outlier data) to obtain the energy data for a given date.

[061] The balance point determination logic 2528 optionally cleanses the energy data prior to analysis (2606). For example, the balance point determination logic 2528 may remove from consideration from the energy data: weekend data points, outlier data points, data points with errors in date or energy consumption data, or

other non-representative data points. The outlier data points may be data points beyond a predefined outlier threshold (e.g., 2 standard deviations away from the mean) input as a balance point parameter. More specifically, the outlier data points may be determined by finding the average and standard deviation of the input data (e.g., the average of weekdays after data with invalid dates and energy data are discarded), then removing data points more than a pre-defined or operator specified multiple of the standard deviation away from the average).

[062] Given the input energy data, the balance point determination logic 2528 performs an analysis (e.g., a regression analysis) to determine a balance point set. The balance point set may include the HBP 2530 and the CBP 2532, as an example. One exemplary analysis is described below with continued reference to Figure 4. In the example given below, the balance point determination logic 2528 uses regression analysis to determine R^2 values. However, it is noted that the balance point determination logic 2528 may apply additional or different statistical tests or variables in its search of the energy data to find the HBP 2530 and CBP 2532.

[063] In particular, the balance point determination logic 2528 sorts the energy data according to temperature (e.g., in ascending order) (2608). An analysis bound, for finding the HBP 2530, is initially set to HBPMin (2610). For all the data points starting from the least temperature to the data point corresponding to HBPMin, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for that set of data points (2612). The balance point determination logic 2528 may determine the correlation coefficient by, in general, performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable. The balance point determination logic 2528 then increments the analysis bound (e.g., by 1 degree, or another pre-defined temperature delta) and if HBPMax has not yet been exceeded, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for all data points from the least temperature to the incremented analysis bound. This way, the balance point determination logic 2528 returns to (2612) repeatedly to determine the next R^2

over the new set of data points extending to the incremented analysis bound until the incremented analysis bound reaches HBPMax. The balance point determination logic 2528 may save, display, analyze, plot or otherwise manipulate any or all of the R^2 values determined during the analysis. Once the balance point determination logic 2528 has determined the R^2 values at each increment delta over the window between HBPMin to HBPMax, the balance point determination logic 2528 determines the temperature at which the best R^2 fit is achieved (2616), e.g., as determined by the greatest R^2 value. That temperature is designated the HBP 2530.

[064] With regard to the CBP 2532, the balance point determination logic sorts the energy data according to decreasing temperature (2617) and sets a new analysis bound equal to CBPMax (2618). For the data points starting from the highest temperature to the data point corresponding to CBPMax, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption, for that set of data points (2620). The balance point determination logic 2528 then decrements the analysis bound (e.g., by 1 degree, or another pre-defined temperature delta) and if CBPMin has not yet been reached, the balance point determination logic 2528 determines the square of the correlation coefficient, R^2, between temperature and energy consumption for all data points from the highest temperature to the decremented analysis bound. This way, the balance point determination logic 2528 returns to (2620) repeatedly to determine the next R^2 over the new set of data points extending to the decremented analysis bound until the decremented analysis bound reaches CBPMin. The balance point determination logic 2528 may save, display, analyze, plot or otherwise manipulate any or all of the R^2 values determined during the analysis. Once the balance point determination logic 2528 has determined the R^2 values at each decrement delta over the window between CBPMmax to CBPMin, the balance point determination logic 2528 determines the temperature at which the best R^2 fit is achieved (2624), e.g., as determined by the greatest R^2 value. That temperature is designated the CBP 2530. The HBP and CBP may be displayed, saved, or otherwise manipulated (2626).

[065] Obtaining the balance point parameters noted above helps to focus the search for the balance points in specific windows. The results are faster and more efficient searches for the balance points. An exhaustive search of all the data points may still be performed, however, and in that regard, the balance point determination logic 2528 need not obtain specific balance point search window parameters before performing its analysis

[066] Once the balance point determination logic 2528 has obtained the HBP 2530 and CBP 2532, the machine 2500 may apply the HBP 2530 and CBP 2532 in many different types of analyses and reporting. For example, the measurement and verification (M&V) logic 2548 (or the balance point determination logic 2528) may calculate the number of HDD and CDD, present analysis plots on the display 2506, or take other actions. For example, the M&V logic 2548 may: plot the CBPMin to CBPMax with corresponding R^2; plot the HBPMin to HBPMax with corresponding R^2; determine whether any day was a CDD according to the CDD test: Min(Temperature recorded that day - CBP, 0) that returns non-zero for a CDD; determine whether any day was a HDD according to the HDD test: Min(HBP - Temperature recorded that day, 0) that returns non-zero for a HDD; extract the month from the date field for each data point (row) and sum the kWh consumption, kBTU consumption, CDD, HDD and the number of days in the data set belonging to each month and store or display the monthly figures; for monthly CDD and HDD, calculate Log CDD, Log HDD, CDD^2, HDD^2 and store or display the values for each month; for each month, calculate average Occupancy, Relative Humidity, Wind Speed, Global Solar Radiation and store or display these for each month; or output other analysis result.

[067] The M&V logic 2548 may define, execute, and display the results of regression analyses, given, as examples, the number of CDD or HDD, the HBP 2530 or CBP 2532, or other parameters. To that end, the M&V logic 2548 may obtain (e.g., from operator input or from pre-defined parameters in the memory 2504) M&V parameters 2550. The M&V parameters 2550 may include, as examples, company name, building name, an (optionally) unique building identifier, analysis start date, analysis end date, or other parameters. Additional

M&V parameters 2550 may include: user-specified independent variables for use in regression analyses, such as CDD, HDD, number of days, CDD^2, HDD^2, Log CDD, Log HDD, occupancy, relative humidity, wind speed, and global solar radiation; and user-specified dependent variables for use in the regression analyses, such as kWh consumption, kBTU (i.e., natural gas) consumption.. Using the M&V parameters 2550, the M&V logic 2548 may calculate, store, display or otherwise perform a user-specified regression analysis. In particular, the M&V logic 2548 may determine the 'n' independent variables specified in the M&V parameters 2550, and from 'i'=1 to n, take 'i' of the variables at a time and create a regression model with the 'i' variables as independent variables and kWh (or kBTU, or other energy measurement chosen) as the dependent variable. Each of the regression models created may use a combination (subset) of the overall 'n' independent variables chosen. The M&V logic 2548 runs the regression based on the data (e.g., monthly, weekly, or daily data) for the dependent and independent variables, and may determine and store the R^2 value, significance F (e.g., from an F-test), or any other variables or test results, and the corresponding intercept and coefficient values for each of the 'i' independent variables.

[068] The M&V logic 2548 may, if desired, for each independent variable chosen, disallow the certain pairs of variables in the regression analysis (e.g., transformations of the same variable may not be chosen together in the same regression model). As examples:

[069] CDD and CDD^2 together may be disallowed;

[070] CDD and Log CDD together may be disallowed;

[071] Log CDD and CDD^2 together may be disallowed;

[072] HDD and HDD^2 together may be disallowed;

[073] HDD and Log HDD together may be disallowed;

[074] Log HDD and HDD^2 together may be disallowed.

[075] Once the combinations of regression outputs for 'i'=1 to n have been generated and stored, the M&V logic 2548 may sort the R^2 values for the regressions (e.g., by decreasing R^2) and output on the display 2506 the top results (e.g., the top 1, 2, or 3 results). Each result may, for example, report the

R^2, Significance F, intercept and coefficients for each independent variable in the top regression results. Additionally, the M&V logic 2548, may use the intercept and the coefficients for each independent variable to create the regression equation for each of the top regression outputs.

[076] In addition to those noted above, the M&V logic 2548 may generate a wide variety of analysis results as outputs on the display 2506. Examples are given below. With regard to the first two examples, the M&V logic 2548 may generate the displays using information obtained from the balance point determination logic 2528. Alternatively or additionally, the balance point determination logic 2528 may display the charts described using the information that it obtains in its analysis to find the balance points.

[077] 1) a line chart showing temperature varying from HBPMin to HBPMax on the X axis and R^2 (the square of correlation for temperature and kWh) corresponding to each temperature on the Y axis;

[078] 2) a line chart showing temperature varying from CBPMin to CBPMax on the X axis and R^2 (the square of correlation for temperature and kWh) corresponding to each temperature on the Y axis;

[079] 3) tables containing the underlying data used to generate above two charts;

[080] 4) a table showing monthly date in any desired (e.g., mm/yyyy) format, kWh consumption, kBTU consumption, monthly CDD, monthly HDD, monthly CDD^2, Log CDD, Log HDD, HDD^2, monthly average Occupancy, monthly average Relative Humidity, monthly average Wind Speed, monthly average Global Solar Radiation, or other variables; and

[081] 5) a table which shows a summary of the top regression outputs, including R^2, Significance F, Regression Equation, Intercept and coefficients for each independent variable for each regression output.

[082] The machine 2500 may additionally or alternatively include comparison logic 2544 (e.g., as one of the energy analysis programs 2524). The comparison logic 2544 may include instructions that when executed by the processor 2502 cause the processor 2502 to perform a kilowatt hour consumption and exception rank analysis, for example. One example of a comparison analysis 2700 that

results from the comparison logic 2544 is shown in Figure 5. The comparison analysis 2700 extends in 30 minute intervals over an entire day for a particular building under analysis, but the comparison logic 2544 may perform analyses over shorter or longer time periods at different intervals. Furthermore, the comparison may be done with respect to a single building (e.g., to compare energy consumption data historically for the building), or with respect to multiple buildings (e.g., to compare a building under analysis to a different control building). In addition, there may be multiple buildings in a control building group that each contribute energy data for defining (e.g., by averaging or according to another statistical treatment) the control building data described below.

[083] The comparison logic 2544 may compare control building data 2702 to a user-defined standard 2704. In the example shown in Figure 5, the control building data 2702 is daily average kWh consumption measured at 30 minute intervals over 15 different days in July, and the user-defined data is 2704 is daily average kWh consumption at 30 minute intervals over the month of January 2009 for a particular building under analysis. The control building data 2702 and user-defined data 2704 may be data points over any other time intervals, time spans, or obtained from any number of different buildings, or from the same building. Further, either the control building data 2702, the user-defined data 2704, or both, may capture desired or expected levels of building performance, may represent actually measured and optionally statistically treated (e.g., averaged) consumption data from one or more buildings, or may represent other data automatically obtained or input by an operator. Thus, as another example, the control building data 2702 may be individual operator specified data points at 30 minute intervals that provide a baseline for comparison. The constitution of the control building data 2702 and the user-defined data 2704 may vary widely, as examples: average consumption at any desired interval on weekdays over a pre-defined time period (e.g., one week, three months, or one year), optionally excluding holidays, and/or outlier data points; average consumption at any desired interval on weekends over a predefined time period; average consumption at any desired interval on holidays over a predefined time period; or other consumption data.

[084] For the example shown in Figure 5, the comparison logic 2544 performs a comparison respect to energy consumption measured in kWh. However, other energy measurements may be used, such as cubic feet of natural gas consumption, gallons of water used, or measurements of other types of energy or resources.

[085] The comparison logic 2544 may determine and display exceptions 2706. The exceptions 2706 may identify noteworthy variations in consumption data for further review or analysis. Figure 5 illustrates an example in which 16 exception ranks 2708 are defined. As specific examples, the exception 2710 indicates a rank 3 exception and the exception 2712 indicates a rank 4 exception. The comparison logic 2544 may analyze the building control data 2702, the user-defined data 2704, or both to determine exceptions at any desired time interval, such as every second, every minute, every 15 minutes or every 30 minutes.

[086] The comparison logic 2544 may determine an exception rank for any interval in many different ways. For example, the exception rank may apply to the user-defined data 2704, with exception rank assigned based on the standard deviation of the user defined data 2704 (e.g., determined at each interval). Table Exception Ranks, below, shows one example definition of the exception ranks according to windows of standard deviations of the user-defined data 2704. The comparison logic 2544 may determine additional, fewer, or different exception ranks according to additional, fewer, or different standard deviation windows, or using any other statistical criteria of interest that map the statistical criteria to one or more exception ranks.

Table: Exception Ranks

Rank	1	2	3	4	5
Standard Deviations from the mean	-1 to +1	from: -1 to -1.5 and from: 1 to 1.5	from: -1.5 to -2 and from: 1.5 to 2	from: -2 to -2.5 and from: 2 to 2.5	from: -2.5 to -3 and from: 2.5 to 3

[087] More specifically, the comparison logic 2544 may determine the average (the control average) and standard deviation (the control standard deviation) of the energy data for each interval (e.g., the interval between 3 am and 3:30 am on a given day) in the building control data 2702. The comparison logic 2544 further determines the average (the user-defined average) of the data for each similar interval in the user-defined data 2704. The comparison logic 2544 then assigns an exception rank to the user-defined average for each interval in the user-defined data 2704 according to where the user-defined average falls within the control standard deviation determined from the building control data 2702 for the same interval. For example, in Figure 5, at 3:30 am the comparison logic 2544 determines an exception rank of 4 because the average consumption (7082.58 kWh) is between -2 and -2.5 standard deviations of the average consumption (7267.40) in the building control data 2702 in the same interval. At 3:30 pm, an exception rank of 3 applies because the average consumption (7526.81 kWh) of the user-defined data 2704 is between -1.5 and -2 standard deviations of the average consumption (8064.87) in the building control data 2702 in the same interval.

[088] The Table Comparison Data, below, shows for the comparison analysis 2700 the analysis data at 30 minute intervals for the control building data 2702 and the user-specified data 2704, including the determined exception rank determined according to Table Exception Ranks.

Table: Comparison Data

	Control Range average by time slot	User Defined Range average by time slot	Exception Rank by time slot	Difference
12:30 AM	7348.93	7213.00	2.00	135.93
1:00 AM	7331.47	7218.42	1.00	113.05
1:30 AM	7310.67	7210.65	1.00	100.02
2:00 AM	7281.27	7204.10	0.00	77.17
2:30 AM	7285.67	7202.52	1.00	83.15
3:00 AM	7275.53	7194.45	1.00	81.08
3:30 AM	7267.40	7082.58	4.00	184.82
4:00 AM	7250.07	7086.48	4.00	163.58

4:30 AM	7248.60	7198.90	0.00	49.70
5:00 AM	7245.80	7206.10	0.00	39.70
5:30 AM	7323.53	7169.90	2.00	153.63
6:00 AM	7265.13	7259.00	0.00	6.13
6:30 AM	7285.67	7291.13	0.00	-5.46
7:00 AM	7413.67	7419.35	0.00	-5.69
7:30 AM	7448.87	7453.87	0.00	-5.00
8:00 AM	7526.47	7419.16	0.00	107.31
8:30 AM	7583.80	7443.19	0.00	140.61
9:00 AM	7673.47	7465.71	1.00	207.76
9:30 AM	7751.73	7499.58	1.00	252.15
10:00 AM	7835.53	7522.03	1.00	313.50
10:30 AM	7923.40	7550.65	2.00	372.75
11:00 AM	7952.73	7556.00	2.00	396.73
11:30 AM	7975.87	7537.77	2.00	438.09
12:00 PM	7994.87	7545.10	3.00	449.77
12:30 PM	8015.13	7557.58	2.00	457.55
1:00 PM	8016.80	7550.87	3.00	465.93
1:30 PM	8041.73	7556.03	3.00	485.70
2:00 PM	8057.87	7556.29	3.00	501.58
2:30 PM	8052.53	7600.32	2.00	452.21
3:00 PM	8043.93	7568.87	3.00	475.06
3:30 PM	8064.87	7526.81	3.00	538.06
4:00 PM	8050.93	7492.26	3.00	558.68
4:30 PM	8041.73	7506.42	4.00	535.31
5:00 PM	8010.40	7509.71	4.00	500.69
5:30 PM	7971.53	7496.00	3.00	475.53
6:00 PM	7935.40	7487.13	3.00	448.27
6:30 PM	7891.13	7462.32	3.00	428.81
7:00 PM	7859.20	7441.35	3.00	417.85
7:30 PM	7815.40	7436.06	3.00	379.34
8:00 PM	7783.07	7426.45	3.00	356.62
8:30 PM	7720.87	7415.61	2.00	305.25
9:00 PM	7703.20	7405.29	2.00	297.91
9:30 PM	7628.07	7392.23	1.00	235.84
10:00 PM	7492.53	7280.90	3.00	211.63
10:30 PM	7442.33	7267.32	2.00	175.01
11:00 PM	7423.47	7257.65	2.00	165.82

11:30 PM	7371.53	7224.42	2.00	147.11
12:00 AM	7349.53	7219.74	2.00	129.79
Total KWH	367583.33	354587.29	3.00	12996.04

[089] Figure 6 shows the logic that the comparison logic 2544 may implement, e.g., as processor executable instructions (i.e., as a computer implemented method). The comparison logic 2544 obtains background information, such as company name, building and company location, an (optionally) unique building identifier, or other data (2802). The comparison logic 2544 gathers overall time of use consumption data at any desired interval (e.g., every 30 minutes) (2804). The operator may specify a date range for exception rank analysis (2806) and for the control range (2808). For example, the operator may specify a particular month in 2006 as the control range, and a particular month in 2010 as the date range for exception rank analysis. Optionally, the operator may directly specify the consumption data for either the control range or exception rank analysis range.

[090] The comparison logic 2544 obtains or establishes exception rank definitions (2810). Examples of exception rank definitions are shown in Table: Exception Ranks, but the definitions may vary widely in implementation to take into consideration any statistical parameter desired. The comparison logic 2544 optionally cleanses any of the input consumption data (2812). To that end, the comparison logic 2544 may remove data rows for which no consumption data is available, for which erroneous data is present, or for which the consumption data is anomalous (e.g., exceeding the mean consumption data by more than a pre-defined threshold).

[091] The exception analysis may be run against all the data, weekdays, weekends, holidays, or any other subset of the overall data. Thus, the comparison logic 2544 identifies and determines the number of weekdays, weekends, holidays, or other particular days in the overall data (2814). Similarly, the comparison logic 2544 determines overall and monthly average consumption data at each interval for weekdays, weekends, holiday, and all days in each month (2816).

[092] For each interval in the control range (e.g., daily, every 30 minutes), the comparison logic 2544 determines the average and standard deviation of the data for that interval (2818). Similarly, the comparison logic 2544 determines the average consumption in each interval in the user-defined date range for the exception rank analysis (2820). The comparison logic 2544, with reference to the exception rank definitions, assigns an exception rank for each interval, using the average consumption from the user-defined date range with reference to the average and standard deviation determined form the corresponding interval in the control range (2822). The comparison logic 2544 may generate and display the resulting comparison analysis 2700 (2824). While Figure 5 shows an analysis of daily consumption at 30 minute intervals, the comparison logic 2544 may analyze other time windows at other intervals (e.g., one day intervals over one month, or one day intervals over one year).

[093] Exception ranks may be determined in ways other than that described above, however. As another example, the comparison logic 2544 may determine the exception rank according to the magnitude of the difference in consumption between the control building data 2702 and the user-defined data 2704, with individual thresholds or ranges defined to determine which difference magnitude maps to which exception rank. Furthermore, the difference may be shaded or otherwise highlighted in the comparison analysis 2700 to help visualize the difference.

[094] The machine 2500 may employ the comparison analysis 2700 to rank or gauge how well a building is performing. The ranking may be output on the display 2506 as an analysis result. For example, a building with more than a threshold number of exceptions of greater than a pre-defined exception rank (or some other function of the exception ranks) may be flagged and displayed as a building that needs special attention with regard to its energy consumption. To that end, the comparison logic 2544 may implement any desired ranking rules based on the comparison analysis 2700 to determine how well a building is performing, and responsively take action, e.g., by notifying a building supervisor, outputting notification or warning messages on the display 2506, or taking other action when the rule fires.

[095] In addition, the machine 2500 may implement building level alerts. The alerts may be defined in the memory 2504 using alert rules 2536. Alert logic 2538, shown in Figure 7, may run at any desired interval. The alert logic 2538 may include instructions that when executed by the processor 2502, read the alert rules 2536 (2902) and energy data from the energy database 2514 (2904). The instructions may further processes the alert rules 2536 to determine based on any of the energy data whether any of the alert rules 2536 should fire (2906). If so, the alert logic 2538 determines the analysis result (2908) based on the alert rule and displays the analysis result (2910). In that regard, the machine 2500 may output a message, display any desired indicia, or take any other pre-defined action when the alert rule fires, as defined in each alert rule 2536. Further, the alert rules 2536 may specify the analysis result (e.g., display a warning message), the analysis results may be pre-determined (e.g., for any rule that fires, send a message to an operator), or the analysis results may be determined in other ways. The alert rules 2536 may vary widely in implementation, and may take into consideration any of the variables obtained from the building or any other source, such as kWh consumption, temperature, time, date, balance points, or other variables. Examples of alert rules 2536 are shown below in Table: Alerts.

Table: Alerts

Alert Category	Alert Name	Alert Rule	Notes
Demand kilowatts(kw)	1. Demand Exceeded Peak Threshold	Building kw demand compared at any desired interval against a user defined kw threshold.	Example: If kw demand reaches over 500kw, then issue alert.
	2. Demand Exceeded Historic Threshold (not normalized)	Building kw demand continuously or at any desired	Example: Daily kw demand is compared to the same day in previous years. Issue alert if

		interval (e.g., daily, monthly) compared against historical demand for the building. Analysis Result: Send warning message to building operator.	demand is greater or less than historical demand by a pre-selected threshold.
	3. Demand Exceeded Baseline Threshold (normalized)	Building kw demand is continuously or at any desired interval (e.g., daily, monthly) compared against historical baseline regression model	Example: Daily kw demand is compared to the same or a similar day (as defined by any desired regression on variables such as HDD, CDD, Humidity, Occupancy, or other variables).
	4. Significant Change (Increase or Decrease) in Demand	Building kw demand is monitored continuously or at any desired interval for changes up or down that exceed a pre-defined threshold.	Example: Demand goes from 700kw at 10am to 500kw 10:15 (the next interval). This could either be a result of a demand / response event or some problem with equipment or behavior changes.
	5. Demand Exceeded Comparable Building Threshold	Building kw demand is continuously or at any desired interval compared against a user-defined	Example: Building 1 demand exceeds Building 7 kw demand (Building 7 is the baseline or control building against which other buildings are

		comparable/similar building.	compared).
Consumption (kwh)	1. Consumption Exceeded Historic Threshold (not normalized)	Building kwh consumption at any desired interval (e.g., hourly, daily, monthly) compared against historical consumption for the building.	Example: Daily kwh consumption is compared to the same day in previous years. Issue alert if consumption is greater or less than historical consumption by a pre-selected threshold.
	2. Consumption Exceeded Baseline Threshold (normalized)	Building kwh consumption is compared at any desired interval (e.g., daily, monthly) against historical baseline regression model	Example: Daily kwh consumption is compared to the same or a similar day (as defined by regression variables such as HDD, CDD, Humidity, Occupancy, or other variables).
	3. Significant Change (Increase or Decrease) in Consumption	Building kwh consumption is monitored at any desired interval for changes up or down that exceed a pre-defined threshold.	Example: Consumption goes from 900kwh between 10 am and 11 am to 500kwh between 11 am and 12 noon. This could either be a result of a demand / response event or some problem with equipment or behavior changes.
	4. Consumption Exceeded Comparable Building Threshold	Building kwh consumption is compared at any desired interval against a user-defined	Example: Building 1 consumption exceeds Building 7 kwh consumption (Building 7 is the baseline or control building against which

		comparable/similar building.	other buildings are compared).

