

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	J. Carl Cooper	Attorney Docket No. 58936-0002IP2
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Title:	POWER SOURCE LOAD CONTROL	

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**PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT
NO. 11,967,857 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42**

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EXHIBITS

EX1001	U.S. Patent No. 11,967,857 to Cooper (“the ’857 Patent”)
EX1002	Excerpts from the Prosecution History of the ’857 Patent
EX1003	Declaration and Curriculum Vitae of Dr. Steven Leeb
EX1004	Complaint, <i>PSLC LLC v. Generac Power Systems, Inc.</i> , 2:24-cv-01270-SCD filed October 7, 2024
EX1005	U.S. Patent Appl. No. 2006/0208574 (“Lasseter”)
EX1006	Rashad M. Kamel & B. Kermanshahi, <i>Enhancement of Micro-Grid Dynamic Performance Subsequent to Islanding Process Using Storage Batteries</i> , 34 IRAN. J. SCI. TECH. 605 (Dec. 2010)
EX1007	Alexander Kusko & Marc T. Thompson, POWER QUALITY IN ELECTRICAL SYSTEMS (2007)
EX1008	U.S. Patent No. 8,410,633 (“Batzler”)
EX1009	U.S. Patent No. 7,149,605 (“Chassin”)
EX1010	Declaration and Curriculum Vitae of June Ann Munford
EX1011	J.A. Peças Lopes et al., <i>Defining Control Strategies for MicroGrids Islanded Operation</i> , 21 IEEE TRANSACTIONS POWER SYSTEMS 916 (May 2006)
EX1012	A.G. Madureira & J.A. Peças Lopes, <i>Coordinated Voltage Support in Distribution Networks with Distributed Generation and Microgrids</i> , 3 IET RENEWABLE POWER GENERATION 439 (2009)
EX1013	Netra Gyawali & Yasuharu Ohsawa, <i>Improved Power Sharing Scheme for a Microgrid with Multiple Distributed Generators</i> , 128 IEEE TRANSACTIONS ON ELECS., INFO. & SYSTEMS 1635 (2008)

- EX1014 Rashad M. Kamel, Aymen Chaouachi & Ken Nagasaka, *Effect of Wind Generation System Rating on Transient Dynamic Performance of the Micro-Grid During Islanding Mode*, 1 LOW CARBON ECON. 29 (2010)
- EX1015 Robert Lasseter, *Providing Premium Power Through Distributed Resources*, PROCS. 33RD HAWAII INT’L CONF. SYS. SCIS. (2000)
- EX1016 R. H. Lasseter, *Smart Distribution: Coupled Microgrids*, 99 PROCS. IEEE 1074 (June 2011)
- EX1017 Nosh K. Medora et al., *Impact of Line Voltage Sag on Switch Mode Power Supply Operation*, 2008 3RD IEEE CONFERENCE ON INDUSTRIAL ELECTRONICS AND APPLICATIONS (July 2008)
- EX1018 Reserved
- EX1019 R.P. Rodrigues & P.M. Silveira, *A Survey of Techniques Applied to Non-stationary Waveforms in Electrical Power Systems*, IEEE PROCEEDINGS OF THE 14TH INTERNATIONAL CONFERENCE ON HARMONICS AND QUALITY OF POWER (Jan. 2010)
- EX1020 U.S. Patent Appl. No. 2004/0051387
- EX1021 U.S. Patent Publ. No. 2010/0019574 (“Baldassarre”)
- EX1022 Paul Sherz, PRACTICAL ELECTRONICS FOR INVENTORS (2000)
- EX1023 U.S. Patent Publ. No. 2007/0222294 (“Tsukida”)
- EX1024 U.S. Patent No. 8,204,632
- EX1025 U.S. Patent No. 7,356,422
- EX1026 U.S. Patent No. 7,274,975 (“Miller”)
- EX1027 U.S. Patent No. 6,314,378
- EX1028 Robert Lasseter et al., *White Paper on Integration of Distributed Energy Resources*, CONSORTIUM FOR ELECTRIC RELIABILITY

TECHNOLOGY SOLUTIONS (Apr. 2002)

- EX1029 Robert Lasseter & Pablo Piagi, *Microgrid: A Conceptual Solution*, PESCE' AACHEN, GERMANY (June 25, 2004)
- EX1030 STANDARD FOR EMERGENCY AND STANDBY POWER SYSTEMS, NFPA® 110 (2010 ed.)