[096] The alerts discussed above are building level alerts with regard to consumption and demand. However, the alert rules may define alerts based on any energy consumption parameters that are directly measured, statistically derived, or otherwise obtained. The machine 2500 may also implement more complex analyses. As one example, the machine 2500 may include event logic 2542 that analyzes equipment data to detect or infer events of interest based on event rules 2540. Such event rules 2540 may help define when demand / response events occur, when equipment has failed or has been fixed, or other events. When the event logic 2542 identifies an event, the event logic 2542 may responsively execute a pre-defined action, for example as specified in the event rules 2540.

[097] The machine 2500 or any of the systems described above may be implemented with additional, different, or fewer components. As one example, a processor may be implemented as a microprocessor, a microcontroller, a DSP, an application specific integrated circuit (ASIC), discrete logic, or a combination of other types of circuits or logic. As another example, memories may be DRAM, SRAM, Flash or any other type of memory. The processing capability of the system may be distributed among multiple components, such as among multiple processors and memories, optionally including multiple distributed processing systems. Parameters, databases, and other data structures may be separately stored and managed, may be incorporated into a single memory or database, may be logically and physically organized in many different ways, and may implemented with different types of data structures such as linked lists, hash tables, or implicit storage mechanisms.

[098] Logic, such as programs or circuitry, may be combined or split among multiple programs, distributed across several memories and processors, and may be implemented in a library, such as a shared library (e.g., a dynamic link library (DLL)). The DLL, for example, may store code that analyzes energy expenditure or that prepares energy reports. As another example, the DLL may itself provide

all or some of the functionality of the machine 2500. The programs may be stored on a computer readable medium, such as a CDROM, hard drive, floppy disk, flash memory, or other computer readable medium. Thus, a computer program product may include computer readable instructions, which when loaded and run in a computer and/or computer network system, cause the computer system and/or the computer network system to perform operations according to any of the claims below, and in particular to perform any of the logic and methods illustrated in Figures 4, 6, and 7, as examples.

[099] While various embodiments of the invention have been described, it will be apparent to those of ordinary skill in the art that many more embodiments and implementations are possible within the scope of the invention. Accordingly, the invention is not to be restricted except in light of the attached claims and their equivalents.

CLAIMS

What is claimed is:

1. (Original) A method for energy analysis comprising:
establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;
obtaining energy data at the network operations center through the data connection to the energy data source;
performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:
determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and
generating and displaying a user interface on a display, the user interface including the analysis result.

2. (Original) The method of claim 1, where determining a balance point set comprises:
determining either or both of a heating balance point search window into the energy data and a cooling balance point search window into the energy data.

3. (Original) The method of claim 2, where determining a balance point set comprises:
executing either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

4. (Original) The method of claim 3, where executing the correlation analysis comprises:
executing a correlation analysis between temperature and energy consumption to

find a best fit correlation.

5. (Original) The method of claim 3, where executing the correlation analysis comprises:

executing the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window.

6. (Original) An energy analysis system comprising:

a processor; and

a memory coupled to the processor, the memory comprising:

energy analysis logic that, when executed by the processor, causes an energy analysis system to:

establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtain energy data at the network operations center through the data connection to the energy data source;

perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:

determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and

generate and display a user interface on a display, the user interface including the analysis result.

7. (Original) The system of claim 6, where the energy analysis logic further causes the energy analysis system to obtain either or both of a heating balance point search window and a cooling balance point search window.

8. (Original) The system of claim 7, where the energy analysis logic further causes the energy analysis system to:

execute either or both of a correlation analysis of the energy data within the

heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

9. (Original) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:
execute a correlation analysis between temperature and energy consumption to find a best fit correlation.

10. (Original) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:
execute the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window.

11. (Currently Amended) A method for energy analysis comprising:
establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;
obtaining energy data at the network operations center through the data connection to the energy data source;
performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:
determining building comparison baseline data within the energy data;
determining actual consumption data within the energy data;
determining, as the analysis result, an exception rank by:
determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and
comparing the comparison standard deviation data and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review; and
generating and displaying a user interface on a display, the user interface including the analysis result.

12. (Currently Amended) The method of claim 11, where determining an exception rank comprises:
determining a comparison average of the energy data within the time interval in the building comparison baseline data.

13. (Currently Amended) The method of claim 12, where determining an exception rank further comprises:
determining an actual consumption average of the energy data within the time interval in the actual consumption data.

14. (Original) The method of claim 13, where determining an exception rank further comprises:
accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and
assigning the exception rank to the time interval according to the mapping.

15. (Currently Amended) The method of claim 14, where the statistical parameter comprises a standard deviation window with respect to the comparison average.

16. (Currently Amended) An energy analysis system comprising:
a processor; and
a memory coupled to the processor, the memory comprising:
energy analysis logic that, when executed by the processor, causes an energy analysis system to:
establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;
obtain energy data at the network operations center through the data connection to the energy data source;
perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:

determining building comparison baseline data within the energy data;
determining actual consumption data within the energy data;
determining, as the analysis result, an exception rank by:
determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and
comparing the comparison standard deviation and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review; and
generate and display a user interface on a display, the user interface including the analysis result.

17. (Currently Amended) The system of claim 16, where the energy analysis logic further causes the energy analysis system to:
determine a comparison average of the energy data within the time interval in the building comparison baseline data.

18. (Currently Amended) The system of claim 17, where the energy analysis logic further causes the energy analysis system to:
determine an actual consumption average of the energy data within the time interval in the actual consumption data.

19. (Original) The system of claim 18, where the energy analysis logic further causes the energy analysis system to:
access an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and
assign an exception rank to the time interval according to the mapping.

20. (Currently Amended) The method of claim 19, where the statistical parameter comprises a standard deviation window with respect to the comparison average.

ABSTRACT

An energy analysis system provides valuable input into building energy expenditures. The system assists with obtaining a detailed view of how energy consumption occurs in a building, what steps may be taken to lower the energy footprint, and executing detailed energy consumption analyses. The analyses may include, as examples, a balance point pair analysis to determine either or both of a heating balance point and a cooling balance point, an exception rank analysis to identify specific data (e.g., energy consumption data) in specific time intervals for further review, or other analysis. The system may display the analysis results on a user interface.

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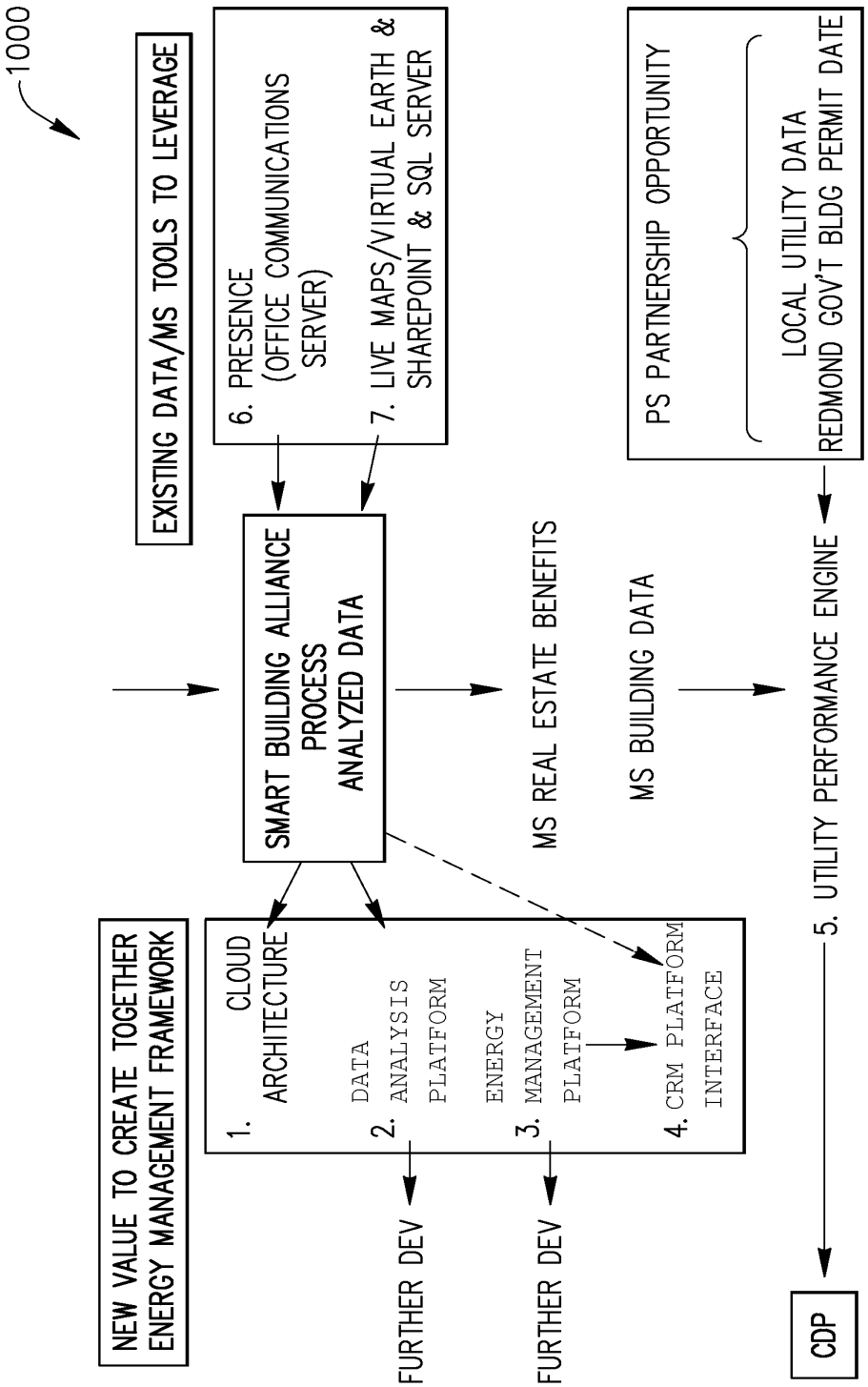

1000
EXISTING DATA/MS TOOLS TO LEVERAGE
6. PRESENCE (OFFICE COMMUNICATIONS SERVER)
7. LIVE MAPS/VIRTUAL EARTH & SHAREPOINT & SQL SERVER
PS PARTNERSHIP OPPORTUNITY
LOCAL UTILITY DATA
REDMOND GOV'T BLDG PERMIT DATE
SMART BUILDING ALLIANCE PROCESS ANALYZED DATA
MS REAL ESTATE BENEFITS
MS BUILDING DATA
5. UTILITY PERFORMANCE ENGINE
NEW VALUE TO CREATE TOGETHER ENERGY MANAGEMENT FRAMEWORK
1. CLOUD ARCHITECTURE
2. DATA ANALYSIS PLATFORM
3. ENERGY MANAGEMENT PLATFORM
4. CRM PLATFORM INTERFACE
FURTHER DEV
FURTHER DEV
CDP

Figure 1

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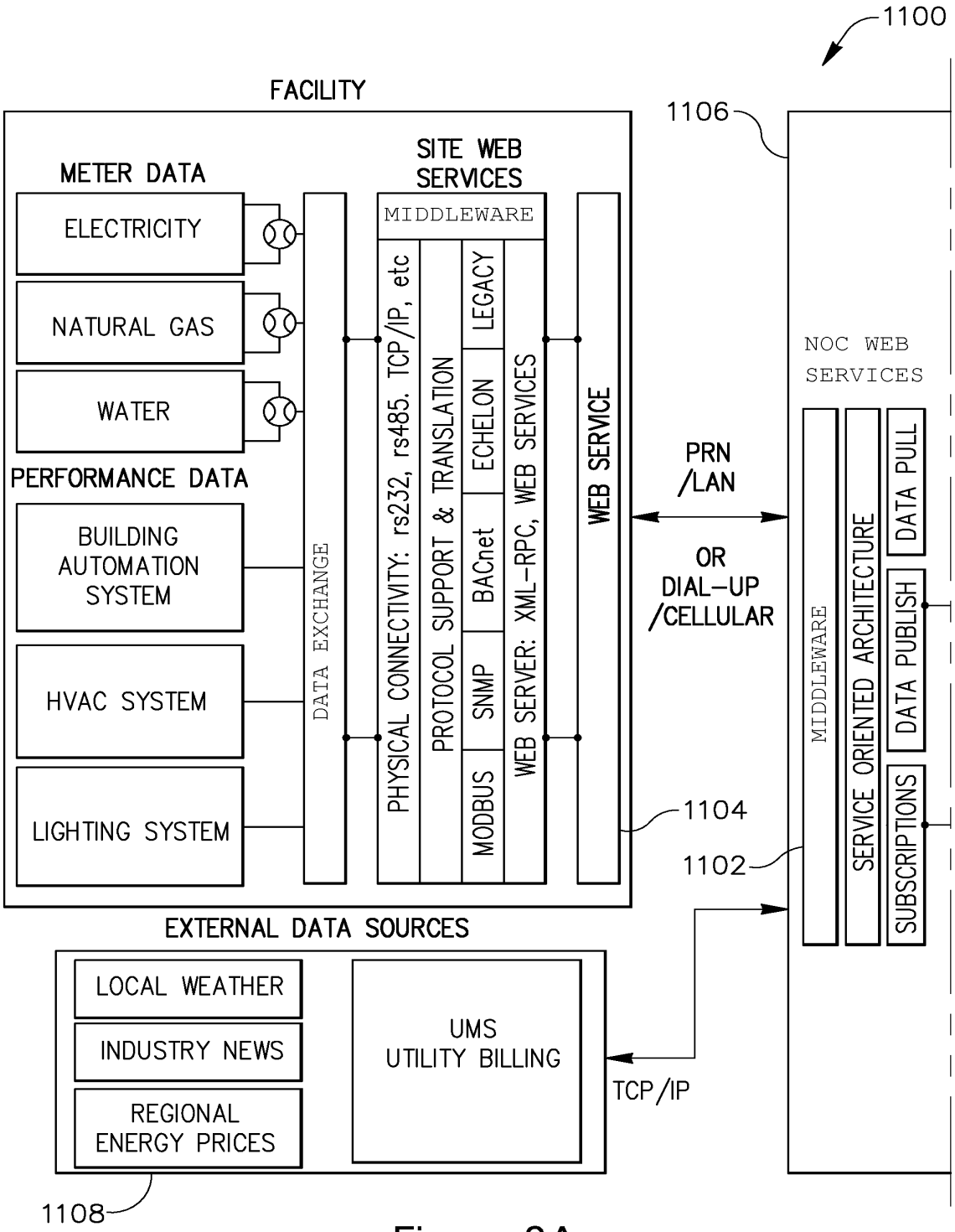

1100
FACILITY
1106
METER DATA
ELECTRICITY
NATURAL GAS
WATER
PERFORMANCE DATA
BUILDING AUTOMATION SYSTEM
HVAC SYSTEM
LIGHTING SYSTEM
DATA EXCHANGE
SITE WEB SERVICES
MIDDLEWARE
PHYSICAL CONNECTIVITY: rs232, rs485, TCP/IP, etc
PROTOCOL SUPPORT & TRANSLATION
MODBUS
SNMP
BACnet
ECHELON
LEGACY
WEB SERVER: XML-RPC, WEB SERVICES
WEB SERVICE
PRN /LAN
OR DIAL-UP /CELLULAR
NOC WEB SERVICES
MIDDLEWARE
SERVICE ORIENTED ARCHITECTURE
DATA PULL
DATA PUBLISH
SUBSCRIPTIONS
1104
1102
EXTERNAL DATA SOURCES
LOCAL WEATHER
INDUSTRY NEWS
REGIONAL ENERGY PRICES
UMS UTILITY BILLING
TCP/IP
1108

Figure 2A

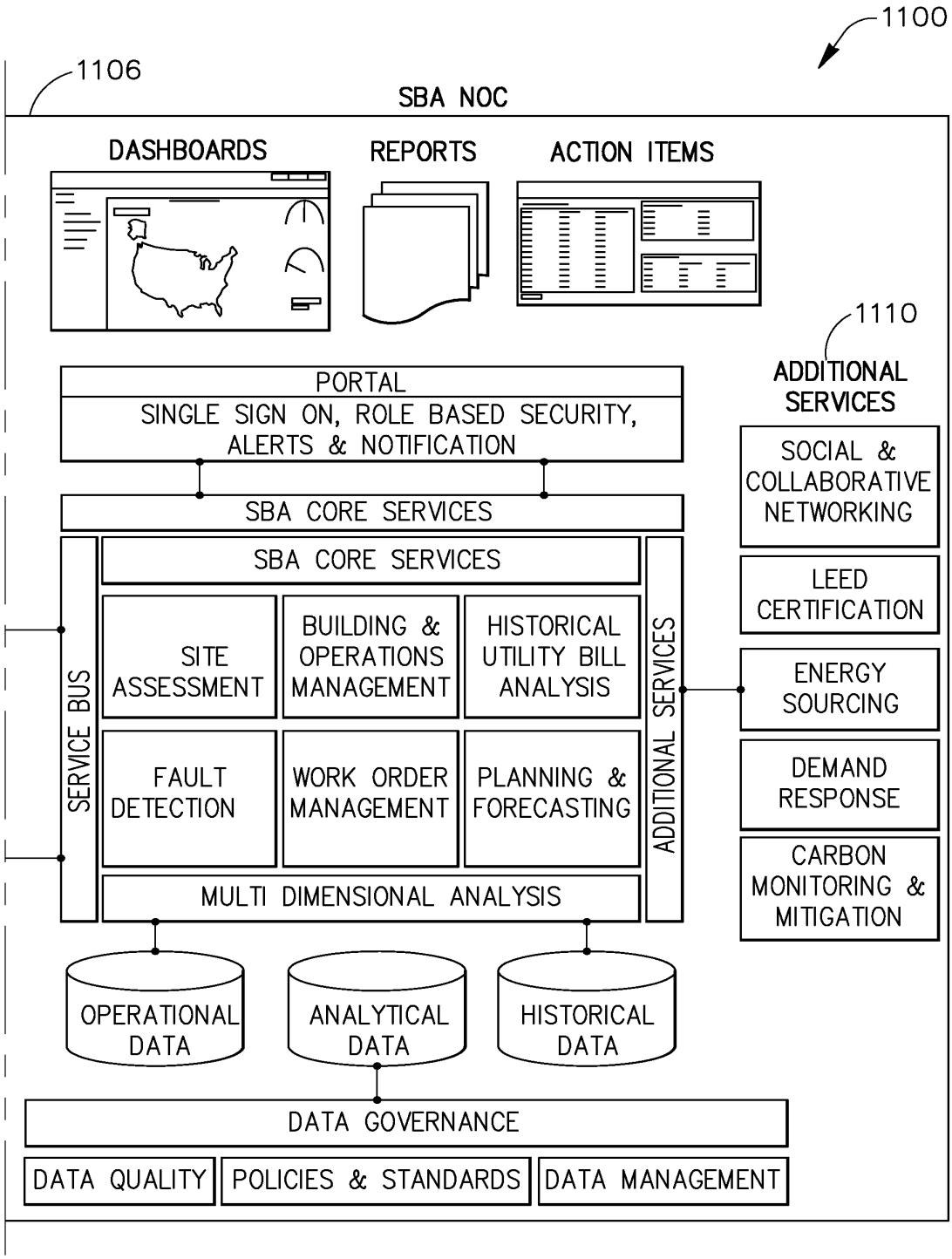

1100
1106
SBA NOC
DASHBOARDS
REPORTS
ACTION ITEMS
1110
ADDITIONAL SERVICES
PORTAL
SINGLE SIGN ON, ROLE BASED SECURITY, ALERTS & NOTIFICATION
SBA CORE SERVICES
SBA CORE SERVICES
SERVICE BUS
SITE ASSESSMENT
BUILDING & OPERATIONS MANAGEMENT
HISTORICAL UTILITY BILL ANALYSIS
FAULT DETECTION
WORK ORDER MANAGEMENT
PLANNING & FORECASTING
MULTI DIMENSIONAL ANALYSIS
ADDITIONAL SERVICES
SOCIAL & COLLABORATIVE NETWORKING
LEED CERTIFICATION
ENERGY SOURCING
DEMAND RESPONSE
CARBON MONITORING & MITIGATION
OPERATIONAL DATA
ANALYTICAL DATA
HISTORICAL DATA
DATA GOVERNANCE
DATA QUALITY
POLICIES & STANDARDS
DATA MANAGEMENT

Figure 2B

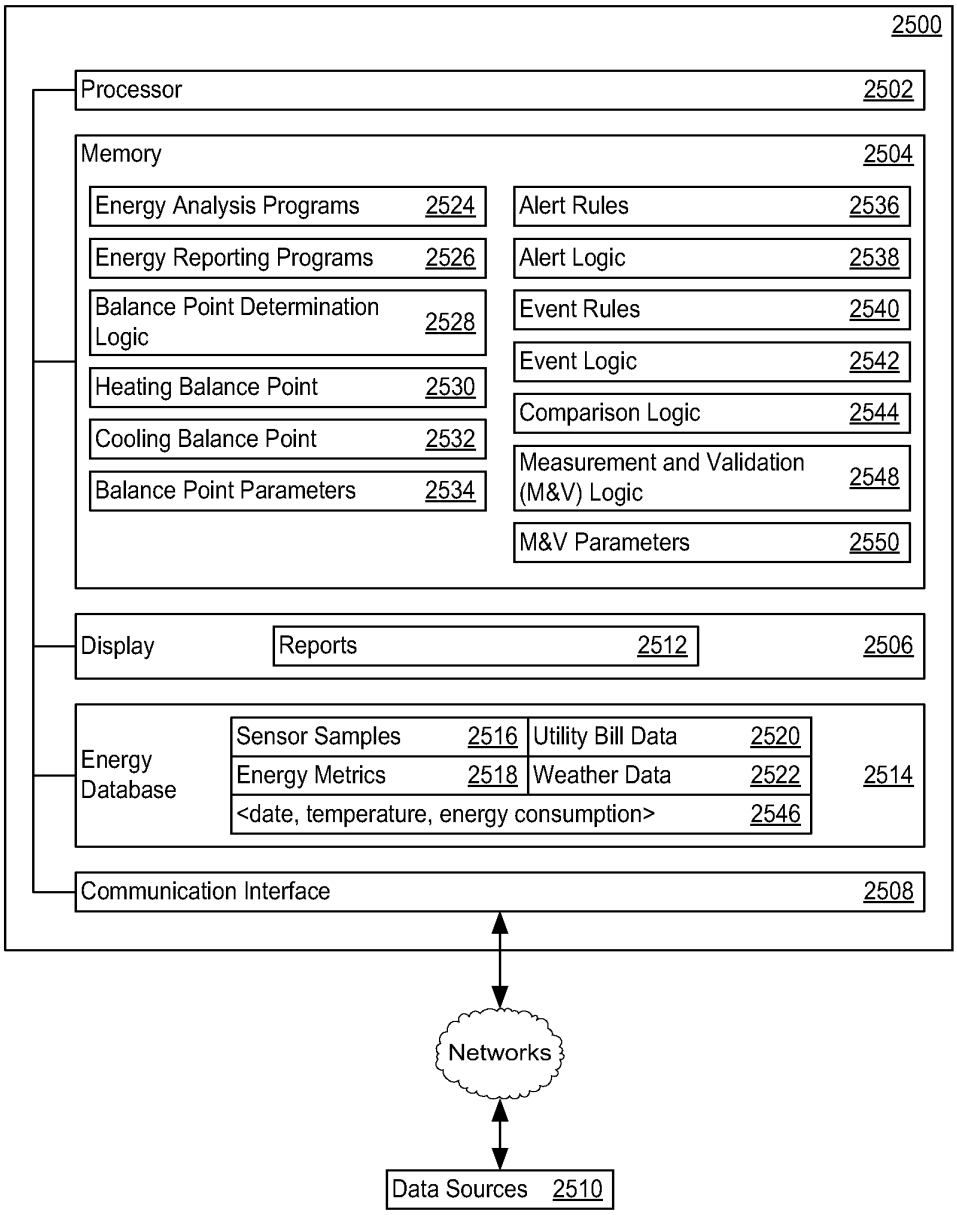

2500
Processor 2502
Memory 2504
Energy Analysis Programs 2524
Energy Reporting Programs 2526
Balance Point Determination Logic 2528
Heating Balance Point 2530
Cooling Balance Point 2532
Balance Point Parameters 2534
Alert Rules 2536
Alert Logic 2538
Event Rules 2540
Event Logic 2542
Comparison Logic 2544
Measurement and Validation (M&V) Logic 2548
M&V Parameters 2550
Display
Reports 2512
2506
Energy Database
Sensor Samples 2516
Utility Bill Data 2520
Energy Metrics 2518
Weather Data 2522
<date, temperature, energy consumption> 2546
2514
Communication Interface 2508
Networks
Data Sources 2510

Figure 3

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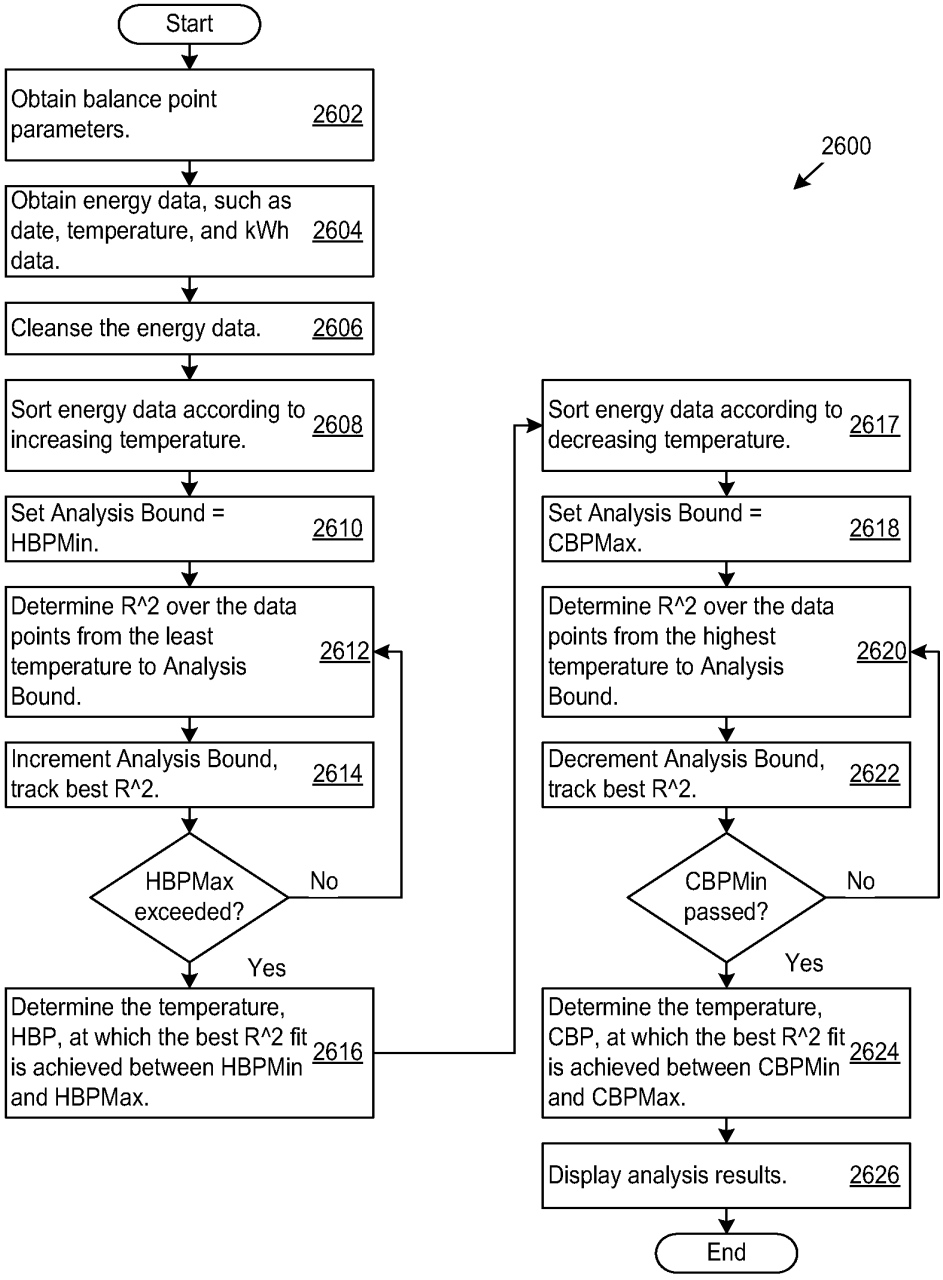

Start
Obtain balance point parameters. 2602
Obtain energy data, such as date, temperature, and kWh data. 2604
Cleanse the energy data. 2606
Sort energy data according to increasing temperature. 2608
Set Analysis Bound = HBPMin. 2610
Determine R^2 over the data points from the least temperature to Analysis Bound. 2612
Increment Analysis Bound, track best R^2. 2614
HBPMax exceeded?
No
Yes
Determine the temperature, HBP, at which the best R^2 fit is achieved between HBPMin and HBPMax. 2616
2600
Sort energy data according to decreasing temperature. 2617
Set Analysis Bound = CBPMax. 2618
Determine R^2 over the data points from the highest temperature to Analysis Bound. 2620
Decrement Analysis Bound, track best R^2. 2622
CBPMin passed?
No
Yes
Determine the temperature, CBP, at which the best R^2 fit is achieved between CBPMin and CBPMax. 2624
Display analysis results. 2626
End

Figure 4

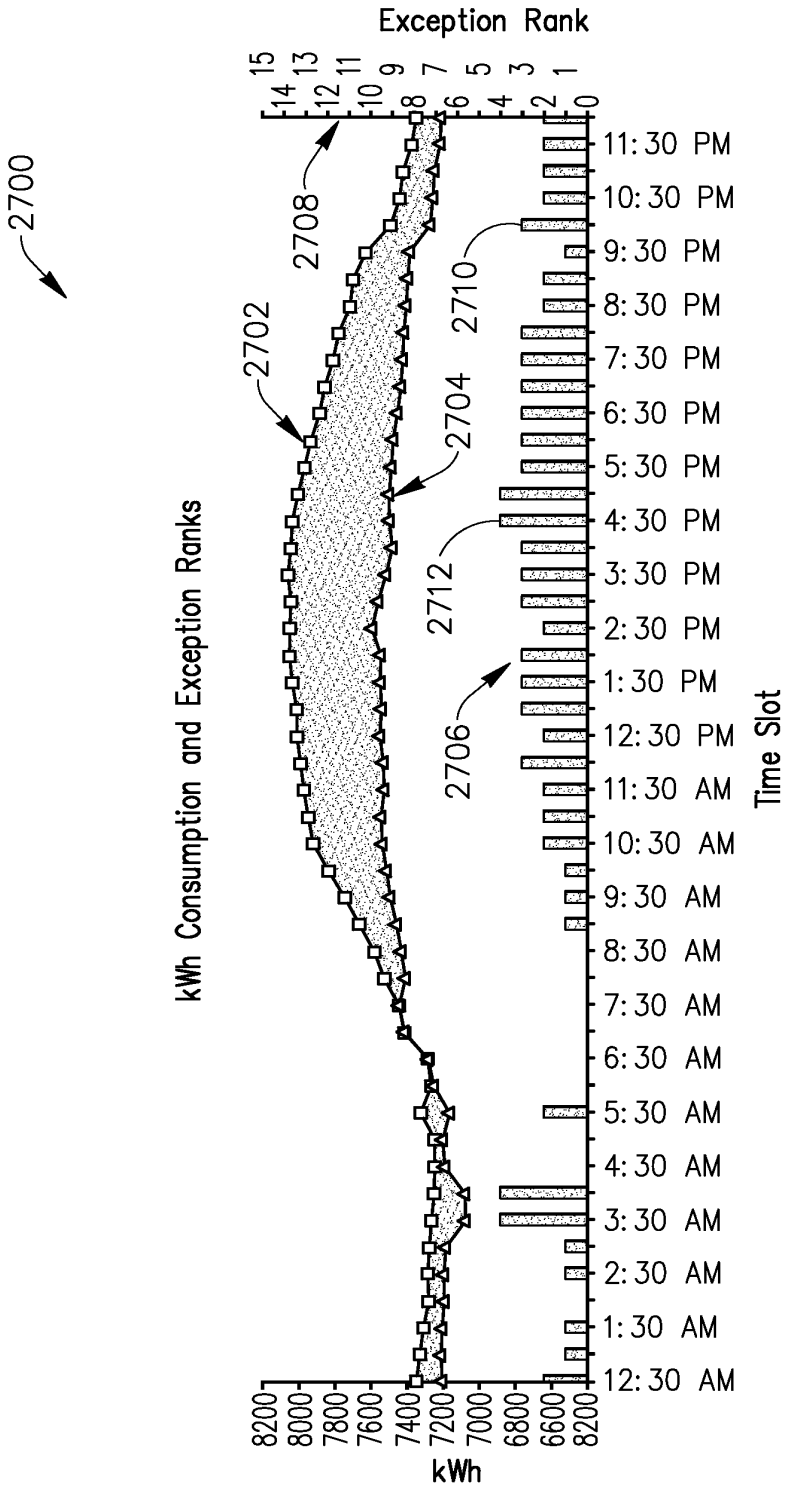

2700
Exception Rank
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
2708
2710
2702
2704
2712
2706
11:30 PM
10:30 PM
9:30 PM
8:30 PM
7:30 PM
6:30 PM
5:30 PM
4:30 PM
3:30 PM
2:30 PM
1:30 PM
12:30 PM
11:30 AM
10:30 AM
9:30 AM
8:30 AM
7:30 AM
6:30 AM
5:30 AM
4:30 AM
3:30 AM
2:30 AM
1:30 AM
12:30 AM
Time Slot
kWh Consumption and Exception Ranks
8200 8000 7800 7600 7400 7200 7000 6800 6600 8200
kWh

Figure 5

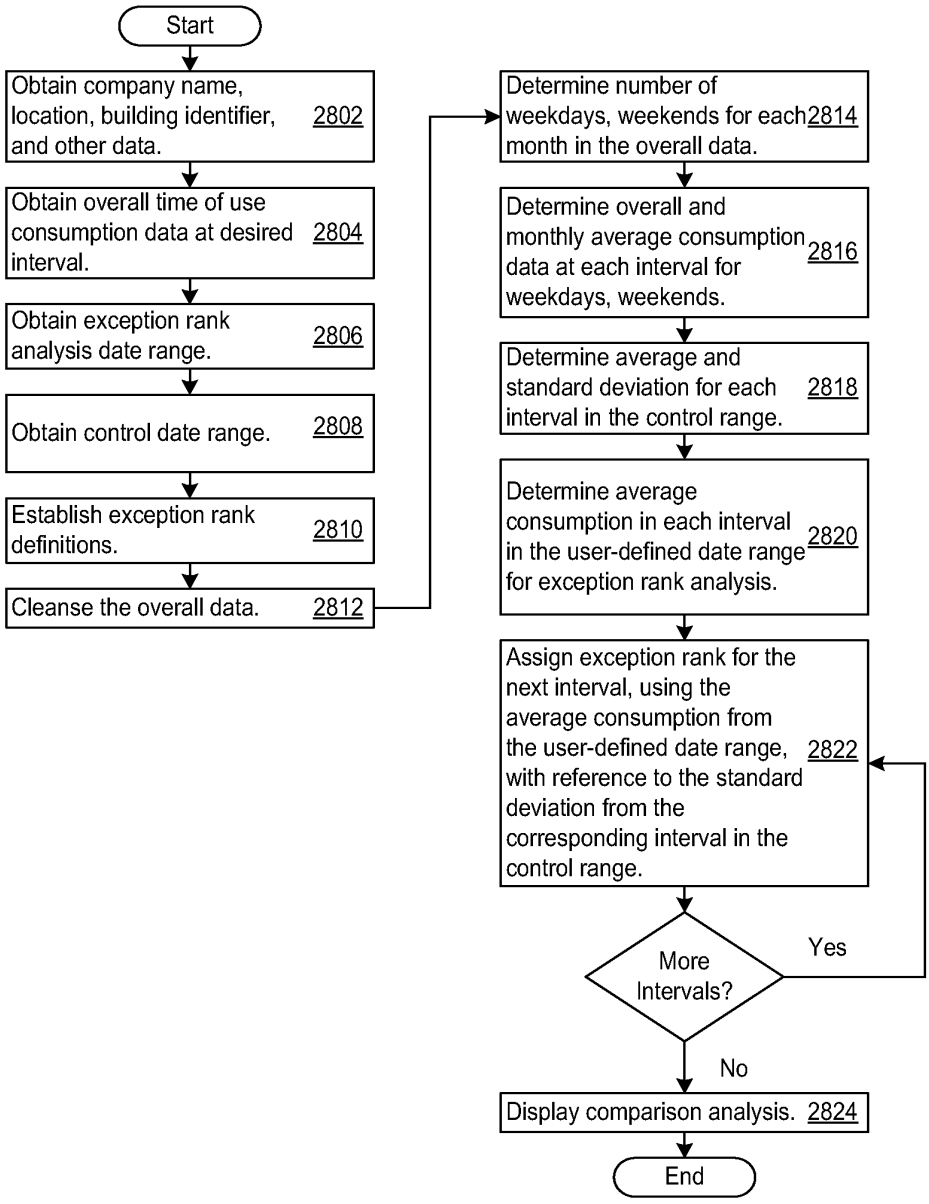

Start
Obtain company name, location, building identifier, and other data. 2802
Obtain overall time of use consumption data at desired interval. 2804
Obtain exception rank analysis date range. 2806
Obtain control date range. 2808
Establish exception rank definitions. 2810
Cleanse the overall data. 2812
Determine number of weekdays, weekends for each month in the overall data. 2814
Determine overall and monthly average consumption data at each interval for weekdays, weekends. 2816
Determine average and standard deviation for each interval in the control range. 2818
Determine average consumption in each interval in the user-defined date range for exception rank analysis. 2820
Assign exception rank for the next interval, using the average consumption from the user-defined date range, with reference to the standard deviation from the corresponding interval in the control range. 2822
More Intervals?
Yes
No
Display comparison analysis. 2824
End

Figure 6

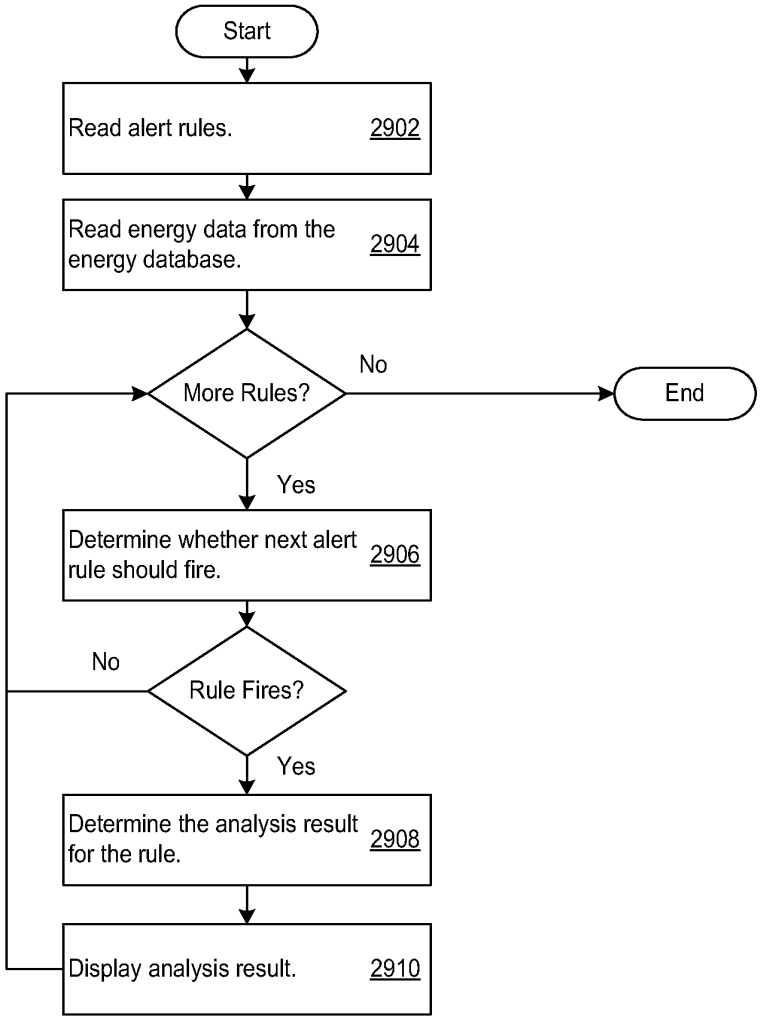

Start
Read alert rules. 2902
Read energy data from the energy database. 2904
More Rules?
No
End
Yes
Determine whether next alert rule should fire. 2906
Rule Fires?
No
Yes
Determine the analysis result for the rule. 2908
Display analysis result. 2910

Figure 7

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

This correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: September 9, 2011 Name: John F. Nethery, Reg. No. 42,928 Signature: _____

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Andrew M. Schechter
Filed:	May 7, 2010	Art Unit:	2857
For:	Building Energy Consumption Analysis System	Confirmation No.:	1676
Attorney Docket No:	10022/1726		

SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

In accordance with the duty of disclosure under 37 CFR §1.56 and §§1.97-1.98, and more particularly in accordance with 37 CFR §1.97(b), Assignee hereby cites the following reference(s):

U.S. PATENT DOCUMENTS		
DOCUMENT NO.	**DATE**	**NAME**
6,785,592	08/31/2004	Smith et al.
6,816,811	11/09/2004	Seem
US 2004/0239494 A1	12/02/2004	Kennedy et al.
7,228,234	06/05/2007	McNally et al.
US 2008/0177423 A1	07/24/2008	Brickfield et al.
7,778,734	08/17/2010	Oswald et al.
US 2010/0211222	08/19/2010	Ghosn
7,966,104	06/21/2011	Srivastava et al.

FOREIGN PATENT DOCUMENTS		
DOCUMENT NO.	**DATE**	**COUNTRY**
EP 0924949	06/23/1999	EP
WO 2007/118128	10/18/2007	WO
JP 2009070339	04/02/2009	JP

OTHER ART – NON PATENT LITERATURE DOCUMENTS
SENSUS – Machine Intelligence, "Energy Monitoring and Reporting" web page, 1p., dated: copyright 2006, obtained from: http://www.sensusmi.com/en/index.php?option=com_content&task=view&id=50&Itemid=82
Brian Thompson, "Simple Fault Detection, Diagnosis & Impact Results," 4pp., dated: May 2006, obtained from: http://www.automatedbuildings.com/news/may06/articles/sensus/060427120550sensus.htm
Brian Thompson, "Service Contractors Profit from the HEAT with Emerging Connectivity and FDDI Analysis," 5pp., dated: September 2006, obtained from: http://www.automatedbuildings.com/news/sep06/articles/sensus/060816105808sensus.htm
Tridium, Inc., Technical Document, VES Niagara^{AX} User Guide, 164pp., dated: May 28, 2008, obtained from: http://www.hvacc.net/pdf/tridium/docs_3.5.25/VES/VES_AX_UserGuide.pdf
M. R. Brambley et al., "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," 162 pp., dated: April 2005, obtained from: http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/pnnl-15149_market_assessment.pdf
Unknown Author, "Modelling building energy systems - Outdoor environment," 5pp., printed June 29, 2011, obtained from: http://www.esru.strath.ac.uk/Courseware/Building_modelling/sim_theory/out_env.htm
Hal Levin, "Systematic Evaluation And Assessment Of Building Environmental Performance (SEABEP), ", 8pp., Submitted for presentation at "Building and Environment," Paris, dated: June 9-12, 1997, obtained from: http://www.buildingecology.net/index_files/publications/SystemicEvaluationandAssessmentSEABEP.pdf
R. K. Pletzer, et al., "Energy Savings Resulting From Shading Devices On Single-Family Residences In Austin, Texas," 10pp., Proceedings of the Fourth Symposium on Improving Building Systems in Hot and Humid Climates, dated: September 15 - 16, 1987, obtained from: http://repository.tamu.edu/bitstream/handle/1969.1/6484/ESL-HH-87-09-15.pdf?sequence=3

Assignee is enclosing Form PTO-1449 (two sheets), along with a copy of each listed reference for which a copy is required under 37 CFR §1.98(a)(2). Pursuant to 1.98(a)(3)(ii), Assignee has included a copy of a written English language translation for each non-English language documents cited. Assignee respectfully requests the Examiner's consideration of the above reference(s) and entry thereof into the record of this application.

By submitting this Statement, Assignee is attempting to fully comply with the duty of candor and good faith mandated by 37 CFR §1.56. As such, this Statement is not

intended to constitute an admission that any of the enclosed references, or other information referred to therein, constitutes "prior art" or is otherwise "material to patentability," as that phrase is defined in 37 CFR §1.56(a).

The Assignee has calculated no fee to be due in connection with the filing of this Information Disclosure Statement. However, the Director is authorized to charge any fee deficiency associated with the filing of this Information Disclosure Statement to a deposit account, as authorized in the Transmittal accompanying this Information Disclosure Statement.

Respectfully submitted,

September 9, 2011
Date

John F. Nethery, Reg. No. 42,928

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
12/776,159	05/07/2010	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	09/09/2011	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X $ =		OR	X $52=	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $ =		OR	X $220=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/LAWANDA MILTON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/776,159	05/07/2010	Jay Hedley	10022/1726	1676

28164 7590 03/14/2012

ACCENTURE CHICAGO 28164
BRINKS HOFER GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

EXAMINER	
KUNDU, SUJOY K	
ART UNIT	PAPER NUMBER
2857	

MAIL DATE	DELIVERY MODE
03/14/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	12/776,159	HEDLEY ET AL.	
	Examiner	Art Unit	
	SUJOY KUNDU	2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 May 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *See Continuation Sheet*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :05/07/2010; 08/27/2010; 09/09/2011.

WILLOW TECH. EX. 1005
Page 539

DETAILED ACTION

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-20 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-20 of copending Application No. 12/814,311. Although the conflicting claims are not identical, they are not patentably distinct from each other.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Harrod et al. (US 2009/0171862 A1).

With regards to Claim 1, 6, Harrod teaches a method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source (Figures 5 and 9, Paragraph 49);

obtaining energy data at the network operations center through the data connection to the energy data source (Paragraph 49);

performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and generating and displaying a user interface on a display, the user interface including the analysis result (Paragraph 26, 27, 31, 35, 41).

With regards to Claim 2, 7, Harrod teaches where determining a balance point set comprises: determining either or both of a heating balance point search window into the energy data and a cooling balance point search window into the energy data (Paragraph 26, 27, 31, 35, 41).

With regards to Claim 3, 8, Harrod teaches where determining a balance point set comprises: executing either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window (Figure 7-9, Paragraph 30-35).

With regards to Claim 4, 9, Harrod teaches where executing the correlation analysis comprises: executing a correlation analysis between temperature and energy consumption to find a best fit correlation (Figures 4 and 8).

With regards to Claim 5, 10, Harrod teaches where executing the correlation analysis comprises: executing the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window (Figures 4 and 8).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 11-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harrod et al. (US 2009/0171862 A1) in view of Carey et al. (US 2006/0161450 A1).