CONVENTIONS OF THE PETITION

- All emphases are added unless noted otherwise;
- Bold-italic emphases correlate to claim language;
- Quotations are generally from exhibits, not claim language; and
- The phrase “*supra*” and equivalent phrases incorporate fully the analysis of the cross-cited portion of the Petition.

Generac Power Systems, Inc. petitions for IPR of claims 17-38 (“the Challenged Claims”) of the ’857 Patent based on the grounds in this Petition.

I. REQUIREMENTS FOR IPR

A. Standing

Petitioner certifies that the ’857 patent is available for IPR, and that Petitioner is not barred or estopped from requesting IPR.

B. Challenge and Relief Requested

Generac requests IPR of the Challenged Claims on the below grounds. Dr. Steven Leeb provides supporting testimony in his Declaration. EX1003, ¶¶1-378.

Ground	Claim(s)	§103 Basis
1A	17-23, 25, and 27-38	Lasseter-Lopes
1B	24 and 26	Lasseter-Lopes-Baldassarre
1C	35-36	Lasseter-Lopes-Tsukida

The references predate May 26, 2011, qualifying as prior art. Petitioner reserves the right to challenge the patent’s priority.

Reference	Date	Pre-AIA Section
Lasseter (EX1005)	9/21/2006 (published)	102(a)/(b)/(e)(1)
Lopes (EX1011)	5/31/2006 (published)	102(a)/(b)
Baldassarre	1/28/2010	102(a)/(b)/(e)(1)

Reference	Date	Pre-AIA Section
(EX1021)	(published)	
Tsukida (EX1023)	9/27/2007 (published)	102(a)/(b)/(e)(1)

The Lopes article published May 2006, being cataloged in Penn State University Library's subject-matter searchable public catalog such that an interested POSITA could have found Lopes as of 5/31/2006. EX1011, 1; EX1010, ¶¶19-22. POSITA contemporaneously found Lopes. *See* EX1012, 2, 4 ("©...2009") (citing EX1011); EX1013, 1-2 ("© 2008") (citing EX1011); EX1014, 1-2 ("© 2010") (citing EX1011).

C. Claim Construction

Unless stated otherwise or expressly defined plain meaning is applied. However, the Challenged Claims are obvious under any reasonable *Phillips* interpretation. Petitioner reserves the right to address any subsequent issues of claim interpretation that arise in any proceeding.

"Overload" is expressly defined as "a load that if not disconnected or otherwise prevented will either cause a departure from specifications for the power output from the power source, for example such as a deviation of AC power voltage or frequency for longer than a specified time period, a loss of power such as from a tripped circuit breaker, or damage such as overheating or exceeding mechanical

stress limits.” EX1001, 7:55-62.

“Parameter” is expressly defined as “a quantity of one or more property or attribute (e.g. of a device, physical property, substance or environment) which is treated as a constant.” EX1001, 10:11-20. “A parameter may at times change or be adjusted.” *Id.* “Examples of parameters of interest herein include various horsepower, mechanical load, temperature, pressure (including altitude), humidity, power, wattage, voltage, current, including maximums, minimums, safe, starting, limited, instant, real time, near real time and timely.” *Id.*

“Timely” is expressly defined as “instant, real time, close to real time or a suitable time.” EX1001, 25:60-66.

“Know” and “known” are expressly defined as “to have been previously stored in a memory and available e.g. having been previously manufactured with, programmed with or measured.” EX1001, 26:18-21.

D. Level of Ordinary Skill in the Art

POSITA of the ’857 Patent’s subject matter as of May 26, 2011, would have had at least a Bachelor’s degree in Electrical or Mechanical Engineering, or equivalent, and at least two-years’ experience in power electronics, power generation, or backup power generation engineering. Additional graduate education could substitute for work experience. EX1003, ¶¶24-28.