With regards to Claim 11, 16, Harrod teaches a method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source (Figures 5 and 9, Paragraph 49);

obtaining energy data at the network operations center through the data connection to the energy data source (Paragraph 49);

Harrod is silent with regards to performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises: determining building comparison baseline data within the energy data; determining the actual consumption data within the energy data;

determining as the analysis result, and exception rank by: determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and comparing the comparison standard deviation and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review and generating and displaying a user interface on a display, the user interface including the analysis result.

Carey teaches performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises: determining building comparison baseline data within the energy data; determining the actual consumption data within the energy data; determining as the analysis result, and exception rank by: determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and comparing the comparison standard deviation and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review and generating and displaying a user interface on a display, the user interface including the analysis result (Paragraph 180-184).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises: determining building comparison baseline data within the energy data; determining the actual consumption data within the energy data; determining as the analysis result, and exception rank by: determining a comparison standard

deviation of the energy data within a time interval in the building comparison baseline data; and comparing the comparison standard deviation and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review and generating and displaying a user interface on a display, the user interface including the analysis result as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 12, 17, Harrod is silent where determining an exception rank: determining a comparison average of the energy data within the time interval in the building comparison baseline data.

Carey teaches determining an exception rank: determining a comparison average of the energy data within the time interval in the building comparison baseline data (Paragraph 180-184, “real-time”).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include determining an exception rank: determining a comparison average of the energy data within the time interval in the building comparison baseline data as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 13, 18, Harrod is silent with regards to where determining an exception rank further comprises: determining an actual consumption average of the energy data within the time interval in the actual consumption data.

Carey teaches where determining an exception rank further comprises: determining an actual consumption average of the energy data within the time interval in the actual consumption data (Paragraph 180-184, “real-time”).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include where determining an exception rank further comprises: determining an actual consumption average of the energy data within the time interval in the actual consumption data as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 14, 19, Harrod is silent with regards to where determining an exception rank further comprises: accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and assigning the exception rank to the time interval according to the mapping.

Carey teaches to where determining an exception rank further comprises: accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and assigning the exception rank to the time interval according to the mapping (Figures 6A, 6B, 7, Paragraph 180-184).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include to where determining an exception rank further comprises: accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and assigning the exception rank to the time interval according to the mapping as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 15, 20, Harrod is silent with regards to where the statistical parameter comprises a standard deviation window with respect to the comparison average.

Carey teaches to where the statistical parameter comprises a standard deviation window with respect to the comparison average (Paragraph 180-184).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include to where the statistical parameter comprises a standard deviation window with respect to the comparison average as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SUJOY KUNDU whose telephone number is (571)272-8586. The examiner can normally be reached on M-F 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Schechter can be reached on 571-272-2302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Sujoy K Kundu/
Primary Examiner, Art Unit 2857
March 7, 2012

Notice of References Cited	Application/Control No. 12/776,159	Applicant(s)/Patent Under Reexamination HEDLEY ET AL.	
	Examiner SUJOY KUNDU	Art Unit 2857	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2009/0171862 a1	07-2009	HARROD et al.	705/412
*	B	US-2006/0161450 a1	07-2006	Carey et al.	705/001
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	**Art Unit**
	SUJOY KUNDU	2857

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2012								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
	11	✓								
	12	✓								
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	14	✓								
	15	✓								
	16	✓								
	17	✓								
	18	✓								
	19	✓								
	20	✓								

FORM PTO-1449		SERIAL NO. 12/776,159	CASE NO. 10022/1726
LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT		FILING DATE May 7, 2010	GROUP ART UNIT 2882
(use several sheets if necessary)	APPLICANT(S): Jay Hedley et al.		CONFIRMATION NO. 1676

REFERENCE DESIGNATION U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	NAME	CLASS/ SUBCLASS	FILING DATE
	C1	6,785,592	08/31/2004	Smith et al.		
	C2	6,816,811	11/09/2004	Seem		
	C3	US 2004/0239494 A1	12/02/2004	Kennedy et al.		
	C4	7,228,234	06/05/2007	McNally et al.		
	C5	US 2008/0177423 A1	07/24/2008	Brickfield et al.		
	C6	7,778,734	08/17/2010	Oswald et al.		
	C7	US 2010/0211222	08/19/2010	Ghosn		
	C8	7,966,104	06/21/2011	Srivastava et al.		

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	COUNTRY	CLASS/ SUBCLASS	TRANSLATION YES OR NO
	C9	EP 0924949	06/23/1999	EP		Abstract
	C10	WO 2007/118128	10/18/2007	WO		
	C11	JP 2009070339	04/02/2009	JP		Abstract

EXAMINER INITIAL		OTHER ART – NON PATENT LITERATURE DOCUMENTS (Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date page(s), volume-issue number(s), publisher, city and/or country where published.)
	C12	SENSUS – Machine Intelligence, "Energy Monitoring and Reporting" web page, 1p., dated: copyright 2006, obtained from: http://www.sensusmi.com/en/index.php?option=com_content&task=view&id=50&Itemid=82
	C13	Brian Thompson, "Simple Fault Detection, Diagnosis & Impact Results," 4pp., dated: May 2006, obtained from: http://www.automatedbuildings.com/news/may06/articles/sensus/060427120550sensus.htm
	C14	Brian Thompson, "Service Contractors Profit from the HEAT with Emerging Connectivity and FDDI Analysis," 5pp., dated: September 2006, obtained from: http://www.automatedbuildings.com/news/sep06/articles/sensus/060816105808sensus.htm
	C15	Tridium, Inc., Technical Document, VES Niagara^{AX} User Guide, 164pp., May 28, 2008, obtained from: http://www.hvacc.net/pdf/tridium/docs_3.5.25/VES/VES_AX_UserGuide.pdf

EXAMINER /Sujoy Kundu/	DATE CONSIDERED 03/07/2012

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.K./

FORM PTO-1449	SERIAL NO. 12/776,159	CASE NO. 10022/1726
LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT	FILING DATE May 7, 2010	GROUP ART UNIT 1676
(use several sheets if necessary)	APPLICANT(S): Jay Hedley et al.	

EXAMINER INITIAL	OTHER ART – NON PATENT LITERATURE DOCUMENTS (Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date page(s), volume-issue number(s), publisher, city and/or country where published.	
	C16	M. R. Brambley et al., "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," 162 pp., dated: April 2005, obtained from: http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/pnnl-15149_market_assessment.pdf
	C17	Unknown Author, "Modelling building energy systems - Outdoor environment," 5pp., printed June 29, 2011, obtained from: http://www.esru.strath.ac.uk/Courseware/Building_modelling/sim_theory/out_env.htm
	C18	Hal Levin, "Systematic Evaluation And Assessment Of Building Environmental Performance (SEABEP), ", 8pp., Submitted for presentation at "Building and Environment," Paris, dated: June 9-12, 1997, obtained from: http://www.buildingecology.net/index_files/publications/SystemicEvaluationandAssessmentSEABEP.pdf
	C19	R. K. Pletzer, et al., "Energy Savings Resulting From Shading Devices On Single-Family Residences In Austin, Texas," 10pp., Proceedings of the Fourth Symposium on Improving Building Systems in Hot and Humid Climates, dated: September 15 - 16, 1987, obtained from: http://repository.tamu.edu/bitstream/handle/1969.1/6484/ESL-HH-87-09-15.pdf?sequence=3

EXAMINER /Sujoy Kundu/	DATE CONSIDERED 03/12/2012

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.K./

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	"12776159"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2012/03/07 09:57
L2	23	("20040239494" | "7966104" | "20100211222" | "20080177423" | "7228234" | "20080147465" | "6785592" | "6816811" | "20090018884" | "20060161450" | "7778734").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/03/07 10:39
L3	3	("20040239494" | "7966104" | "20100211222" | "20080177423" | "7228234" | "20080147465" | "6785592" | "6816811" | "20090018884" | "20060161450" | "7778734").PN. and standard near3 deviation	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/03/07 10:39
L4	3	("20040239494" | "7966104" | "20100211222" | "20080177423" | "7228234" | "20080147465" | "6785592" | "6816811" | "20090018884" | "20060161450" | "7778734").PN. and standard adj deviation	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/03/07 10:39
L5	7020132	("20040239494" | "7966104" | "20100211222" | "20080177423" | "7228234" | "20080147465" | "6785592" | "6816811" | "20090018884" | "20060161450" | "7778734").PN. and standard adj deviation and balance point	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/03/07 10:39
L6	0	("20040239494" | "7966104" | "20100211222" | "20080177423" | "7228234" | "20080147465" | "6785592" | "6816811" | "20090018884" | "20060161450" | "7778734").PN. and standard adj deviation and balance near4 point	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/03/07 10:39
S1	20696	energy near4 (analysis consumption consum$5 volum$3) same (heat$3 cool$3)	USPAT	OR	OFF	2012/03/06 15:02
S2	61970	energy near4 (analysis consumption consum$5 volum$3) same (heat$3 cool$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2012/03/06 15:02

			DERWENT; IBM_TDB			
S3	23	energy near4 (analysis consumption consum$5 volum$3) same (heat$3 cool$3) same balance near4 point	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2012/03/06 15:02

3/7/2012 11:29:20 AM
C:\Users\skundu\Documents\EAST\Workspaces\12776159.wsp

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BIB DATA SHEET

CONFIRMATION NO. 1676

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/776,159	05/07/2010 RULE	702	2857	10022/1726

APPLICANTS

Jay Hedley, Arlington, VA;
Boris Tsypin, Chicago, IL;
Deepak Raghu, Gurgaon, INDIA;

**** CONTINUING DATA ***************************

This appln claims benefit of 61/176,855 05/08/2009
and claims benefit of 61/176,790 05/08/2009

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

05/17/2010

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and Acknowledged /SUJOY K KUNDU/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		VA	35	20	4

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CHICAGO, IL 60610
UNITED STATES

TITLE

BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

FILING FEE RECEIVED		
1740	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

FORM PTO-1449		SERIAL NO. Not yet assigned	CASE NO. 10022/1726
LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT		FILING DATE Herewith	GROUP ART UNIT Not yet assigned
(use several sheets if necessary)	APPLICANT(S): Jay Hedley et al.		CONFIRMATION NO. Not yet assigned

REFERENCE DESIGNATION U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	NAME	CLASS/ SUBCLASS	FILING DATE

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	COUNTRY	CLASS/ SUBCLASS	TRANSLATION YES OR NO

EXAMINER INITIAL		OTHER ART – NON PATENT LITERATURE DOCUMENTS (Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date page(s), volume-issue number(s), publisher, city and/or country where published.
	A1	David Clayton et al., Building Automation Systems Worldwide Outlook, Market Analysis and Forecast Through 2006, ARC Advisory Group, 145pgs. (Printed 2pgs. Per Sheet - 73 sheets).
	A2	International Performance Measurement & Verification Protocol, Concepts and Options for Determining Energy and Water Savings, Vol. 1, 93 pgs., March 2002.

EXAMINER /Sujoy Kundu/	DATE CONSIDERED 03/07/2012

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.K./

FORM PTO-1449	SERIAL NO. 12/776,159	CASE NO. 10022/1726
LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT	FILING DATE May 7, 2010	GROUP ART UNIT 2882
(use several sheets if necessary) APPLICANT(S): Jay Hedley et al.		CONFIRMATION NO. 1676

REFERENCE DESIGNATION **U.S. PATENT DOCUMENTS**

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	NAME	CLASS/ SUBCLASS	FILING DATE
	B1	US 2009/0018884 A1	01/15/2009	McConnell et al.		
	B2	US 2008/0147465 A1	06/19/2008	Raines et al.		
	B3	US 2006/0161450 A1	07/20/2006	Carey et al.		

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	COUNTRY	CLASS/ SUBCLASS	TRANSLATION YES OR NO
	B4	WO 2007/0139587 A1	12/06/2007	WO		

EXAMINER INITIAL		OTHER ART – NON PATENT LITERATURE DOCUMENTS (Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date page(s), volume-issue number(s), publisher, city and/or country where published.
	B5	PCT International Search Report received in International Application No. PCT/US2010/034111, 3pp., dated July 6, 2010.

EXAMINER /Sujoy Kundu/	DATE CONSIDERED 03/07/2012

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.K./

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	Art Unit
	SUJOY KUNDU	2857

SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
EAST Search Tools - USPAT, USPG_PUB, EPO, JPO, DERWENT, IBM_TBD	03/07/2012	SKK
Spoke with Mike Day - agrees with Double Patenting rejection	03/07/2012	SKK

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

	/S.K./ Primary Examiner.Art Unit 2857

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: June 7, 2012 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

Our Case No. 10022-1726 (D08-138/02045-00-US)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Jay Hedley
Serial No. 12/776,159
Filing Date: May 07, 2010
For: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Examiner: Sujoy K Kundu
Group Art Unit No.: 2857
Confirmation No.: 1676

AMENDMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandra, VA 22313-1450

Dear Sir:

Please enter the following amendments and remarks in response to the non-final Office Action of March 14, 2012.

Amendments to Claims are reflected in the **listing of claims** that begin on page 2 of this paper; and

Remarks begin on page 8 of this paper.

AMENDMENTS TO CLAIMS

The listing of the claims below replaces all previous listings of the claims.

Listing of the Claims:

1. (Original) A method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtaining energy data at the network operations center through the data connection to the energy data source;

performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and

generating and displaying a user interface on a display, the user interface including the analysis result.

2. (Currently amended) The method of claim 1, where determining a balance point set comprises:

determining ~~either or~~ both of a heating balance point search window into the energy data and a cooling balance point search window into the energy data.

3. (Original) The method of claim 2, where determining a balance point set comprises:

executing either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

4. (Currently amended) The method of claim 3, where executing the correlation analysis comprises:

executing a correlation analysis between temperature and energy consumption to find a best fit correlation by performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable.

5. (Currently amended) The method of claim 3, where executing the correlation analysis comprises:

executing the correlation analysis at each step of a pre-selected temperature delta through ~~either or~~ both of the heating balance point window and the cooling balance point window.

6. (Original) An energy analysis system comprising: a processor; and

a memory coupled to the processor, the memory comprising:

energy analysis logic that, when executed by the processor, causes an energy analysis system to:

establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtain energy data at the network operations center through the data connection to the energy data source;

perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:

determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and

generate and display a user interface on a display, the user interface including the analysis result.

7. (Original) The system of claim 6, where the energy analysis logic further causes the energy analysis system to obtain either or both of a heating balance point search window and a cooling balance point search window.

8. (Original) The system of claim 7, where the energy analysis logic further causes the energy analysis system to:

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execute either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

9. (Currently amended) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:

execute a correlation analysis between temperature and energy consumption to find a best fit correlation by performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable.

10. (Original) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:

execute the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window.

11. (Currently amended) A method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtaining energy data at the network operations center through the data connection to the energy data source;

performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

determining a heating balance point and a cooling balance point;

determining building comparison baseline data within the energy data;

determining actual consumption data within the energy data;

determining, as the analysis result, an exception rank by;

determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and

comparing the comparison standard deviation data and the actual consumption, the exception rank identifying specific data in the actual consumption for further review; and

generating and displaying a user interface on a display, the user interface including the analysis result.

12. (Previously presented) The method of claim 11, where determining an exception rank comprises:

determining a comparison average of the energy data within the time interval in the building comparison baseline data.

13. (Previously presented) The method of claim 12, where determining an exception rank further comprises:

determining an actual consumption average of the energy data within the time interval in the actual consumption data.

14. (Original) The method of claim 13, where determining an exception rank further comprises:

accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and

assigning the exception rank to the time interval according to the mapping.

15. (Previously presented) The method of claim 14, where the statistical parameter comprises a standard deviation window with respect to the comparison average.

16. (Currently amended) An energy analysis system comprising:

a processor; and

a memory coupled to the processor, the memory comprising:

energy analysis logic that, when executed by the processor, causes an energy analysis system to:

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Page 563

establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtain energy data at the network operations center through the data connection to the energy data source;

perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:

determining a heating balance point and a cooling balance point;

determining building comparison baseline data within the energy data; determining actual consumption data within the energy data;

determining, as the analysis result, an exception rank by;

determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and

comparing the comparison standard deviation data and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review; and

generate and display a user interface on a display, the user interface including the analysis result.

17. (Previously presented) The system of claim 16, where the energy analysis logic further causes the energy analysis system to:

determine a comparison average of the energy data within the time interval in the building comparison baseline data.

18. (Previously presented) The system of claim 17, where the energy analysis logic further causes the energy analysis system to:

determine an actual consumption average of the energy data within the time interval in the actual consumption data.

19. (Original) The system of claim 18, where the energy analysis logic further causes the energy analysis system to:

access an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and

assign an exception rank to the time interval according to the mapping.

20. (Previously presented) The method of claim 19, where the statistical parameter comprises a standard deviation window with respect to the comparison average.

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Page 565

REMARKS

Claims 1-20 are pending in the application. Claims 2, 4, 5, 9, 11, and 16 are amended. Reconsideration and allowance of the claims of the application is respectfully requested in view of the amendments to the claims and remarks below.

Double Patenting Rejections

The Office Action provisionally rejects claims 1-20 on the grounds of non-statutory obviousness-type double patenting in view of U.S. Patent Application No. 12/814,311. The Office Action indicates that a timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome the rejections.

Applicant submits herewith a Terminal Disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d). The filing of this Terminal Disclaimer is done solely for the purpose of expediting this application through issuance as a patent and is not an admission of the propriety of the rejection. Rather, it simply serves the statutory function of removing the rejection of double patenting, and raises neither a presumption nor estoppel on the merits of the rejection. See *Quad Environmental Technologies Corp. v. Union Sanitary District*, 946 F.2d 870, 20 USPQ2d 1392 (Fed. Cir. 1991).

Rejections under 35 U.S.C. §§ 102 and 103

The Office Action rejects claims 1-20 under 35 U.S.C. § 102(e) as being anticipated by Harrod (U.S. 2009/0171862 A1). Claims 11-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Harrod in view of Carey et al. (US 2006/0161450 A1).

i) **Independent Claims 1 and 6**

Independent claims 1 and 6, as previously presented, recite:

> determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point;

Applicant submits that Harrod does not disclose this limitation.

Harrod is directed to an energy control system that determines various balance points. The balance points include an application balance point, an economic balance point, and an actual balance point. Harrod discloses that the application balance point corresponds to a temperature below which a heat pump heating capacity is less than a rate of heat loss of a structure. (See para [0026].) The economic balance point corresponds to the intersection on a chart of a heat pump operating cost and a furnace operating cost. (See para [0033].) The actual balance point corresponds to the higher of the application and economic balance points. However, the various balance points are only associated with a heating balance point. Harrod does not disclose any analysis based on a cooling balance point.

By contrast, claim 1 recites a balance point set that comprises both a heating balance point (HBP) and a cooling balance point (CBP). The application notes the advantages of considering both balance points. For example, the application notes that identifying both the HBP and CBP may significantly increase the accuracy of the count of the number of heating degree days (HDDs) and the number of cooling degree days (CDDs) for a building. (See para [057].) The increased accuracy in the determination of HDDs and CDDs has positive effects in downstream technical analyses, such as obtaining a more accurate determination of the weather load on the building and, therefore, a more accurate regression model of how the building responds to weather load.

For at least these reasons, Applicant respectfully submits that claims 1 and 6 are not anticipated by Harrod. Applicant, therefore, respectfully requests withdrawal of the rejections under 35 U.S.C. § 102(e) against claims 1 and 6, and those claims that depend from claims 1 and 6, respectively.

Dependent claims 4 and 9 recite execution of a correlation analysis between temperature and energy consumption to find a best fit correlation by performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable. Harrod does not disclose such a limitation.

Fig. 4 of Harrod discloses a graph that correlates an outdoor temperature with energy consumption to facilitate determination of a balance point 100. However, the

graph is simply a linear interpolation between two points of data. (See para [0024].) Applicant submits that this is different than determining a correlation analysis via linear regression as recited in claims 4 and 9. Accordingly, for this reason as well, Applicant submits that claims 4 and 9 are not anticipated by Harrod and, therefore, are in condition for allowance.

Dependent claims 11 and 16, as amended, recite the limitations discussed above with respect to claims 1 and 6. For the reasons argued above, Applicant respectfully submits that claims 11 and 16 are not anticipated by Harrod. Accordingly, Applicant respectfully requests withdrawal of the rejections under 35 U.S.C. § 102(e) against claims 11 and 16, and those claims that depend from claims 11 and 16, respectively.

Conclusion

Applicant believes that the amendments and arguments presented herein are sufficient to overcome the several rejections. Accordingly, allowance of all the claims is respectfully requested. Should the Examiner deem a telephone conference to be of assistance in advancing the application to allowance, the Examiner is invited to call the undersigned attorney at the telephone number below.

Respectfully submitted,

/Edward Machado/
Edward Machado
Registration No. 58,372
Attorney for the Applicant

June 7, 2012
BRINKS HOFER GILSON & LIONE
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CHICAGO, ILLINOIS 60610
(312) 321-4200

PTO/SB/26(1-08)

TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A PRIOR PATENT	Docket Number (Optional) . 10022-1726 (D08-138/02045-00-US)

In re Application of: Jay Hedley.

Application No. 12/776,159

Filed: May 20, 2009

For: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

The owner*, ACCENTURE GLOBAL SERVICES LIMITED, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application, which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. 154 and 173, as presently shortened by any terminal disclaimer, of prior Patent No. 12/814,311. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the prior patent, as presently shortened by any terminal disclaimer, in the event that it later: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/ organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☒ The undersigned is an attorney of record. Registration No. 58,372

/Edward Machado/	June 7, 2012
Signature	Date
Edward Machado	312-840-3269
Typed or Printed Name	Telephone No.

☒ Terminal disclaimer fee under 37 CFR 1.20(d) is included.
☐ A check in the amount of the fee is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The Commissioner is hereby authorized to charge any fees which may be required or credit any overpayment to Deposit Account No. 23-1925. Enclosed is a dupl. copy of this sheet.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

* Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	12776159
Filing Date:	07-May-2010
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Filer:	Edward Machado/Nancy Tarwater
Attorney Docket Number:	10022/1726

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Statutory or terminal disclaimer	1814	1	160	160
		Total in USD ($)		**160**

Electronic Acknowledgement Receipt

EFS ID:	12962388
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	Edward Machado/Maggie Pieczonka
Filer Authorized By:	Edward Machado
Attorney Docket Number:	10022/1726
Receipt Date:	07-JUN-2012
Filing Date:	07-MAY-2010
Time Stamp:	17:14:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$160
RAM confirmation Number	4484
Deposit Account	231925
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees) Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees) Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10022-1726AmendTermDisc.pdf	379378 e8bb5eb63ab03a73f86878eb294e959e38ddbb84	yes	12

Multipart Description/PDF files in .zip description

Document Description	Start	End
Transmittal Letter	1	1
Amendment/Req. Reconsideration-After Non-Final Reject	2	2
Claims	3	8
Applicant Arguments/Remarks Made in an Amendment	9	11
Statutory disclaimers per MPEP 1490.	12	12

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30259 7750a97c43be351a52d316f3e1757f0adda830ab	no	2

Warnings:

Information:

Total Files Size (in bytes):	409637

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: June 7, 2012 Name: Edward Machado, Reg. No. 58, 372 Signature: /Edward Machado/

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley		
Appln. No.:	12/776,159	Examiner:	Sujoy K Kundu
Filed:	May 07, 2010	Art Unit:	2857
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.:	10022-1726 (D08-138/02045-00-US		

TRANSMITTAL

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Amendment; and Terminal Disclaimer to Obviate a Double Patenting Rejection Over a Prior Patent.

Fee calculation:

☐ No additional fee is required.

☐ Small Entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR § 1.17(_____).

☐ An additional filing fee has been calculated as shown below:

					Small Entity			Not a Small Entity	
	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra	Rate	Add'l Fee	OR	Rate	Add'l Fee
Total		Minus			x $30=			x $60=	
Indep.		Minus			x 125=			x $250=	
First Presentation of Multiple Dep. Claim					+$225=			+ $450=	
					Total	$		Total	$

Fee payment:

☒ Please charge Deposit Account No. 23-1925 in the amount of $160 for terminal disclaimer fee.

☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

June 7, 2012
Date

/Edward Machado/
Edward Machado (Reg. No. 58,372)

BRINKS HOFER GILSON & LIONE
NBC Tower – Suite 3600, 455 N. Cityfront Plaza Drive, Chicago, IL 60611-5599

BRINKS HOFER GILSON &LIONE

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
12/776,159	05/07/2010	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	06/07/2012	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X $ =		OR	X $60=	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $ =		OR	X $250=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/KIM P. DOZIER/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	12/776,159	HEDLEY, JAY	

Document Code - DISQ	Internal Document – DO NOT MAIL

TERMINAL DISCLAIMER	☐ APPROVED	☒ DISAPPROVED
Date Filed : 07 JUN 2012	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:

The attorney is not on record in the file, FP 14.29.01. The TD must be filed on a form PTO/SB/25.

JAB

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/776,159	05/07/2010	Jay Hedley	10022/1726	1676

28164 7590 08/21/2012

ACCENTURE CHICAGO 28164
BRINKS HOFER GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

EXAMINER	
KUNDU, SUJOY K	

ART UNIT	PAPER NUMBER
2857	

MAIL DATE	DELIVERY MODE
08/21/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	12/776,159	HEDLEY ET AL.	
	Examiner	Art Unit	
	SUJOY KUNDU	2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 June 2012*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-20 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-20 of copending Application No. 12/814,311. Although the conflicting claims are not identical, they are not patentably distinct from each other.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Remarks

The Terminal Disclaimer filed 06/07/2012 is not proper.

An attorney or agent, not of record, is not authorized to sign a terminal disclaimer in the capacity as an attorney or agent acting in a representative capacity as provided by 37 CFR 1.34 (a). See 37 CFR 1.321(b) and/or (c).

Please file a new Terminal Disclaimer with an attorney or agent of record or submit a new POA and Terminal Disclaimer with the current attorney or agent.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SUJOY KUNDU whose telephone number is (571)272-8586. The examiner can normally be reached on M-F 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Schechter can be reached on 571-272-2302. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Sujoy K Kundu/
Primary Examiner, Art Unit 2857
August 14, 2012

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	**Art Unit**
	SUJOY KUNDU	2857

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2012	08/14/2012							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
	16	✓	✓							
	17	✓	✓							
	18	✓	✓							
	19	✓	✓							
	20	✓	✓							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	Art Unit
	SUJOY KUNDU	2857

SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
EAST Search Tools - USPAT, USPG_PUB, EPO, JPO, DERWENT, IBM_TBD	03/07/2012	SKK
Spoke with Mike Day - agrees with Double Patenting rejection	03/07/2012	SKK

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: October 10, 2012 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

Our Case No. 10022-1726 (D08-138/02045-00-US)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Jay Hedley et al.
Serial No. 12/776,159
Filing Date: May 07, 2010
For: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Examiner: Sujoy K Kundu
Group Art Unit No.: 2857
Confirmation No.: 1676

RESPONSE TO OFFICE ACTION

Mail Stop After Final
Commissioner for Patents
P.O. Box 1450
Alexandra, VA 22313-1450

Dear Sir:

Please enter the following amendments and remarks in response to the Final Office Action of August 21, 2012.

Remarks begin on page 2 of this paper.

REMARKS

Claims 1-20 are pending in the application. Reconsideration and allowance of the claims of the application is respectfully requested in view of the remarks below.

Double Patenting Rejections

The Office Action provisionally rejects claims 1-20 on the grounds of non-statutory obviousness-type double patenting in view of U.S. Patent Application No. 12/814,311. The Office Action indicates that a timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome the rejections.

Applicant submits herewith a Terminal Disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d). The filing of this Terminal Disclaimer is done solely for the purpose of expediting this application through issuance as a patent and is not an admission of the propriety of the rejection. Rather, it simply serves the statutory function of removing the rejection of double patenting, and raises neither a presumption nor estoppel on the merits of the rejection. See *Quad Environmental Technologies Corp. v. Union Sanitary District*, 946 F.2d 870, 20 USPQ2d 1392 (Fed. Cir. 1991).

Conclusion

Applicant believes that the rejections have been overcome. Accordingly, allowance of all the claims is respectfully requested. Should the Examiner deem a telephone conference to be of assistance in advancing the application to allowance, the Examiner is invited to call the undersigned attorney at the telephone number below.

Respectfully submitted,

/Edward Machado/
Edward Machado
Registration No. 58,372
Attorney for the Applicant

October 10, 2012
BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73 (b).

I hereby appoint:

☒ Practitioners associated with the Customer Number: 28164 - Accenture/BHGL (Chicago)

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number		Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☒ The address associated with Customer Number: 28164 - Accenture/BHGL (Chicago)

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:
Accenture Global Services Limited
3 Grand Canal Plaza
Grand Canal Street Upper
Dublin 4, Ireland

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date Feb 8, 2012
Name	Aram D. Hermiz	Telephone: (312) 693-1048
Title	Title: Senior Director of Legal Services Accenture Global Services Limited	

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/96 (01-09)
Approved for use through 01/31/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Accenture Global Services Limited

Application No./Patent No.: 12/776,159 Filed/Issue Date: May 7, 2010

Titled:
BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Accenture Global Services Limited , a Corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is _____ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy therefore is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Boris Tsypin and Deepak Raghu To: ACCENTURE GLOBAL SERVICES GMBH
   The document was recorded in the United States Patent and Trademark Office at
   Reel 024368, Frame 0082, or for which a copy thereof is attached.

2. From: Jay Hedley To: ACCENTURE GLOBAL SERVICES GMBH
   The document was recorded in the United States Patent and Trademark Office at
   Reel 024728, Frame 0256, or for which a copy thereof is attached.

3. From: ACCENTURE GLOBAL SERVICES GMBH To: ACCENTURE GLOBAL SERVICES LIMITED
   The document was recorded in the United States Patent and Trademark Office at
   Reel 025700, Frame 0287, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Edward Machado/ October 10, 2012
Signature Date

Edward Machado Attorney for Applicant
Printed or Typed Name Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	12776159
Filing Date:	07-May-2010
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Filer:	Edward Machado/Nancy Tarwater
Attorney Docket Number:	10022/1726

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Statutory or terminal disclaimer	1814	1	160	160
		Total in USD ($)		**160**

Electronic Acknowledgement Receipt

EFS ID:	13949542
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	Edward Machado/Maggie Pieczonka
Filer Authorized By:	Edward Machado
Attorney Docket Number:	10022/1726
Receipt Date:	10-OCT-2012
Filing Date:	07-MAY-2010
Time Stamp:	13:09:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$160
RAM confirmation Number	10975
Deposit Account	231925
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10022-1726RespOA.pdf	246624 21eeb1acf05580bf67ef18d7cdc3d363307d6d70	yes	7

Multipart Description/PDF files in .zip description

Document Description	Start	End
Transmittal Letter	1	1
Amendment After Final	2	2
Applicant Arguments/Remarks Made in an Amendment	3	4
Terminal Disclaimer Filed	5	5
Power of Attorney	6	6
Assignee showing of ownership per 37 CFR 3.73.	7	7

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30259 d5bbe253a2ca8f4f95c25f974bd65c77ad9d50a2	no	2

Warnings:

Information:

Total Files Size (in bytes):	276883

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: October 10, 2012 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Sujoy K. Kundu
Filed:	May 7, 2010	Art Unit:	2857
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.:	10022-1726 (D08-138/02045-00-US)		

TRANSMITTAL

Mail Stop AF
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Response to Office Action; Terminal Disclaimer; Power of Attorney; and Statement under 37 CFR 3.73(b).

Fee calculation:

☐ No additional fee is required.

☐ Small Entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☒ A petition or processing fee in an amount of $160.00 under 37 CFR 1.20(d).

☐ An additional filing fee has been calculated as shown below:

						Small Entity			Not a Small Entity	
	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra		Rate	Add'l Fee	OR	Rate	Add'l Fee
Total		Minus				x $31=			x $62=	
Indep.		Minus				x $125=			x $250=	
First Presentation of Multiple Dep. Claim						+$230=			+ $460=	
						Total	$		Total	$

Fee payment:

☒ Please charge Deposit Account No. 23-1925 in the amount of $160.00 for terminal disclaimer.

☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

October 10, 2012
Date

/Edward Machado/
Edward Machado (Reg. No. 58,372)

PTO/SB/26(1-08)

TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A PRIOR PATENT	Docket Number (Optional) . 10022-1726 (D08-138/02045-00-US)

In re Application of: Jay Hedley et al.

Application No. 12/776,159

Filed: May 20, 2009

For: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

The owner*, ACCENTURE GLOBAL SERVICES LIMITED, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application, which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. 154 and 173, as presently shortened by any terminal disclaimer, of prior Patent No. 12/814,311. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the prior patent, as presently shortened by any terminal disclaimer, in the event that it later: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/ organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☒ The undersigned is an attorney of record. Registration No. 58,372

/Edward Machado/	October 10, 2012
Signature	Date
Edward Machado	312-840-3269
Typed or Printed Name	Telephone No.

☒ Terminal disclaimer fee under 37 CFR 1.20(d) is included.
☐ A check in the amount of the fee is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The Commissioner is hereby authorized to charge any fees which may be required or credit any overpayment to Deposit Account No. 23-1925. Enclosed is a dupl. copy of this sheet.

WARNING: **Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

* Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	12/776,159	HEDLEY ET AL.	

Document Code - DISQ	Internal Document – DO NOT MAIL

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed : 10/10/12	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:

jean proctor

U.S. Patent and Trademark Office

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/776,159	05/07/2010	Jay Hedley	10022/1726

CONFIRMATION NO. 1676

28164
ACCENTURE CHICAGO 28164
BRINKS HOFER GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

POA ACCEPTANCE LETTER

OC000000057169449

Date Mailed: 10/19/2012

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 10/10/2012.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/zabraha/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/776,159	05/07/2010	Jay Hedley	10022/1726	1676

28164 7590 10/31/2012

ACCENTURE CHICAGO 28164
BRINKS HOFER GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

EXAMINER	
KUNDU, SUJOY K	

ART UNIT	PAPER NUMBER
2857	

MAIL DATE	DELIVERY MODE
10/31/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	12/776,159	HEDLEY ET AL.	
	Examiner	Art Unit	
	SUJOY KUNDU	2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 October 2012*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Terminal Disclaimer

The terminal disclaimer filed on 10/10/2012 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of 12/814,311 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harrod et al. (US 2009/0171862 A1) in view of Carey et al. (US 2006/0161450 A1).

With regards to Claim 1, 6, Harrod teaches a method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source (Figures 5 and 9, Paragraph 49);

obtaining energy data at the network operations center through the data connection to the energy data source (Paragraph 49);

performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

Harrod is silent with regards to determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and generating and displaying a user interface on a display, the user interface including the analysis result.

Carey teaches determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and generating and displaying a user interface on a display, the user interface including the analysis result (Paragraphs 11, 16, 17, 18, 75, 82, 85).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and generating and displaying a user interface on a display, the user interface including the analysis result as taught by Carey into Harrod for the purpose of obtaining accurate results with regards to cost effectiveness.

With regards to Claim 2, 7, Harrod teaches where determining a balance point set comprises: determining either or both of a heating balance point search window into the energy data and a cooling balance point search window into the energy data (Paragraph 26, 27, 31, 35, 41).

With regards to Claim 3, 8, Harrod teaches where determining a balance point set comprises: executing either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window (Figure 7-9, Paragraph 30-35).

With regards to Claim 4, 9, Harrod teaches where executing the correlation analysis comprises: executing a correlation analysis between temperature and energy consumption to find a best fit correlation (Figures 4 and 8).

With regards to Claim 5, 10, Harrod teaches where executing the correlation analysis comprises: executing the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window (Figures 4 and 8).

With regards to Claim 11, 16, Harrod teaches a method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source (Figures 5 and 9, Paragraph 49);

obtaining energy data at the network operations center through the data connection to the energy data source (Paragraph 49);

Harrod is silent with regards to performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises: determining building comparison baseline data within the energy data; determining the actual consumption data within the energy data; determining as the analysis result, and exception rank by: determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and comparing the comparison standard deviation and the actual consumption data, the exception rank identifying specific data in the actual

consumption data for further review and generating and displaying a user interface on a display, the user interface including the analysis result.

Carey teaches performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises: determining building comparison baseline data within the energy data; determining the actual consumption data within the energy data; determining as the analysis result, and exception rank by: determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and comparing the comparison standard deviation and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review and generating and displaying a user interface on a display, the user interface including the analysis result (Paragraph 180-184).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises: determining building comparison baseline data within the energy data; determining the actual consumption data within the energy data; determining as the analysis result, and exception rank by: determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and comparing the comparison standard deviation and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review and generating and displaying a user interface on a display, the user

interface including the analysis result as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 12, 17, Harrod is silent where determining an exception rank: determining a comparison average of the energy data within the time interval in the building comparison baseline data.

Carey teaches determining an exception rank: determining a comparison average of the energy data within the time interval in the building comparison baseline data (Paragraph 180-184, “real-time”).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include determining an exception rank: determining a comparison average of the energy data within the time interval in the building comparison baseline data as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 13, 18, Harrod is silent with regards to where determining an exception rank further comprises: determining an actual consumption average of the energy data within the time interval in the actual consumption data.

Carey teaches where determining an exception rank further comprises: determining an actual consumption average of the energy data within the time interval in the actual consumption data (Paragraph 180-184, “real-time”).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include where determining an exception rank further comprises: determining an actual consumption average of the energy data within the time interval

in the actual consumption data as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 14, 19, Harrod is silent with regards to where determining an exception rank further comprises: accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and assigning the exception rank to the time interval according to the mapping.

Carey teaches to where determining an exception rank further comprises: accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and assigning the exception rank to the time interval according to the mapping (Figures 6A, 6B, 7, Paragraph 180-184).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include to where determining an exception rank further comprises: accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and assigning the exception rank to the time interval according to the mapping as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 15, 20, Harrod is silent with regards to where the statistical parameter comprises a standard deviation window with respect to the comparison average.

Carey teaches to where the statistical parameter comprises a standard deviation window with respect to the comparison average (Paragraph 180-184).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include to where the statistical parameter comprises a standard deviation window with respect to the comparison average as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

Response to Arguments

Upon further review of the claim language, the Examiner agrees with applicant as Harrod alone is silent with regards to determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and generating and displaying a user interface on a display, the user interface including the analysis result. However, Carey teaches, determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point; and generating and displaying a user interface on a display, the user interface including the analysis result as shown in Paragraphs 11, 16, 17, 18, 75, 82, and 85. Taking the broadest interpretation of the claim language, one ordinary skilled in the art would be able to apply algorithms defined by the user to calculate a balance point for both heating and cooling with the acquisition of data presented in Carey.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SUJOY KUNDU whose telephone number is (571)272-8586. The examiner can normally be reached on M-F 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Schechter can be reached on 571-272-2302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Sujoy K Kundu/
Primary Examiner, Art Unit 2857
October 23, 2012

OK TO ENTER: /S.K./

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: October 10, 2012 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

Our Case No. 10022-1726 (D08-138/02045-00-US)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Jay Hedley et al.
Serial No. 12/776,159
Filing Date: May 07, 2010
For: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Examiner: Sujoy K Kundu
Group Art Unit No.: 2857
Confirmation No.: 1676

RESPONSE TO OFFICE ACTION

Mail Stop After Final
Commissioner for Patents
P.O. Box 1450
Alexandra, VA 22313-1450

Dear Sir:

Please enter the following amendments and remarks in response to the Final Office Action of August 21, 2012.

Remarks begin on page 2 of this paper.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	Art Unit
	SUJOY KUNDU	2857

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2012	08/14/2012	10/23/2012						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	✓						
	7	✓	✓	✓						
	8	✓	✓	✓						
	9	✓	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	✓	✓	✓						
	13	✓	✓	✓						
	14	✓	✓	✓						
	15	✓	✓	✓						
	16	✓	✓	✓						
	17	✓	✓	✓						
	18	✓	✓	✓						
	19	✓	✓	✓						
	20	✓	✓	✓						

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	Art Unit
	SUJOY KUNDU	2857

SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
EAST Search Tools - USPAT, USPG_PUB, EPO, JPO, DERWENT, IBM_TBD	03/07/2012	SKK
Spoke with Mike Day - agrees with Double Patenting rejection	03/07/2012	SKK

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: January 24, 2013 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

Our Case No. 10022-1726

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Jay Hedley et al.
Serial No. 12/776,159
Filing Date: May 07, 2010
For: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Examiner: Sujoy K Kundu
Group Art Unit No.: 2857
Confirmation No.: 1676

AMENDMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandra, VA 22313-1450

Dear Sir:

Please enter the following amendments and remarks in response to the Office Action of October 31, 2012.

Amendments to Claims are reflected in the **listing of claims** that begin on page 2 of this paper; and

Remarks begin on page 8 of this paper.

AMENDMENTS TO CLAIMS

The listing of the claims below replaces all previous listings of the claims.

Listing of the Claims:

1. (Currently amended) A method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtaining energy data at the network operations center through the data connection to the energy data source;

performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled; and

generating and displaying a user interface on a display, the user interface including the analysis result.

2. (Previously presented) The method of claim 1, where determining a balance point set comprises:

determining both of a heating balance point search window into the energy data and a cooling balance point search window into the energy data.

3. (Original) The method of claim 2, where determining a balance point set comprises:

executing either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

4. (Previously presented) The method of claim 3, where executing the correlation analysis comprises:

executing a correlation analysis between temperature and energy consumption to find a best fit correlation by performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable.

5. (Original) The method of claim 3, where executing the correlation analysis comprises:

executing the correlation analysis at each step of a pre-selected temperature delta through both of the heating balance point window and the cooling balance point window.

6. (Currently amended) An energy analysis system comprising: a processor; and

a memory coupled to the processor, the memory comprising:

energy analysis logic that, when executed by the processor, causes an energy analysis system to:

establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtain energy data at the network operations center through the data connection to the energy data source;

perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:

determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled; and

generate and display a user interface on a display, the user interface including the analysis result.

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Page 614

7. (Original) The system of claim 6, where the energy analysis logic further causes the energy analysis system to obtain either or both of a heating balance point search window and a cooling balance point search window.

8. (Original) The system of claim 7, where the energy analysis logic further causes the energy analysis system to:

execute either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

9. (Previously presented) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:

execute a correlation analysis between temperature and energy consumption to find a best fit correlation by performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable.

10. (Original) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:

execute the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window.

11. (Currently amended) A method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtaining energy data at the network operations center through the data connection to the energy data source;

performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

determining a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled;

determining building comparison baseline data within the energy data;

determining actual consumption data within the energy data;

determining, as the analysis result, an exception rank by;

determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and

comparing the comparison standard deviation data and the actual consumption, the exception rank identifying specific data in the actual consumption for further review; and

generating and displaying a user interface on a display, the user interface including the analysis result.

12. (Previously presented) The method of claim 11, where determining an exception rank comprises:

determining a comparison average of the energy data within the time interval in the building comparison baseline data.

13. (Previously presented) The method of claim 12, where determining an exception rank further comprises:

determining an actual consumption average of the energy data within the time interval in the actual consumption data.

14. (Original) The method of claim 13, where determining an exception rank further comprises:

accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and

assigning the exception rank to the time interval according to the mapping.

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Page 616

15. (Previously presented) The method of claim 14, where the statistical parameter comprises a standard deviation window with respect to the comparison average.

16. (Currently amended) An energy analysis system comprising:

a processor; and

a memory coupled to the processor, the memory comprising:

energy analysis logic that, when executed by the processor, causes an energy analysis system to:

establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtain energy data at the network operations center through the data connection to the energy data source;

perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:

determining a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled;

determining building comparison baseline data within the energy data; determining actual consumption data within the energy data;

determining, as the analysis result, an exception rank by;

determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and

comparing the comparison standard deviation data and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review; and

generate and display a user interface on a display, the user interface including the analysis result.

17. (Previously presented) The system of claim 16, where the energy analysis logic further causes the energy analysis system to:

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determine a comparison average of the energy data within the time interval in the building comparison baseline data.

18. (Previously presented) The system of claim 17, where the energy analysis logic further causes the energy analysis system to:

determine an actual consumption average of the energy data within the time interval in the actual consumption data.

19. (Original) The system of claim 18, where the energy analysis logic further causes the energy analysis system to:

access an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and

assign an exception rank to the time interval according to the mapping.

20. (Previously presented) The method of claim 19, where the statistical parameter comprises a standard deviation window with respect to the comparison average.

REMARKS

Claims 1-20 are pending in the application. Claims 1, 6, 11, and 16 are amended. Reconsideration and allowance of the claims of the application is respectfully requested in view of the amendments to the claims and remarks below.

Rejections under 35 U.S.C. § 103

The Office Action rejects claims 1-20 under 35 U.S.C. § 103(a) as being unpatentable over Harrod et al. (US 2009/0171862 A1) in view of Carey et al. (US 2006/0161450 A1).

i) Independent Claims 1, 6, 11, and 16

Independent claim 1, as amended, recites:

> wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled.

Claims 6, 11, and 16 recite the same limitations. Applicant submits that claims 1, 6, 11, and 17 are patentable over the cited the references.

The Office Action admits that Harrod does not disclose determining a balance point set from energy data that includes both a cooling balance point and a heating balance point. The Office Action asserts in the alternative that Carey discloses these limitations. Applicant respectfully disagrees with this assertion.

Carey discloses a system that tracks energy usage. The energy usage is determined on the basis of various factors that include weather station data. The weather station data is specified in terms of cooling degree days and heating degree days. (See Carey, paragraphs [0052]-[0054].) The Office Action appears to suggest cooling and heating degree days are equivalent to the cooling and heating balance points recited in the claims. Applicant respectfully disagrees.

Carey discloses that a cooling degree day is computed by subtracting a base temperature of 65° F from an average temperature for a day, and that a heating degree day is computed by subtracting the average temperature for the day from

a base temperature of 65° F. (See Carey, paragraph [0054].) In other words, a cooling degree day corresponds to a day where the average temperature is above 65° F, and a heating degree day corresponds to a day where the average temperature is below 65° F. Applicant submits that these metrics are different than the heating and cooling balance points recited in previously presented claims 1, 6, 11, and 16. For this reason alone, Applicant submits that claims 1, 6, 11, and 16, as previously presented, were patentable over the cited references.

Nevertheless, claim 1 is amended to recite that a heating balance point is a temperature above which a building is not heated and that a cooling balance point is a temperature below which the building is not cooled. Support for these amendments can be found at least in paragraph [057] of the application. Claims 1, 6, 11, and 16, as amended, clarify that the respective balance points are defined in terms of a temperature, not a number of days, as is the case in Carey. Moreover, the respective balance points indicate whether a building is being cooled or heated by an HVAC system, which is different than determining a number of days above or below a set temperature.

Applicant further submits that Carey teaches away from two distinct balance points because Carey discloses determining the number of cooling and heating degree days based on a singe reference point or balance point of 65° F. In fact, the application notes the disadvantages in determining the number of heating and cooling degree days based on a standard and usually inaccurate balance point of 65° F. (See application paragraph [057].)