II. THE '857 PATENT

A. Brief Description

The '857 Patent discloses methods of controlling backup power sources. EX1001, Abstract. Specifically, it concerns controlling a backup power source's AC-power frequency "in response to the loading on the power source." *Id.*

Given a power source's loading, the system "can determine the amount of remaining power available from the power source," if any. *Id.* If inadequate power remains—*i.e.*, if the power source is (or is about to be) overloaded—the claimed system can alter its frequency. *Id.*

B. Prosecution History

The Examiner allowed the '857 Patent because he believed the prior art did not teach:

the power source operating in such a manner so as to control the frequency of the output AC power to have a first frequency when the power source is not overloaded and a second frequency when the power source is overloaded or near to being overloaded *in addition to a processor circuit operating in response to the occurrence of the second frequency to control the amount of AC output power consumed by at least one load.*

EX1002, 40-41. But this Petition shows such processor circuits were part of the prior art. The Challenged Claims are obvious—this would have been apparent if the Examiner had the prior art presented below. EX1003, ¶¶40-49.

III. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. [GROUND 1A] – Claims 17-23, 25, And 27-38 Are Obvious Over Lasseter-Lopes

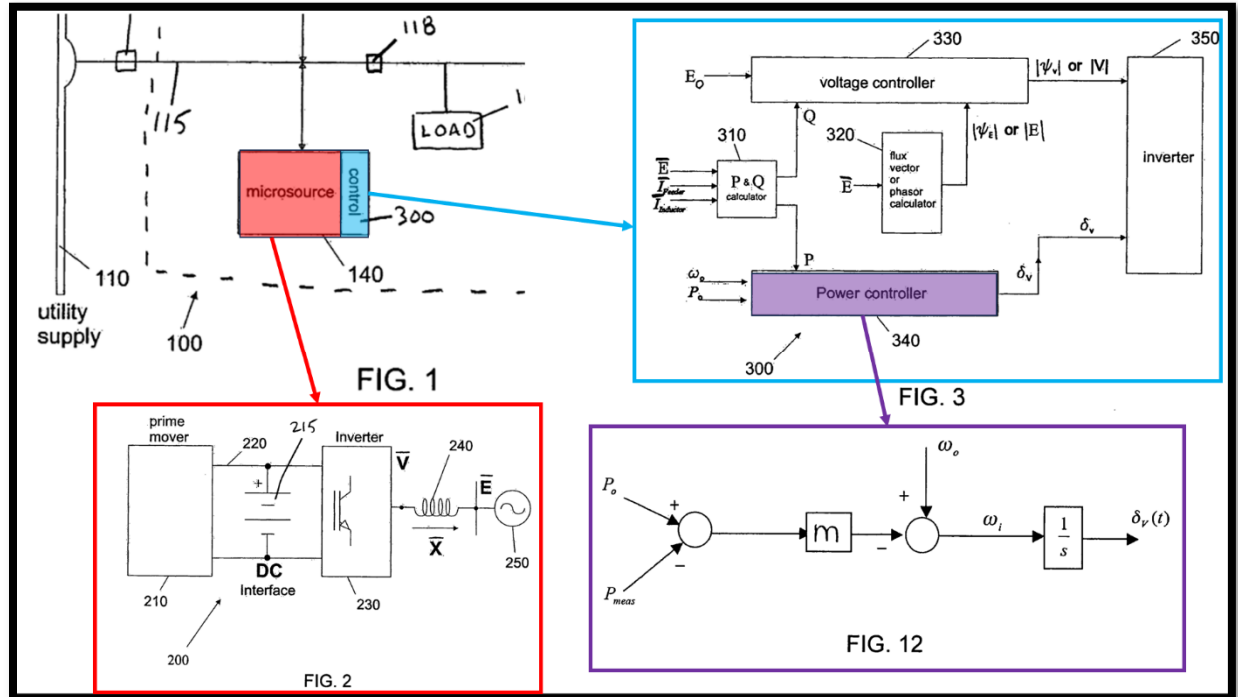
1. Lasseter (EX1005)

Lasseter concerns “distributed energy resource system[s].” EX1005, Abstract. “[D]istributed energy resources (DER)” are “independent power generation and storage systems which may be owned by, and located near, consumers of electrical power.” *Id.*, ¶[0006]. DERs “provide more reliable power...as a backup to the primary electrical supply.” *Id.*, ¶[0007]. DER power sources are called “microsources.” *Id.*, ¶[0009].