Accordingly, for these reasons as well, Applicant submits that claims 1, 6, 11, and 16 are patentable over the cited references. Applicant, therefore, respectfully requests withdrawal of the rejections under 35 U.S.C. § 103(a) against claims 1, 6, 11, and 16, and those claims that depend from claims 1, 6, 11, and 16, respectively.

ii) Dependent Claims 4 and 9

Dependent claims 4 and 9 recite execution of a correlation analysis between temperature and energy consumption to find a best fit correlation by performing a

linear regression using the least squares method, with 'n' independent variables and one dependent variable.

The Office Action does not appear to consider the limitations with respect to the performance of linear regression via the least squares method and instead re-asserts that Figs. 4 and 8 of Harrod disclose execution of a correlation analysis between temperature and energy consumption. Applicant submits, however, that the graphs in those figures simply show a linear interpolation between two points of data. (See para [0024].) As noted in the previous response, this is different than determining a correlation analysis via linear regression as recited in claims 4 and 9. Accordingly, for this reason as well, Applicant submits that claims 4 and 9 are patentable over the cited references.

Conclusion

Applicant believes that the amendments and arguments presented herein are sufficient to overcome the several rejections. Accordingly, allowance of all the claims is respectfully requested. Should the Examiner deem a telephone conference to be of assistance in advancing the application to allowance, the Examiner is invited to call the undersigned attorney at the telephone number below.

Respectfully submitted,

/Edward Machado/
Edward Machado
Registration No. 58,372
Attorney for the Applicant

January 24, 2013
BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

Electronic Acknowledgement Receipt

EFS ID:	14783372
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	Edward Machado/Maggie Pieczonka
Filer Authorized By:	Edward Machado
Attorney Docket Number:	10022/1726
Receipt Date:	24-JAN-2013
Filing Date:	07-MAY-2010
Time Stamp:	16:40:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10022-1726Amendment.pdf	342715 7c85ca86e843908476a0eb3cbc525ab7bc91bac2	yes	11

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Amendment/Req. Reconsideration-After Non-Final Reject	2	2
	Claims	3	8
	Applicant Arguments/Remarks Made in an Amendment	9	11
Warnings:			
Information:			
	Total Files Size (in bytes):	342715	

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: January 24, 2013 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Sujoy K Kundu
Filed:	May 07, 2010	Art Unit:	2857
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676

Attorney Docket No.: 10022-1726

TRANSMITTAL

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Amendment.

Fee calculation:

☒ No additional fee is required.

☐ Small Entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR 1.20(d).

☐ An additional filing fee has been calculated as shown below:

					Small Entity			Not a Small Entity	
	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra	Rate	Add'l Fee	OR	Rate	Add'l Fee
Total		Minus			x $31=			x $62=	
Indep.		Minus			x $125=			x $250=	
First Presentation of Multiple Dep. Claim					+$230=			+ $460=	
					Total	$		Total	$

Fee payment:

☐ Please charge Deposit Account No. 23-1925 in the amount of $_____ for_____.

☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

January 24, 2013
Date

/Edward Machado/
Edward Machado (Reg. No. 58,372)

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
12/776,159	05/07/2010	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	01/24/2013	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X $ =		OR	X $62=	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $ =		OR	X $250=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/DANTE SMITH/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/776,159	05/07/2010	Jay Hedley	10022/1726	1676

28164 7590 04/05/2013

ACCENTURE CHICAGO 28164
BRINKS HOFER GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

EXAMINER	
KUNDU, SUJOY K	

ART UNIT	PAPER NUMBER
2857	

MAIL DATE	DELIVERY MODE
04/05/2013	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 12/776,159	Applicant(s) HEDLEY ET AL.	
	Examiner SUJOY KUNDU	Art Unit 2857	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 January 2013*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some * c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Interim copies:

a)☐ All b)☐ Some c)☐ None of the: Interim copies of the priority documents have been received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(a):
(a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), first paragraph:
The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 6, 11, 16 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

Applicant amends the claim to recite, “wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled.." This limitation is not taught in the specification.

Page 9 of applicants remarks suggest that support for this amendment is in Paragraph 57 of the application.

Paragraph 57 of applicants specification recites:

[057] Co-develop the EMF leveraging .NET, SQL Server, Dynamics, Virtual Earth, Azure, and Sharepoint to lead the industry in defining a unique platform to develop, deployed, and manage energy related applications.

Paragraph 57 of the published application recites:

[0057] Create the strategy and roadmap for co-developing the Energy Management Framework (EMF).

None of these paragraphs above or anywhere in the specification suggest, “wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled.."

Note: The Examiner recognizes that the applicant uses a negative limitation in amended claims 1, 6, 11 and 16, it is required to have support for negative limitations in the specification, just because a limitation is negated does not constitute proper support.

Furthermore, the claims are rejected as best understood by the Examiner.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harrod et al. (US 2009/0171862 A1) in view of Carey et al. (US 2006/0161450 A1).

With regards to Claim 1, 6, Harrod teaches a method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source (Figures 5 and 9, Paragraph 49);

obtaining energy data at the network operations center through the data connection to the energy data source (Paragraph 49);

performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

Harrod is silent with regards to determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled and generating and displaying a user interface on a display, the user interface including the analysis result.

Carey teaches determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled (Paragraph 22, 24, 25 – as best understood by the Examiner) and generating and displaying a user interface on a display, the user interface including the analysis result (Paragraphs 11, 16, 17, 18, 75, 82, 85).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled (Paragraph 22, 24, 25 – as best understood by the Examiner) and generating and displaying a user interface on a display, the user interface including the analysis result as taught by Carey into Harrod for the purpose of obtaining accurate results with regards to cost effectiveness.

With regards to Claim 2, 7, Harrod teaches where determining a balance point set comprises: determining either or both of a heating balance point search window into the energy data and a cooling balance point search window into the energy data (Paragraph 26, 27, 31, 35, 41).

With regards to Claim 3, 8, Harrod teaches where determining a balance point set comprises: executing either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window (Figure 7-9, Paragraph 30-35).

With regards to Claim 4, 9, Harrod teaches where executing the correlation analysis comprises: executing a correlation analysis between temperature and energy consumption to find a best fit correlation (Figures 4 and 8).

With regards to Claim 5, 10, Harrod teaches where executing the correlation analysis comprises: executing the correlation analysis at each step of a pre-selected

temperature delta through either or both of the heating balance point window and the cooling balance point window (Figures 4 and 8).

With regards to Claim 11, 16, Harrod teaches a method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source (Figures 5 and 9, Paragraph 49);

obtaining energy data at the network operations center through the data connection to the energy data source (Paragraph 49);

Harrod is silent with regards to performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises: determining building comparison baseline data within the energy data; determining the actual consumption data within the energy data; determining as the analysis result, and exception rank by: determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and comparing the comparison standard deviation and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review and generating and displaying a user interface on a display, the user interface including the analysis result.

Carey teaches performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises: determining building comparison baseline data within the energy data;

determining the actual consumption data within the energy data; determining as the analysis result, and exception rank by: determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and comparing the comparison standard deviation and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review and generating and displaying a user interface on a display, the user interface including the analysis result (Paragraph 180-184).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises: determining building comparison baseline data within the energy data; determining the actual consumption data within the energy data; determining as the analysis result, and exception rank by: determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and comparing the comparison standard deviation and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review and generating and displaying a user interface on a display, the user interface including the analysis result as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 12, 17, Harrod is silent where determining an exception rank: determining a comparison average of the energy data within the time interval in the building comparison baseline data.

Carey teaches determining an exception rank: determining a comparison average of the energy data within the time interval in the building comparison baseline data (Paragraph 180-184, “real-time”).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include determining an exception rank: determining a comparison average of the energy data within the time interval in the building comparison baseline data as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 13, 18, Harrod is silent with regards to where determining an exception rank further comprises: determining an actual consumption average of the energy data within the time interval in the actual consumption data.

Carey teaches where determining an exception rank further comprises: determining an actual consumption average of the energy data within the time interval in the actual consumption data (Paragraph 180-184, “real-time”).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include where determining an exception rank further comprises: determining an actual consumption average of the energy data within the time interval in the actual consumption data as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 14, 19, Harrod is silent with regards to where determining an exception rank further comprises: accessing an exception rank definition that

comprises a mapping of a statistical parameter to exception ranks; and assigning the exception rank to the time interval according to the mapping.

Carey teaches to where determining an exception rank further comprises: accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and assigning the exception rank to the time interval according to the mapping (Figures 6A, 6B, 7, Paragraph 180-184).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include to where determining an exception rank further comprises: accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and assigning the exception rank to the time interval according to the mapping as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

With regards to Claim 15, 20, Harrod is silent with regards to where the statistical parameter comprises a standard deviation window with respect to the comparison average.

Carey teaches to where the statistical parameter comprises a standard deviation window with respect to the comparison average (Paragraph 180-184).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include to where the statistical parameter comprises a standard deviation window with respect to the comparison average as taught by Carey into Harrod for the purpose of automating the reporting of compliance goals set by standards groups.

Response to Arguments

Applicant amends the claim to recite, “wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled.." This limitation is not taught in the specification.

Page 9 of applicants remarks suggest that support for this amendment is in Paragraph 57 of the application.

Paragraph 57 of applicants specification recites:

[057] Co-develop the EMF leveraging .NET, SQL Server, Dynamics, Virtual Earth, Azure, and Sharepoint to lead the industry in defining a unique platform to develop, deployed, and manage energy related applications.

Paragraph 57 of the published application recites:

[0057] Create the strategy and roadmap for co-developing the Energy Management Framework (EMF).

None of these paragraphs above or anywhere in the specification suggest, “wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled.."

Note: The Examiner recognizes that the applicant uses a negative limitation in amended claims 1, 6, 11 and 16, it is required to have support for negative limitations in the specification, just because a limitation is negated does not constitute proper support.

Furthermore, the claims are rejected as best understood by the Examiner.

Carey teaches determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled (Paragraph 22, 24, 25 – as best understood by the Examiner) and generating and displaying a user interface on a display, the user interface including the analysis result (Paragraphs 11, 16, 17, 18, 75, 82, 85).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SUJOY KUNDU whose telephone number is (571)272-8586. The examiner can normally be reached on M-F 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Schechter can be reached on 571-272-2302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Sujoy K Kundu/
Primary Examiner, Art Unit 2857
April 3, 2013

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	Art Unit
	SUJOY KUNDU	2857

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2012	08/14/2012	10/23/2012	04/03/2013					
	1	✓	✓	✓	✓					
	2	✓	✓	✓	✓					
	3	✓	✓	✓	✓					
	4	✓	✓	✓	✓					
	5	✓	✓	✓	✓					
	6	✓	✓	✓	✓					
	7	✓	✓	✓	✓					
	8	✓	✓	✓	✓					
	9	✓	✓	✓	✓					
	10	✓	✓	✓	✓					
	11	✓	✓	✓	✓					
	12	✓	✓	✓	✓					
	13	✓	✓	✓	✓					
	14	✓	✓	✓	✓					
	15	✓	✓	✓	✓					
	16	✓	✓	✓	✓					
	17	✓	✓	✓	✓					
	18	✓	✓	✓	✓					
	19	✓	✓	✓	✓					
	20	✓	✓	✓	✓					

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	Art Unit
	SUJOY KUNDU	2857

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
EAST Search Tools - USPAT, USPG_PUB, EPO, JPO, DERWENT, IBM_TBD	03/07/2012	SKK
Spoke with Mike Day - agrees with Double Patenting rejection	03/07/2012	SKK
Spoke with Tung Lau who agreed with 112, 1st rejection	04/03/2013	SKK

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

	/S.K./ Primary Examiner.Art Unit 2857

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: June 5, 2013 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

Our Case No. 10022-1726 (D08-138/02045-00-US)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Jay Hedley	
Serial No. 12/776,159	Examiner: Sujoy K Kundu
Filing Date: May 07, 2010	Group Art Unit No. 2857
For BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Confirmation No. 1676

AMENDMENT

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandra, VA 22313-1450

Dear Sir:

Please enter the following amendments and remarks in response to the Office Action of April 5, 2013.

A Listing of Claims begins on page 2 of this paper; and

Remarks begin on page 8 of this paper.

LISTING OF CLAIMS

1. (Previously presented) A method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtaining energy data at the network operations center through the data connection to the energy data source;

performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled; and

generating and displaying a user interface on a display, the user interface including the analysis result.

2. (Previously presented) The method of claim 1, where determining a balance point set comprises:

determining both of a heating balance point search window into the energy data and a cooling balance point search window into the energy data.

3. (Original) The method of claim 2, where determining a balance point set comprises:

executing either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

4. (Previously presented) The method of claim 3, where executing the correlation analysis comprises:

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executing a correlation analysis between temperature and energy consumption to find a best fit correlation by performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable.

5. (Original) The method of claim 3, where executing the correlation analysis comprises:

executing the correlation analysis at each step of a pre-selected temperature delta through both of the heating balance point window and the cooling balance point window.

6. (Previously presented) An energy analysis system comprising: a processor; and

a memory coupled to the processor, the memory comprising:

energy analysis logic that, when executed by the processor, causes an energy analysis system to:

establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtain energy data at the network operations center through the data connection to the energy data source;

perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:

determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled; and

generate and display a user interface on a display, the user interface including the analysis result.

7. (Original) The system of claim 6, where the energy analysis logic further causes the energy analysis system to obtain either or both of a heating balance point search window and a cooling balance point search window.

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Page 643

8. (Original) The system of claim 7, where the energy analysis logic further causes the energy analysis system to:

execute either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

9. (Previously presented) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:

execute a correlation analysis between temperature and energy consumption to find a best fit correlation by performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable.

10. (Original) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:

execute the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window.

11. (Previously presented) A method for energy analysis comprising:

establishing a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtaining energy data at the network operations center through the data connection to the energy data source;

performing an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

determining a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled;

determining building comparison baseline data within the energy data;

determining actual consumption data within the energy data;

determining, as the analysis result, an exception rank by;

determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and

comparing the comparison standard deviation data and the actual consumption, the exception rank identifying specific data in the actual consumption for further review; and

generating and displaying a user interface on a display, the user interface including the analysis result.

12. (Previously presented) The method of claim 11, where determining an exception rank comprises:

determining a comparison average of the energy data within the time interval in the building comparison baseline data.

13. (Previously presented) The method of claim 12, where determining an exception rank further comprises:

determining an actual consumption average of the energy data within the time interval in the actual consumption data.

14. (Original) The method of claim 13, where determining an exception rank further comprises:

accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and

assigning the exception rank to the time interval according to the mapping.

15. (Previously presented) The method of claim 14, where the statistical parameter comprises a standard deviation window with respect to the comparison average.

16. (Previously presented) An energy analysis system comprising:

a processor; and

a memory coupled to the processor, the memory comprising:

energy analysis logic that, when executed by the processor, causes an energy analysis system to:

establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtain energy data at the network operations center through the data connection to the energy data source;

perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:

determining a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled;

determining building comparison baseline data within the energy data; determining actual consumption data within the energy data;

determining, as the analysis result, an exception rank by;

determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and

comparing the comparison standard deviation data and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review; and

generate and display a user interface on a display, the user interface including the analysis result.

17. (Previously presented) The system of claim 16, where the energy analysis logic further causes the energy analysis system to:

determine a comparison average of the energy data within the time interval in the building comparison baseline data.

18. (Previously presented) The system of claim 17, where the energy analysis logic further causes the energy analysis system to:

determine an actual consumption average of the energy data within the time interval in the actual consumption data.

19. (Original) The system of claim 18, where the energy analysis logic further causes the energy analysis system to:

access an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and

assign an exception rank to the time interval according to the mapping.

20. (Previously presented) The method of claim 19, where the statistical parameter comprises a standard deviation window with respect to the comparison average.

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Page 647

REMARKS

Claims 1-20 are pending in the application. Reconsideration and allowance of the claims of the application is respectfully requested in view of the remarks below.

Examiner Interview

On May 20, 2013, an interview was held between Examiner and attorney for Applicant (herein after Applicant). Applicant thanks Examiner for giving Applicant the opportunity to discuss the rejections made in the Office Action.

During the interview, Applicant identified support in the specification for the limitations that were added in the previous response. Applicant further discussed patentability of the claims, as previously presented, over the cited references. Examiner acknowledged that the specification supported the limitations. Examiner also appeared amendable to comments regarding patentability of the claims in view of the identified support.

Examiner requested that Applicant submit a response based on the comments made during the interview to provide Examiner further time to consider the claims and the remarks. Examiner indicated that the next Office Action would either be an allowance of the claims or a new non-final rejection.

Rejections under 35 U.S.C. § 112

The Office Action rejects claims 1, 6, 11, 16 under 35 U.S.C. § 112(a), or in the alternative, 35 U.S.C. § 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. Specifically, the Office Action asserts that the limitations added in the previous response were not supported by the specification.

As noted above, Applicant identified support for the limitations during the interview. Applicant, therefore, respectfully requests withdrawal of the rejections under 35 U.S.C. § 112.

Rejections under 35 U.S.C. § 103

The Office Action rejects claims 1-20 under 35 U.S.C. § 103(a) as being unpatentable over Harrod et al. (US 2009/0171862 A1) in view of Carey et al. (US 2006/0161450 A1).

i) <u>Independent Claims 1, 6, 11, and 16</u>

Independent claim 1, as previously presented, recited:

> wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled.

Claims 6, 11, and 16, as previously presented, recited the same limitations.

During the Interview, Applicant noted that the interpretation of the recited heating and cooling balance points ascribed by the Office Action was inconsistent with the interpretation ascribed by the specification. Applicant further noted the patentable differences between the claims and the cited references.

In particular, Applicant noted that Carey discloses that a cooling degree-day is computed by subtracting a base temperature of 65° F from an average temperature for a day, and that a heating degree-day is computed by subtracting the average temperature for the day from a base temperature of 65° F. (See Carey, paragraph [0054].) In other words, a cooling degree-day corresponds to a day where the average temperature is above 65° F, and a heating degree-day corresponds to a day where the average temperature is below 65° F. Applicant noted that these metrics are different than the heating and cooling balance points recited in previously presented claims 1, 6, 11, and 16.

Applicant further noted that Carey teaches away from two distinct balance points because Carey discloses determining the number of cooling and heating degree days based on a singe reference point or balance point of 65° F. Applicant noted that the application notes the disadvantages in determining the number of heating and cooling degree days based on a standard and usually inaccurate balance point of 65° F. (See application paragraph [057].)

As noted above, Examiner was generally amendable to Applicant's comments. Applicant, therefore, believes that no further comment is necessary. Accordingly, Applicant, respectfully requests withdrawal of the rejections under 35 U.S.C. §103(a) against claims 1, 6, 11, and 16, and those claims that depend from claims 1, 6, 11, and 16, respectively.

WILLOW TECH. EX. 1005
Page 649

ii) Dependent Claims 4 and 9

As noted in the previous response, dependent claims 4 and 9 recite execution of a correlation analysis between temperature and energy consumption to find a best fit correlation by performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable.

The Office Action does not appear to consider the limitations with respect to the performance of linear regression via the least squares method and instead re-asserts that Figs. 4 and 8 of Harrod disclose execution of a correlation analysis between temperature and energy consumption. Applicant submits, however, that the graphs in those figures simply show a linear interpolation between two points of data. (See para [0024]). As noted in the previous response, this is different than determining a correlation analysis via linear regression as recited in claims 4 and 9. Accordingly, for this reason as well, Applicant submits that claims 4 and 9 are patentable over the cited references.

Conclusion

Applicant believes that the previously presented amendments and the remarks presented herein are sufficient to overcome the several rejections. Accordingly, allowance of all the claims is respectfully requested. Should the Examiner deem a telephone conference to be of assistance in advancing the application to allowance, the Examiner is invited to call the undersigned attorney at the telephone number below.

Respectfully submitted,

/Edward Machado/
Edward Machado
Registration No. 58,372
Attorney for the Applicant

June 5, 2013
BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

Electronic Acknowledgement Receipt

EFS ID:	15954690
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	Edward Machado/Maggie Pieczonka
Filer Authorized By:	Edward Machado
Attorney Docket Number:	10022/1726
Receipt Date:	05-JUN-2013
Filing Date:	07-MAY-2010
Time Stamp:	15:29:27
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	10022-1726_TRANSMITTAL-Amendment.pdf	134264 d4bc084f593a647ad331129552de75679a580f0d	no	1

Warnings:

Information:

2		10022-1726_Amendment.pdf	80016 a125f14eb7b72c939582c830384b5d341db6865e	yes	10

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment After Final	1	1
Claims	2	7
Applicant Arguments/Remarks Made in an Amendment	8	10

Warnings:	
Information:	
Total Files Size (in bytes):	214280

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: June 5, 2013 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Sujoy K Kundu
Filed:	May 07, 2010	Art Unit:	2857
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.:	10022-1726 (D08-138/02045-00-US)		

TRANSMITTAL

Mail Stop AF
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Amendment (10 pgs.).

Fee calculation:

☒ No additional fee is required.

☐ Per 37 CFR §1.27, ☐ Applicant is small entity ☐ Applicant is micro entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR § 1.17(_____).

☐ An additional filing fee has been calculated as shown below:

					Fee		Small Entity Fee		Micro Entity Fee	
	Claims Remaining After Amendment		Highest No. Previously Paid	Present Extra	Rate	Add'l Fee	Rate	Add'l Fee	Rate	Add'l Fee
Total		Minus			x $ 80 =	$	x $ 40 =	$	x $20 =	$
Independent		Minus			x $420 =	$	x $210 =	$	x $105 =	$
First Presentation of Multiple Dep. Claim					+ $780 =	$	+ $390 =	$	+ $195 =	$
					Total	$	Total	$	Total	$

Fee payment:

☐ Please charge Deposit Account No. 23-1925 in the amount of $_____ for _____.

☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).
WARNING: Information on this form may become public. **Credit card information should not be included on this form.**

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

June 5, 2013
Date

/Edward Machado/
Edward Machado (Reg. No. 58,372)

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/776,159	Filing Date 05/07/2010	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	06/05/2013	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/MELINDA L. OLIVER/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

FORM PTO-1449	SERIAL NO. 12/776,159	CASE NO. 10022-01726 (D08-138/02045-00-US)
LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT	FILING DATE May 7, 2010	GROUP ART UNIT 2857
(use several sheets if necessary)	APPLICANT(S): Jay Hedley et al.	

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	NAME	CLASS/ SUBCLASS	FILING DATE
	D1	5963458A	Oct 5, 1999	Cascia		
	D2	20040255601A1	Dec 23, 2004	Kwon et al.		
	D3	20070143045A1	Jun 21, 2007	MacGregor		

EXAMINER INITIAL		OTHER ART – NON PATENT LITERATURE DOCUMENTS (Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date page(s), volume-issue number(s), publisher, city and/or country where published.
	D4	Singapore Search Report and Written Opinion for Application No. 201108097-5, March 6, 2013

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Rev. Feb.-97

c:\Users\mdelarosa.DOMAIN_BHGL5\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\ASEODGQ5\10022-1726 PTO 1449 June 12 2013

Electronic Patent Application Fee Transmittal

Application Number:	12776159
Filing Date:	07-May-2010
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Filer:	Edward Machado
Attorney Docket Number:	10022/1726
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt	
EFS ID:	16017400
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	Edward Machado/Jeff Skinner
Filer Authorized By:	Edward Machado
Attorney Docket Number:	10022/1726
Receipt Date:	12-JUN-2013
Filing Date:	07-MAY-2010
Time Stamp:	16:18:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$180
RAM confirmation Number	3221
Deposit Account	231925
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10022-01726_3rd-Supp_IDS.pdf	387586 09a87622b9e94a583173734129294 1f0f1a62f55	yes	13

Multipart Description/PDF files in .zip description

Document Description	Start	End
Transmittal Letter	1	1
Transmittal Letter	2	3
Information Disclosure Statement (IDS) Form (SB08)	4	4
Non Patent Literature	5	13

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30386 3fd2f1f70c0fa28af6bed769a787486c2d017515	no	2

Warnings:

Information:

Total Files Size (in bytes):	417972

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: June 12, 2013 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Jay Hedley et al.
Serial No. 12/776,159
Filing Date: May 7, 2010
For BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Attorney Docket No. 10022-01726
(D08-138/02045-00-US)

Examiner: Sujoy K Kundu
Group Art Unit No. 2857
Confirmation No. 1676

TRANSMITTAL

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Third Supplemental Information Disclosure Statement (2 pgs.); and Form PTO-1449 (1 pg. with copy of cited reference D4).

Fee calculation:

☐ No additional fee is required.

☐ Per 37 CFR §1.27, ☐ Applicant is small entity ☐ Applicant is micro entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR § 1.17(_____).

☐ An additional filing fee has been calculated as shown below:

	Claims Remaining After Amendment		Highest No. Previously Paid	Present Extra	Fee Rate	Fee Add'l Fee	Small Entity Fee Rate	Small Entity Fee Add'l Fee	Micro Entity Fee Rate	Micro Entity Fee Add'l Fee
Total		Minus			x $ 80 =	$	x $ 40 =	$	x $20 =	$
Independent		Minus			x $420 =	$	x $210 =	$	x $105 =	$
First Presentation of Multiple Dep. Claim					+ $780 =	$	+ $390 =	$	+ $195 =	$
					Total	$	Total	$	Total	$

Fee payment:

☒ Please charge Deposit Account No. 23-1925 in the amount of $180.00 for Third Supplement IDS.

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

June 12, 2013
Date

/Edward Machado/
Edward Machado (Reg. No. 58,372)

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: June 12, 2013 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

Our Case No. 10022-01726 (D08-138/02045-00-US)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Jay Hedley et al.
Serial No. 12/776,159
Filing Date: May 7, 2010
For BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Examiner: Sujoy K Kundu
Group Art Unit No. 2857
Confirmation No. 1676

THIRD SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

This application is related to the following United States patent application(s): 12/814,311, filed June 11, 2010. The Examiner is directed to any Office Actions issued in the related application(s) and the references cited therein, and any Information Disclosure Statements submitted in the related application(s).

In accordance with the duty of disclosure under 37 C.F.R. §1.56 and §§1.97-1.98, and more particularly in accordance with 37 C.F.R. §1.97(b), Applicants hereby cite the following reference(s):

U.S. PATENTS AND PUBLICATIONS

DOCUMENT NUMBER Number-kind Code (if known)	DATE	NAME
5963458A	Oct 5, 1999	Cascia
20040255601A1	Dec 23, 2004	Kwon et al.
20070143045A1	Jun 21, 2007	MacGregor

OTHER DOCUMENTS

Singapore Search Report and Written Opinion for Application No. 201108097-5, March 6, 2013

Applicant is enclosing Form PTO-1449 (one sheet), along with a copy of each listed reference for which a copy is required under 37 C.F.R. §1.98(a)(2).

By submitting this Statement, Applicants are attempting to fully comply with the duty of candor and good faith mandated by 37 C.F.R. §1.56. As such, this Statement is not intended to constitute an admission that any of the enclosed references, or other information referred to therein, constitutes "prior art" or is otherwise "material to patentability," as that phrase is defined in 37 C.F.R. §1.56(a).

Applicant has calculated a processing fee in the amount of $180.00 to be due under 37 C.F.R. §1.17(p) in connection with the filing of this Statement. Applicant has enclosed a check covering this fee, or authorized charging the fee to a deposit account or credit card, as indicated in the Transmittal accompanying this Statement.

Respectfully submitted,

June 12, 2013
Date

/Edward Machado/
Edward Machado (Reg. No.58,372)

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/776,159	05/07/2010	Jay Hedley	10022/1726	1676

28164 7590 06/18/2013

ACCENTURE CHICAGO 28164
BRINKS HOFER GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

EXAMINER	
KUNDU, SUJOY K	
ART UNIT	PAPER NUMBER
2857	

MAIL DATE	DELIVERY MODE
06/18/2013	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 12/776,159	Applicant(s) HEDLEY ET AL.	
	Examiner SUJOY KUNDU	Art Unit 2857	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *5 June 2013*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☒ Claim(s) *6-10 and 16-20* is/are allowed.

7)☒ Claim(s) *1-5 and 11-15* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some * c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Interim copies:

a)☐ All b)☐ Some c)☐ None of the: Interim copies of the priority documents have been received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *06/12/2013*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Patent-eligible subject matter does not include laws of nature, natural phenomena, or abstract ideas. *Bilski v. Kappos,* 130 S. Ct. 3218 (U.S. 2010).

Process claims must either (1) be tied to a particular machine or apparatus, or (2) transform a particular article to a different state or thing. This is called the "machine-or-transformation test". There are two corollaries to this test. First, a mere field-of-use limitation is generally insufficient to render an otherwise ineligible method claim patent-eligible. This means the machine or transformation must impose meaningful limits on the method claim's scope to pass the test. Second, insignificant extra-solution activity will not transform an unpatentable principle into a patentable process. This means reciting a specific machine or a particular transformation of a specific article in an insignificant step, such a data gathering or outputting, is not sufficient to pass the test.

Claims 1 and 11 fail the Machine-or-Transformation (M/T) test. In claims 1 and 11, the first prong of the M/T test, we ask what machine is performing the process step of “determining.” If these steps implicitly or explicitly do not require a machine to perform the steps, and if a person can performing the process steps of “determining,” the claim fails the first prong. Here it does fail, and must be fixed by adding the word “by a

processor." Additionally, if a step is tied to a machine, then the step must be central to the claimed process and cannot be a mere extra-solution activity.

Allowable Subject Matter

Claims 6-10 and 16-20 are allowed.

Claims 1-5 and 11-15 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 101, set forth in this Office action.

Reasons for Allowance

The following is an examiner's statement of reasons for allowance:
With regards to Claims 6 and 16, the prior art of record or any combination of prior art searched fails to teach the limitations of determining a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SUJOY KUNDU whose telephone number is (571)272-8586. The examiner can normally be reached on M-F 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Schechter can be reached on 571-272-2302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Sujoy K Kundu/
Primary Examiner, Art Unit 2857
June 17, 2013

FORM PTO-1449	SERIAL NO. 12/776,159	CASE NO. 10022-01726 (D08-138/02045-00-US)
LIST OF PATENTS AND PUBLICATIONS FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT	FILING DATE May 7, 2010	GROUP ART UNIT 2857
(use several sheets if necessary)	APPLICANT(S): Jay Hedley et al.	

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	NAME	CLASS/ SUBCLASS	FILING DATE
	D1	5963458A	Oct 5, 1999	Cascia		
	D2	20040255601A1	Dec 23, 2004	Kwon et al.		
	D3	20070143045A1	Jun 21, 2007	MacGregor		

EXAMINER INITIAL		OTHER ART – NON PATENT LITERATURE DOCUMENTS (Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date page(s), volume-issue number(s), publisher, city and/or country where published.
	D4	Singapore Search Report and Written Opinion for Application No. 201108097-5, March 6, 2013

EXAMINER /Sujoy Kundu/	DATE CONSIDERED 06/17/2013

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Rev. Feb.-97

c:\Users\mdelarosa.DOMAIN_BHGL5\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\ASEODGQ5\10022-1726 PTO 1449 June 12 2013

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.K./

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	**Art Unit**
	SUJOY KUNDU	2857

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2012	08/14/2012	10/23/2012	04/03/2013	06/17/2013				
	1	✓	✓	✓	✓	✓				
	2	✓	✓	✓	✓	✓				
	3	✓	✓	✓	✓	✓				
	4	✓	✓	✓	✓	✓				
	5	✓	✓	✓	✓	✓				
	6	✓	✓	✓	✓	=				
	7	✓	✓	✓	✓	=				
	8	✓	✓	✓	✓	=				
	9	✓	✓	✓	✓	=				
	10	✓	✓	✓	✓	=				
	11	✓	✓	✓	✓	✓				
	12	✓	✓	✓	✓	✓				
	13	✓	✓	✓	✓	✓				
	14	✓	✓	✓	✓	✓				
	15	✓	✓	✓	✓	✓				
	16	✓	✓	✓	✓	=				
	17	✓	✓	✓	✓	=				
	18	✓	✓	✓	✓	=				
	19	✓	✓	✓	✓	=				
	20	✓	✓	✓	✓	=				

OK TO ENTER: /S.K./

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: June 5, 2013 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

Our Case No. 10022-1726 (D08-138/02045-00-US)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
Jay Hedley	)	
Serial No. 12/776,159	)	Examiner: Sujoy K Kundu
Filing Date: May 07, 2010	)	Group Art Unit No. 2857
For BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	)	Confirmation No. 1676

AMENDMENT

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandra, VA 22313-1450

Dear Sir:

Please enter the following amendments and remarks in response to the Office Action of April 5, 2013.

A Listing of Claims begins on page 2 of this paper; and

Remarks begin on page 8 of this paper.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	Art Unit
	SUJOY KUNDU	2857

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
EAST Search Tools - USPAT, USPG_PUB, EPO, JPO, DERWENT, IBM_TBDSpoke with Mike Day - agrees with Double Patenting rejectionSpoke with Tung Lau who agreed with 112, 1st rejection	03/07/201203/07/201204/03/2013	SKKSKKSKK

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: August 21, 2013 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

Our Case No. 10022-1726

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Jay Hedley	
Serial No. 12/776,159	Examiner: Sujoy K Kundu
Filing Date: May 07, 2010	Group Art Unit No.: 2857
For: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Confirmation No.: 1676

AMENDMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandra, VA 22313-1450

Dear Sir:

Please enter the following amendments and remarks in response to the Office Action of June 18, 2013.

Amendments to the Claims are shown in the listing of the claims that begins on page 2 of this paper; and

Remarks begin on page 8 of this paper.

AMENDMENTS TO THE CLAIMS

The listing of claims below replaces all previously presented claim listings.

Listing of the Claims:

1. (Currently amended) A method for energy analysis comprising:

establishing, by a processor, a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtaining, by a processor, energy data at the network operations center through the data connection to the energy data source;

performing, by the processor, an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

determining, by the processor, a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled; and

generating and displaying, by the processor, a user interface on a display, the user interface including the analysis result.

2. (Previously presented) The method of claim 1, where determining a balance point set comprises:

determining both of a heating balance point search window into the energy data and a cooling balance point search window into the energy data.

3. (Original) The method of claim 2, where determining a balance point set comprises:

executing either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

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4. (Previously presented) The method of claim 3, where executing the correlation analysis comprises:

executing a correlation analysis between temperature and energy consumption to find a best fit correlation by performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable.

5. (Original) The method of claim 3, where executing the correlation analysis comprises:

executing the correlation analysis at each step of a pre-selected temperature delta through both of the heating balance point window and the cooling balance point window.

6. (Previously presented) An energy analysis system comprising: a processor; and

a memory coupled to the processor, the memory comprising:

energy analysis logic that, when executed by the processor, causes an energy analysis system to:

establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtain energy data at the network operations center through the data connection to the energy data source;

perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:

determining a balance point set from the energy data as the analysis result, the balance point set comprising a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled; and

generate and display a user interface on a display, the user interface including the analysis result.

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Page 674

7. (Original) The system of claim 6, where the energy analysis logic further causes the energy analysis system to obtain either or both of a heating balance point search window and a cooling balance point search window.

8. (Original) The system of claim 7, where the energy analysis logic further causes the energy analysis system to:

execute either or both of a correlation analysis of the energy data within the heating balance point window and a correlation analysis of the energy data within the cooling balance point window.

9. (Previously presented) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:

execute a correlation analysis between temperature and energy consumption to find a best fit correlation by performing a linear regression using the least squares method, with 'n' independent variables and one dependent variable.

10. (Original) The system of claim 8, where the energy analysis logic further causes the energy analysis system to:

execute the correlation analysis at each step of a pre-selected temperature delta through either or both of the heating balance point window and the cooling balance point window.

11. (Currently amended) A method for energy analysis comprising:

establishing, by a processor, a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtaining, by the processor, energy data at the network operations center through the data connection to the energy data source;

performing, by the processor, an energy analysis in the network operations center on the energy data to produce an analysis result, where performing the energy analysis comprises:

determining, by the processor, a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled;

determining[[]], by the processor, building comparison baseline data within the energy data;

determining, by the processor, actual consumption data within the energy data;

determining, by the processor, as the analysis result, an exception rank by;

determining, by the processor, a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and

comparing, by the processor, the comparison standard deviation data and the actual consumption, the exception rank identifying specific data in the actual consumption for further review; and

generating and displaying, by the processor, a user interface on a display, the user interface including the analysis result.

12. (Previously presented) The method of claim 11, where determining an exception rank comprises:

determining a comparison average of the energy data within the time interval in the building comparison baseline data.

13. (Previously presented) The method of claim 12, where determining an exception rank further comprises:

determining an actual consumption average of the energy data within the time interval in the actual consumption data.

14. (Original) The method of claim 13, where determining an exception rank further comprises:

accessing an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and

assigning the exception rank to the time interval according to the mapping.

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15. (Previously presented) The method of claim 14, where the statistical parameter comprises a standard deviation window with respect to the comparison average.

16. (Previously presented) An energy analysis system comprising:

a processor; and

a memory coupled to the processor, the memory comprising:

energy analysis logic that, when executed by the processor, causes an energy analysis system to:

establish a data connection from a network operations center through an energy data connectivity interface to an energy data source;

obtain energy data at the network operations center through the data connection to the energy data source;

perform an energy analysis in the network operations center on the energy data to produce an analysis result, where the energy analysis comprises:

determining a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled;

determining building comparison baseline data within the energy data; determining actual consumption data within the energy data;

determining, as the analysis result, an exception rank by;

determining a comparison standard deviation of the energy data within a time interval in the building comparison baseline data; and

comparing the comparison standard deviation data and the actual consumption data, the exception rank identifying specific data in the actual consumption data for further review; and

generate and display a user interface on a display, the user interface including the analysis result.

17. (Previously presented) The system of claim 16, where the energy analysis logic further causes the energy analysis system to:

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determine a comparison average of the energy data within the time interval in the building comparison baseline data.

18. (Previously presented) The system of claim 17, where the energy analysis logic further causes the energy analysis system to:

determine an actual consumption average of the energy data within the time interval in the actual consumption data.

19. (Original) The system of claim 18, where the energy analysis logic further causes the energy analysis system to:

access an exception rank definition that comprises a mapping of a statistical parameter to exception ranks; and

assign an exception rank to the time interval according to the mapping.

20. (Previously presented) The method of claim 19, where the statistical parameter comprises a standard deviation window with respect to the comparison average.

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REMARKS

Claims 1-20 are pending in the application. Claims 1 and 11 are amended. Reconsideration and allowance of the claims of the application is respectfully requested in view of the remarks below.

Rejections under 35 U.S.C. § 101

The Office Action rejects claims 1 and 11 under 35 U.S.C. § 101 and asserts that these claims are directed to non-statutory because they are not tied to a particular machine or apparatus.

Pursuant to the suggestion in the Office Action, claims 1 and 11 are amended to recite a processor that performs that various steps. Applicant believes, therefore, that claims 1 and 11 are in allowable form. Accordingly, Applicant respectfully requests withdrawal of the rejections under 35 U.S.C. § 101.

Allowable Subject Matter

The Office Action indicates that the claims 6-10 and 16-20 are allowed. The Office Action further indicates that claims 1-5 and 11-15 would be allowable if amended to overcome the rejections under 35 U.S.C. § 101. Applicant thanks the Examiner for this determination. As noted above, claims 1 and 11 are amended to address the rejection under 35 U.S.C § 101. Applicant believes, therefore, that all the claims are in condition for allowance.

Conclusion

Applicant believes that the amendments and remarks presented herein are sufficient to overcome the several rejections. Accordingly, allowance of all the claims is respectfully requested. Should the Examiner deem a telephone conference to be of assistance in advancing the application to allowance, the Examiner is invited to call the undersigned attorney at the telephone number below.

WILLOW TECH. EX. 1005
Page 679

Respectfully submitted,

/Edward Machado/
Edward Machado
Registration No. 58,372
Attorney for the Applicant

August 21, 2013
BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

Electronic Acknowledgement Receipt

EFS ID:	16647329
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	Edward Machado/Maggie Pieczonka
Filer Authorized By:	Edward Machado
Attorney Docket Number:	10022/1726
Receipt Date:	21-AUG-2013
Filing Date:	07-MAY-2010
Time Stamp:	15:21:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10022-1726Amendment.pdf	285606 bbe001f25d31552cc3f5c8f76a0d98ddcd32814c	yes	10

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Amendment/Req. Reconsideration-After Non-Final Reject	2	2
	Claims	3	8
	Applicant Arguments/Remarks Made in an Amendment	9	10
Warnings:			
Information:			
	Total Files Size (in bytes):	285606	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: August 21, 2013 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Jay Hedley et al.
Serial No. 12/776,159
Filing Date: May 7, 2010
For: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

Attorney Docket No. 10022-01726

Examiner: Sujoy K Kundu
Group Art Unit No.: 2857
Confirmation No.: 1676

TRANSMITTAL

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Amendment.

Fee calculation:

☒ No additional fee is required.

☐ Per 37 CFR §1.27, ☐ Applicant is small entity ☐ Applicant is micro entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR § 1.17(_____).

☐ An additional filing fee has been calculated as shown below:

					Fee		Small Entity Fee		Micro Entity Fee	
	Claims Remaining After Amendment		Highest No. Previously Paid	Present Extra	Rate	Add'l Fee	Rate	Add'l Fee	Rate	Add'l Fee
Total		Minus			x $ 80 =	$	x $ 40 =	$	x $20 =	$
Independent		Minus			x $420 =	$	x $210 =	$	x $105 =	$
First Presentation of Multiple Dep. Claim					+ $780 =	$	+ $390 =	$	+ $195 =	$
					Total	$	Total	$	Total	$

Fee payment:

☐ Please charge Deposit Account No. 23-1925 in the amount of $_____ for _____..

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

August 21, 2013
Date

/Edward Machado/
Edward Machado (Reg. No. 58,372)

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/776,159	Filing Date 05/07/2010	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)		
	08/21/2013	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	* 20	Minus	** 20	=	X $ =	
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

		(Column 1)		(Column 2)	(Column 3)		
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/KATRINA . TURNER/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

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NOTICE OF ALLOWANCE AND FEE(S) DUE

28164 7590 02/18/2014

BGL/Accenture - Chicago
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P O BOX 10395
CHICAGO, IL 60610

EXAMINER
SUAREZ, FELIX E

ART UNIT	PAPER NUMBER
2865	

DATE MAILED: 02/18/2014

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/776,159	05/07/2010	Jay Hedley	10022/1726	1676

TITLE OF INVENTION: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	05/19/2014

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

WILLOW TECH. EX. 1005
Page 685

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

28164 7590 02/18/2014
BGL/Accenture - Chicago
BRINKS GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

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12/776,159	05/07/2010	Jay Hedley	10022/1726	1676

TITLE OF INVENTION: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	05/19/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
SUAREZ, FELIX E	2865	702-060000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Page 686

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/776,159	05/07/2010	Jay Hedley	10022/1726	1676

28164 7590 02/18/2014

BGL/Accenture - Chicago
BRINKS GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

EXAMINER	
SUAREZ, FELIX E	

ART UNIT	PAPER NUMBER
2865	

DATE MAILED: 02/18/2014

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 303 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 303 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 12/776,159	Applicant(s) HEDLEY ET AL.	
	Examiner FELIX SUAREZ	Art Unit 2865	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *amendment filed 08/21/2013*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-20*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

DETAILED ACTION

Allowable Subject Matter

1. **Claims 1-20** are allowed.

2. The following is an examiner's statement of reasons for allowance:

Claims 1-20, are allowable because the closest prior art, Harrod et al. [U.S. Patent Application Publication No. 2009/0171862] and Carey et al. [U.S. Patent Application Publication No. 2006/0161450], either singularly or in combination, fail to anticipate or render obvious a method (or a system) for energy analysis; for determining, by a processor, a balance point set from the energy data as the result, the balance point set comprising a heating balance point and a cooling balance point, wherein the heating balance point is a temperature above which a building is not heated and the cooling balance point is a temperature below which the building is not cooled.

Conclusion

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Felix Suarez, whose telephone number is (571) 272-2223. The examiner can normally be reached on weekdays from 8:30 a.m. to 5:00 p.m.
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sujoy K. Kundu can be reached on (571) 272-8586. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300 for regular communications and for After Final communications.
February 4, 2014

/Felix E Suarez/
Examiner, Art Unit 2865

/SUJOY KUNDU/
Supervisory Patent Examiner, Art Unit 2862
February 6, 2014

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	3	"12776159"	US-PGPUB; USPAT	AND	ON	2014/02/05 13:58
L2	13	processor & network & (energy with analysis) & (balance with point) & (heating with (balance with point)) & (cooling with (balance with point)) & (user with interface)	US-PGPUB; USPAT	AND	ON	2014/02/05 14:02
L3	1	702/60,32,34,36.ccls. & (processor & network & (energy with analysis) & (balance with point) & (heating with (balance with point)) & (cooling with (balance with point)) & (user with interface)).clm.	US-PGPUB; USPAT	AND	ON	2014/02/05 14:04

2/ 5/ 2014 2:05:16 PM
C:\ Users\ fsuarez\ Documents\ EAST\ Workspaces\ 12776159_20140205.wsp

WILLOW TECH. EX. 1005

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	Art Unit
	SUJOY KUNDU	2857

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
EAST Search Tools - USPAT, USPG_PUB, EPO, JPO, DERWENT, IBM_TBD	03/07/2012	SKK
Spoke with Mike Day - agrees with Double Patenting rejection	03/07/2012	SKK
Spoke with Tung Lau who agreed with 112, 1st rejection	04/03/2013	SKK
Primary Examiner Kundu S. Reviewed.	06/17/2013	FS
Search Text EAST	02/05/2014	FS

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
702	60, 130, 132, 136	02/05/2014	FS

	/S.K./ Primary Examiner.Art Unit 2857

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	**Art Unit**
	FELIX SUAREZ	2865

CPC		
Symbol	**Type**	**Version**

CPC Combination Sets				
Symbol	**Type**	**Set**	**Ranking**	**Version**

/FELIX SUAREZ/ Examiner.Art Unit 2865	02/05/2014	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/SUJOY KUNDU/ Supervisory Patent Examiner.Art Unit 2862	02/07/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	**Art Unit**
	FELIX SUAREZ	2865

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION														
CLASS	SUBCLASS	CLAIMED									NON-CLAIMED					
702	60	G	0	1	R	19 / 02 (2006.01.01)										
CROSS REFERENCE(S)		G	0	1	K	3 / 02 (2006.01.01)										
		G	0	1	K	3 / 04 (2006.01.01)										
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)	G	0	1	K	13 / 10 (2006.01.01)										
702	130	132	136													

/FELIX SUAREZ/ Examiner.Art Unit 2865	02/05/2014	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/SUJOY KUNDU/ Supervisory Patent Examiner.Art Unit 2862	02/07/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	**Art Unit**
	FELIX SUAREZ	2865

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	17	17												
2	2	18	18												
3	3	19	19												
4	4	20	20												
5	5														
6	6														
7	7														
8	8														
9	9														
10	10														
11	11														
12	12														
13	13														
14	14														
15	15														
16	16														

/FELIX SUAREZ/ Examiner.Art Unit 2865	02/05/2014	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/SUJOY KUNDU/ Supervisory Patent Examiner.Art Unit 2862	02/07/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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BIB DATA SHEET

CONFIRMATION NO. 1676

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/776,159	05/07/2010 RULE	702	2865	10022/1726

APPLICANTS

INVENTORS

Jay Hedley, Arlington, VA;
Boris Tsypin, Chicago, IL;
Deepak Raghu, Gurgaon, INDIA;

**** CONTINUING DATA ***************************

This appln claims benefit of 61/176,855 05/08/2009
and claims benefit of 61/176,790 05/08/2009

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

05/17/2010

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and Acknowledged /SUJOY K KUNDU/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		VA	35	20	4

ADDRESS

BGL/Accenture - Chicago
BRINKS GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610
UNITED STATES

TITLE

BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

FILING FEE RECEIVED		
1740	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12776159	HEDLEY ET AL.
	Examiner	**Art Unit**
	SUJOY KUNDU	2857

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2012	08/14/2012	10/23/2012	04/03/2013	06/17/2013	02/05/2014			
1	1	✓	✓	✓	✓	✓	=			
2	2	✓	✓	✓	✓	✓	=			
3	3	✓	✓	✓	✓	✓	=			
4	4	✓	✓	✓	✓	✓	=			
5	5	✓	✓	✓	✓	✓	=			
6	6	✓	✓	✓	✓	=	=			
7	7	✓	✓	✓	✓	=	=			
8	8	✓	✓	✓	✓	=	=			
9	9	✓	✓	✓	✓	=	=			
10	10	✓	✓	✓	✓	=	=			
11	11	✓	✓	✓	✓	✓	=			
12	12	✓	✓	✓	✓	✓	=			
13	13	✓	✓	✓	✓	✓	=			
14	14	✓	✓	✓	✓	✓	=			
15	15	✓	✓	✓	✓	✓	=			
16	16	✓	✓	✓	✓	=	=			
17	17	✓	✓	✓	✓	=	=			
18	18	✓	✓	✓	✓	=	=			
19	19	✓	✓	✓	✓	=	=			
20	20	✓	✓	✓	✓	=	=			

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS on the below date:

Date: February 24, 2014 Name: Edward Machado Reg. No. 58,372 Signature: /Edward Machado/

BRINKS GILSON & LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Felix E Suarez
Filed:	May 7, 2010	Art Unit:	2865
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Confirmation No.:	1676
Attorney Docket No:	10022-01726 (D08-138/02045-00-US)		

FOURTH SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

In accordance with the duty of disclosure, Applicant(s) hereby cites the following references:

US PATENT REFERENCES

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	NAME
	E1	2007063059A1	Mar-2007	VOTAW
	E2	2007143045A1	Jun-2007	MACGREGOR

OTHER ART – NON PATENT LITERATURE DOCUMENTS

EXAMINER INITIAL		Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.
	E3	Ahmed Safwat: "CHAPTER IV BalancePoint Temperature and the Evaluation of the Building's Thermal Performance Introduction",, 1 January 1999 (1999-01-01), XP055091120, pages 102-111
	E4	DRURY B CRAWLEY ET AL: "EnergyPlus: A New-Generation Building Energy Simulation Program", PROCEEDINGS OF RENEWABLE AND ADVANCED ENERGY SYSTEMS FOR THE 21TH CENTURY, 4 November 1999 (1999-11-04), XP055091318, Abstract and pages 4-13
	E5	Tom Stroozas: "THE BALANCE POINT ISSUE 'Simultaneous Heating & Cooling of Kitchens'", COOKING FOR PROFIT, 15 August 2006 (2006-08-15), XP055091320, pages 4 and 6
	E6	RAFFIO G ET AL: "Targeting residential energy assistance", 1 January 2007 (2007-01-01). PROCEEDINGS OF THE ENERGY SUSTAINABILITY CONFERENCE,, PAGE(S) 489 - 495. XP009174735, ISBN: 978-0-7918-4797-7, pages 489-495
	E7	Extended European Search Report for European Patent Application 10 772 910.5-1238, Mailed December 16, 2013

1. PRIORITY INFORMATION:

☐ This application claims priority under 35 USC §120 to the following United States patent application(s):. In accordance with 37 CFR §1.98(d), copies of the references cited herein which were submitted to, or cited by, the office, in compliance with 37 CFR §1.98(a)-(c) in the earlier application are not provided herewith. The Examiner is directed to those references cited in all Information Disclosure Statements filed in the priority United States patent application(s) cited above in addition to the references cited herein.

2. CERTIFICATIONS: (CHECK ALL THAT APPLY)

☐ For purposes of 37 CFR §1.704(d)(i), Applicant hereby certifies that each item of information contained in this Information Disclosure Statement was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and that this communication was not received by any individual designated in 37 CFR §1.56(c) more than thirty days prior to the filing of this Information Disclosure Statement.

☐ For purposes of 37 CFR §1.704(d)(ii), Applicant hereby certifies that each item of information contained in this Information Disclosure Statement is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and that this communication was not received by any individual designated in 37 CFR §1.56(c) more than thirty days prior to the filing of this Information Disclosure Statement.

☒ Applicant hereby certifies pursuant to 37 CFR §1.97(e)(1) that each item of information in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement.

☐ Applicant hereby certifies pursuant to 37 CFR §1.97(e)(2) that no item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the undersigned after making reasonable inquiry, no item of information contained in this Statement was known to any individual designated in 37 CFR §1.56(c), more than three months prior to the filing of this Information Disclosure Statement.

3. FEE INFORMATION: (CHECK IF FEE REQUIRED)

☒ Applicant has calculated a processing fee in the amount of $180.00 to be due under 37 CFR §1.17(p) in connection with the filing of this Information Disclosure Statement. Applicant authorizes charging the fee to Deposit Account 23-1925.

☒ The Director is hereby authorized to charge any fee deficiency associated with the filing of this Information Disclosure Statement to Deposit Account 23-1925.

This application is related to the following United States patent application(s): 12/814,311, filed June 11, 2010. The Examiner is directed to any Office Actions issued in the related application(s) and the references cited therein, and any Information Disclosure Statements submitted in the related application(s).

Pursuant to the undersigned attorney's obligation and duties under 37 CFR §§ 1.56 and 1.98(a)(3) and (c), either English language abstracts, partial translations, or full translations are included for patent documents which are not in English for the express purpose of providing a concise explanation of the references to the Patent and Trademark Office with the opportunity to evaluate the same. Applicant respectfully requests the Examiner's consideration of the above reference(s) and entry thereof into the record of this application.

By submitting this Statement, Applicant is attempting to fully comply with the duty of candor and good faith mandated by 37 CFR §1.56. As such, this Statement is not intended to constitute an admission that any of the enclosed references, or other information referred to therein, constitutes "prior art" or is otherwise "material to patentability," as that phrase is defined in 37 CFR §1.56(a).

Respectfully submitted,

February 24, 2014
Date

/Edward Machado/
Edward Machado (Reg. No. 58,372)

Electronic Patent Application Fee Transmittal

Application Number:	12776159
Filing Date:	07-May-2010
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Filer:	Edward Machado
Attorney Docket Number:	10022/1726

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt

EFS ID:	18276867
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	Edward Machado/Dunia Gomez
Filer Authorized By:	Edward Machado
Attorney Docket Number:	10022/1726
Receipt Date:	24-FEB-2014
Filing Date:	07-MAY-2010
Time Stamp:	13:15:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$180
RAM confirmation Number	12118
Deposit Account	231925
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	10022-1726_Transmittal_February_24__2014.pdf	80822 b1c2bac81483081ad0b7ec9a977ead953c513ed1	no	1
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	10022-1726_IDS_February_24__2014.pdf	113458 b36dfc815c33444be4560fb545dc9674d57e7489	no	3
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Non Patent Literature	Safwat.pdf	4824910 ae4dc78cbd0413b4a82801487306ccb3724b9c63	no	34
Warnings:					
Information:					
4	Non Patent Literature	CRAWLEY.pdf	3473491 92bd0617cc005a56d4ff13573a879d926a11ecc7	no	17
Warnings:					
Information:					
5	Non Patent Literature	Stroozas.pdf	1066985 6e13b765ae7b9907cc27c6c85959e62367fc8469	no	4
Warnings:					
Information:					
6	Non Patent Literature	RAFFIO.pdf	2116559 3c346cf1affbbb9d2dd4ce4e126ee6810a01e0b7	no	7
Warnings:					
Information:					
7	Non Patent Literature	EESR_EU_10772910_5-1238__Mailed_December_16__2013_out.pdf	1012905 da9ec62dbc12fc70d5ed3764a0053e4c9ec490fc	no	8
Warnings:					
Information:					

8	Fee Worksheet (SB06)	fee-info.pdf	30386 58c2d1c9ceeaaf11a74eb087795befa71ed2cbda	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	12719516	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: February 24, 2014 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

BRINKS HOFER GILSON &LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Felix E Suarez
Filed:	May 7, 2010	Art Unit:	2865
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.:	10022-01726 (D08-138/02045-00-US)		

TRANSMITTAL

MailStop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Information Disclosure Statement.

Fee calculation:

☐ No additional fee is required.

☐ Small Entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR § 1.17(_____).

☐ An additional filing fee has been calculated as shown below:

						Small Entity			Not a Small Entity	
	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra		Rate	Add'l Fee	OR	Rate	Add'l Fee
Total		Minus				x $31=			x $62=	
Indep.		Minus				x 125=			x $250=	
First Presentation of Multiple Dep. Claim						+$230=			+ $460=	
						Total	$		Total	$

Fee payment:

☒ Please charge Deposit Account No. 23-1925 in the amount of $180 for Information Disclosure Statement.

☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).
WARNING: Information on this form may become public. **Credit card information should not be included on this form.**

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

February 24, 2014
Date

/Edward Machado/
Edward Machado (Reg. No. 58,372)

BRINKS HOFER GILSON & LIONE
NBC Tower – Suite 3600, 455 N. Cityfront Plaza Drive, Chicago, IL 60611-5599

BRINKS HOFER GILSON &LIONE

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS on the below date:

Date: February 24, 2014 Name: Edward Machado Reg. No. 58,372 Signature: /Edward Machado/

BRINKS GILSON & LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley et al.		
Appln. No.:	12/776,159	Examiner:	Felix E Suarez
Filed:	May 7, 2010	Art Unit:	2865
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Confirmation No.:	1676
Attorney Docket No:	10022-01726 (D08-138/02045-00-US)		

FOURTH SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

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US PATENT REFERENCES

EXAMINER INITIAL		DOCUMENT NUMBER Number-Kind Code (if known)	DATE	NAME
	E1	2007063059A1	Mar-2007	VOTAW
	E2	2007143045A1	Jun-2007	MACGREGOR

OTHER ART – NON PATENT LITERATURE DOCUMENTS

EXAMINER INITIAL		Include name of author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.
	E3	Ahmed Safwat: "CHAPTER IV BalancePoint Temperature and the Evaluation of the Building's Thermal Performance Introduction",, 1 January 1999 (1999-01-01), XP055091120, pages 102-111
	E4	DRURY B CRAWLEY ET AL: "EnergyPlus: A New-Generation Building Energy Simulation Program", PROCEEDINGS OF RENEWABLE AND ADVANCED ENERGY SYSTEMS FOR THE 21TH CENTURY, 4 November 1999 (1999-11-04), XP055091318, Abstract and pages 4-13
	E5	Tom Stroozas: "THE BALANCE POINT ISSUE 'Simultaneous Heating & Cooling of Kitchens'", COOKING FOR PROFIT, 15 August 2006 (2006-08-15), XP055091320, pages 4 and 6
	E6	RAFFIO G ET AL: "Targeting residential energy assistance", 1 January 2007 (2007-01-01). PROCEEDINGS OF THE ENERGY SUSTAINABILITY CONFERENCE,, PAGE(S) 489 - 495. XP009174735, ISBN: 978-0-7918-4797-7, pages 489-495
	E7	Extended European Search Report for European Patent Application 10 772 910.5-1238, Mailed December 16, 2013

/Felix Suarez/ 04/16/2014

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /F.S./

1. PRIORITY INFORMATION:

☐ This application claims priority under 35 USC §120 to the following United States patent application(s):. In accordance with 37 CFR §1.98(d), copies of the references cited herein which were submitted to, or cited by, the office, in compliance with 37 CFR §1.98(a)-(c) in the earlier application are not provided herewith. The Examiner is directed to those references cited in all Information Disclosure Statements filed in the priority United States patent application(s) cited above in addition to the references cited herein.

2. CERTIFICATIONS: (CHECK ALL THAT APPLY)

☐ For purposes of 37 CFR §1.704(d)(i), Applicant hereby certifies that each item of information contained in this Information Disclosure Statement was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and that this communication was not received by any individual designated in 37 CFR §1.56(c) more than thirty days prior to the filing of this Information Disclosure Statement.

☐ For purposes of 37 CFR §1.704(d)(ii), Applicant hereby certifies that each item of information contained in this Information Disclosure Statement is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and that this communication was not received by any individual designated in 37 CFR §1.56(c) more than thirty days prior to the filing of this Information Disclosure Statement.

☒ Applicant hereby certifies pursuant to 37 CFR §1.97(e)(1) that each item of information in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement.

☐ Applicant hereby certifies pursuant to 37 CFR §1.97(e)(2) that no item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the undersigned after making reasonable inquiry, no item of information contained in this Statement was known to any individual designated in 37 CFR §1.56(c), more than three months prior to the filing of this Information Disclosure Statement.

3. FEE INFORMATION: (CHECK IF FEE REQUIRED)

☒ Applicant has calculated a processing fee in the amount of $180.00 to be due under 37 CFR §1.17(p) in connection with the filing of this Information Disclosure Statement. Applicant authorizes charging the fee to Deposit Account 23-1925.

☒ The Director is hereby authorized to charge any fee deficiency associated with the filing of this Information Disclosure Statement to Deposit Account 23-1925.

This application is related to the following United States patent application(s): 12/814,311, filed June 11, 2010. The Examiner is directed to any Office Actions issued in the related application(s) and the references cited therein, and any Information Disclosure Statements submitted in the related application(s).

Pursuant to the undersigned attorney's obligation and duties under 37 CFR §§ 1.56 and 1.98(a)(3) and (c), either English language abstracts, partial translations, or full translations are included for patent documents which are not in English for the express purpose of providing a concise explanation of the references to the Patent and Trademark Office with the opportunity to evaluate the same. Applicant respectfully requests the Examiner's consideration of the above reference(s) and entry thereof into the record of this application.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /F.S./

By submitting this Statement, Applicant is attempting to fully comply with the duty of candor and good faith mandated by 37 CFR §1.56. As such, this Statement is not intended to constitute an admission that any of the enclosed references, or other information referred to therein, constitutes "prior art" or is otherwise "material to patentability," as that phrase is defined in 37 CFR §1.56(a).

Respectfully submitted,

February 24, 2014
Date

/Edward Machado/
Edward Machado (Reg. No. 58,372)

04/16/2014

/Felix Suarez/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/776,159	05/07/2010	Jay Hedley	10022/1726	1676

28164 7590 04/24/2014

BGL/Accenture - Chicago
BRINKS GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

EXAMINER	
SUAREZ, FELIX E	

ART UNIT	PAPER NUMBER
2865	

MAIL DATE	DELIVERY MODE
04/24/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES DEPARTMENT OF COMMERCE
U.S. Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
12/776,159	07 May, 2010	HEDLEY ET AL.	10022/1726

BGL/Accenture - Chicago
BRINKS GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

EXAMINER	
FELIX SUAREZ	
ART UNIT	PAPER
2865	20140416

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

SUPPLEMENTAL ACTION
Information Disclosure Statement (IDS)
1. The reference listed in the Information Disclosure Statement (IDS) filed on 02/24/2014, has been considered by the Examiner (see attached PTO 1449 initialized).
Conclusion
2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Felix Suarez, whose telephone number is (571) 272-2223. The examiner can normally be reached on weekdays from 8:30 a.m. to 5:00 p.m.
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sujoy K. Kundu can be reached on (571) 272-8586. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300 for regular communications and for After Final communications.
April 16, 2014

/Felix E Suarez/
Examiner, Art Unit 2865

/SUJOY KUNDU/ Supervisory Patent Examiner, Art Unit 2862	/FELIX SUAREZ/ Examiner, Art Unit 2865

PTO-90C (Rev.04-03)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

28164 7590 02/18/2014
BGL/Accenture - Chicago
BRINKS GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Patent and Trademark Office via EFS transmission on the date indicated below.

Edward Machado, Reg. No. 58, 372	(Depositor's name)
/Edward Machado/	(Signature)
May 8, 2014	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/776,159	05/07/2010	Jay Hedley	10022/1726	1676

TITLE OF INVENTION: BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	05/19/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
SUAREZ, FELIX E	2865	702-060000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 Brinks Gilson & Lione
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: ACCENTURE GLOBAL SERVICES LIMITED

(B) RESIDENCE: (CITY and STATE OR COUNTRY): DUBLIN, IRELAND

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 23-1925 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
☐ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
☐ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Edward Machado/ Date May 8, 2014
Typed or printed name Edward Machado Registration No. 58,372

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

WILLOW TECH. EX. 1005
Page 712

Electronic Patent Application Fee Transmittal

Application Number:	12776159
Filing Date:	07-May-2010
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Filer:	Edward Machado/Nancy Tarwater
Attorney Docket Number:	10022/1726

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	960	960
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**960**

Electronic Acknowledgement Receipt	
EFS ID:	18977104
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	Edward Machado/Maggie Pieczonka
Filer Authorized By:	Edward Machado
Attorney Docket Number:	10022/1726
Receipt Date:	08-MAY-2014
Filing Date:	07-MAY-2010
Time Stamp:	14:02:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$960
RAM confirmation Number	224
Deposit Account	231925
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees) Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees) Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10022-1726IssueFee.pdf	102648 b76b29178f629a2c012f5da6be9cca9390511a48	yes	2

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Transmittal Letter	1	1
Issue Fee Payment (PTO-85B)	2	2

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30182 155157faece59563a3c14bdefbc474b5048c63a1	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	132830		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: May 8, 2014 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

BRINKS GILSON & LIONE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley		
Appln. No.:	12/776,159	Examiner:	Felix E Suarez
Filed:	May 7, 2010	Art Unit:	2865
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.:	10022-1726		

TRANSMITTAL

Mail Stop Issue Fee
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Part B - Fee(s) Transmittal.

Fee calculation:

☐ No additional fee is required.

☐ Per 37 CFR §1.27, ☐ Applicant is small entity ☐ Applicant is micro entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR § 1.17(_____).

☐ An additional filing fee has been calculated as shown below:

					Fee		Small Entity Fee		Micro Entity Fee	
	Claims Remaining After Amendment		Highest No. Previously Paid	Present Extra	Rate	Add'l Fee	Rate	Add'l Fee	Rate	Add'l Fee
Total		Minus			x $ 80 =	$	x $ 40 =	$	x $20 =	$
Independent		Minus			x $420 =	$	x $210 =	$	x $105 =	$
First Presentation of Multiple Dep. Claim					+ $780 =	$	+ $390 =	$	+ $195 =	$
					Total	$	Total	$	Total	$

Fee payment:

☒ Please charge Deposit Account No. 23-1925 in the amount of $960 for issue fee.

☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).
WARNING: Information on this form may become public. **Credit card information should not be included on this form.**

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

May 8, 2014
Date

/Edward Machado/
Edward Machado (Reg. No. 58,372)

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/776,159	06/17/2014	8756024	10022/1726	1676

28164 7590 05/28/2014

BGL/Accenture - Chicago
BRINKS GILSON & LIONE
P O BOX 10395
CHICAGO, IL 60610

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 597 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Jay Hedley, Arlington, VA;
Boris Tsypin, Chicago, IL;
Deepak Raghu, Gurgaon, INDIA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

CERTIFICATE OF EFS FILING UNDER 37 CFR §1.8

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office, Commissioner for Patents, via the EFS pursuant to 37 CFR §1.8 on the below date:

Date: June 25, 2014 Name: Edward Machado, Reg. No. 58,372 Signature: /Edward Machado/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley	
Appln. No.:	12/776,159	Examiner: Felix E Suarez
Filed:	May 7, 2010	Art Unit: 2865
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.: 1676

Attorney Docket No.: 10022-1726

NOTICE OF POSSIBLE ERROR IN PATENT TERM ADJUSTMENT

MAIL STOP PATENT EXT.
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

We believe there may be an error in the patent term adjustment calculated by the U.S. Patent and Trademark Office for the above-referenced patent that extends the term of this patent by too many days. We believe the error may be due to an Information Disclosure Statement of June 12, 2013, not being taken into consideration in the patent term adjustment calculation. This is not a request for reconsideration of patent term adjustment pursuant to 37 CFR §1.705(d), and no fee is being submitted herewith. Please make this Notice part of the permanent record for this patent.

Respectfully submitted,

Date: June 25, 2014

/Edward Machado/
Edward Machado, Reg. No. 58,372
Attorney for Applicant

BRINKS GILSON & LIONE
PO Box 10395
Chicago, IL 60610
312-321-4200

Electronic Acknowledgement Receipt

EFS ID:	19411339
Application Number:	12776159
International Application Number:	
Confirmation Number:	1676
Title of Invention:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM
First Named Inventor/Applicant Name:	Jay Hedley
Customer Number:	28164
Filer:	Edward Machado/Jesus Rodriguez
Filer Authorized By:	Edward Machado
Attorney Docket Number:	10022/1726
Receipt Date:	25-JUN-2014
Filing Date:	07-MAY-2010
Time Stamp:	17:49:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10022-1726-NoticePossPTAError.pdf	61128 b583d417f6643d2855cd4be6208fa4025aaf6cf4	yes	2

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Miscellaneous Incoming Letter	2	2
Warnings:			
Information:			
	Total Files Size (in bytes):	61128	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

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<u>New International Application Filed with the USPTO as a Receiving Office</u>
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Appln. of:	Jay Hedley		
Appln. No.:	12/776,159	Examiner:	Felix E Suarez
Filed:	May 7, 2010	Art Unit:	2865
For:	BUILDING ENERGY CONSUMPTION ANALYSIS SYSTEM	Conf. No.:	1676
Attorney Docket No.:	10022-1726		

TRANSMITTAL

Mail Stop Patent Ext.
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached is/are:

☒ Notice of Possible Error in Patent Term Adjustment.

Fee calculation:

☒ No additional fee is required.

☐ Small Entity.

☐ An extension fee in an amount of $_____ for a _____-month extension of time under 37 CFR § 1.136(a).

☐ A petition or processing fee in an amount of $_____ under 37 CFR § 1.17(_____).

☐ An additional filing fee has been calculated as shown below:

					Small Entity			Not a Small Entity	
	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra	Rate	Add'l Fee	OR	Rate	Add'l Fee
Total		Minus			x $30=			x $60=	
Indep.		Minus			x 125=			x $250=	
First Presentation of Multiple Dep. Claim					+$225=			+ $450=	
					Total	$		Total	$

Fee payment:

☐ Please charge Deposit Account No. 23-1925 in the amount of $_____ for _____.

☐ Payment by credit card in the amount of $_____ (Form PTO-2038 is attached).

☒ The Director is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this paper (including any extension fee required to ensure that this paper is timely filed), or to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

June 25, 2014
Date

/Edward Machado/
Edward Machado (Reg. No. 58,372)

BRINKS GILSON & LIONE
NBC Tower – Suite 3600, 455 N. Cityfront Plaza Drive, Chicago, IL 60611-5599