Lasseter discloses “controlling the instantaneous frequency and power from one or more microsources in ways that tend to ensure that the microsources stay within their normal operating ranges and otherwise operate effectively.” *Id.*, ¶[0058], ¶¶[0106]-[0142], ¶¶[0158]-[0171]; FIGS. 14-18, 25-29. These frequency-changing control schemes focus on “respon[ding] to events such as islanding or new loads.” *Id.* When loads demand additional power, microsource have “controllers that reduce the operating frequency of” microsources “to increase...unit output power.” *Id.*, Abstract, ¶[0110].

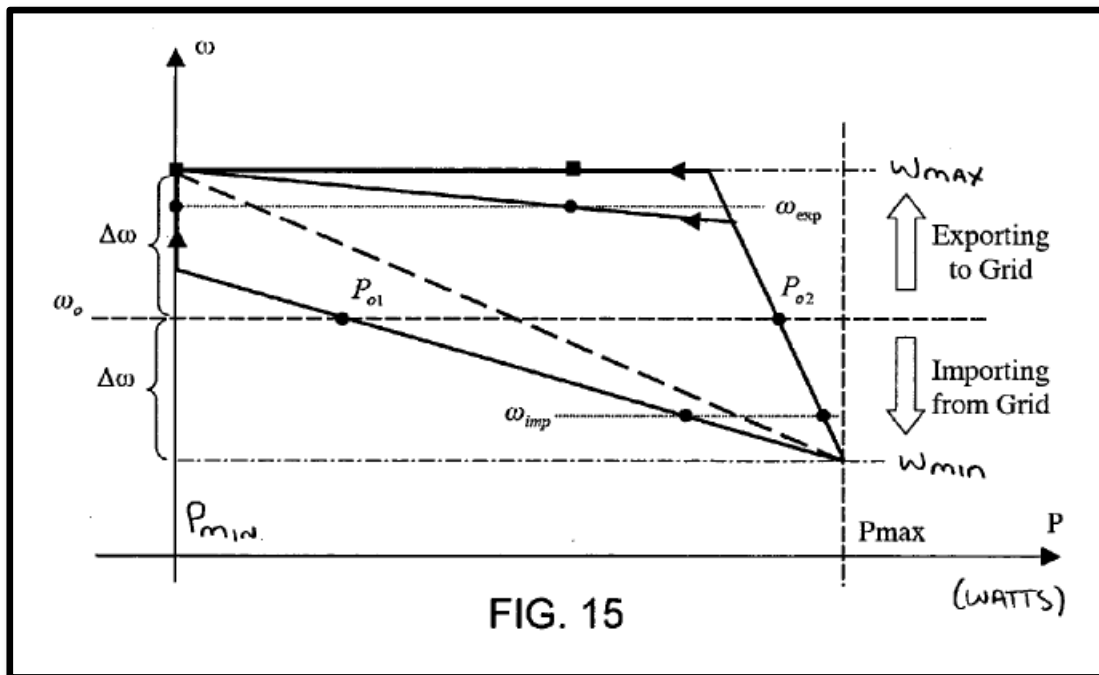
Lasseter’s “feeder lines **115**...interconnect microsource systems...and one or more loads.” *Id.*, ¶[0063], FIG. 1. “[F]eeder line 115, the interconnected microsource systems...and the one or more loads **160** can form a microgrid **117**.” *Id.* “FIG. 2 is

a diagram of an exemplary microsource **200** that can be used in a [DER] such as that of FIG. 1.” *Id.*, ¶[0070]. “FIG. 3 is a diagram of a controller **300** that can be used with a microsource such as that of FIG. 2...to control an inverter that regulates power flow from the microsource in a distributed energy resource system such as that of FIG. 1.” *Id.*, ¶[0074]. Controller **300** includes voltage controller **330** and power controller **340**. Voltage controller **330** controls “the magnitude of the inverter output voltage $|V|$,” as discussed for FIG. 5. *Id.*, ¶¶[0074]-[0076], ¶¶[0086]-[0090]. Power controller **340** “control[s] the instantaneous operating frequency ω_i of the inverter [350] by changing the operating phase angle of the inverter $\delta_v(t)$.” *Id.*, ¶¶[0074]-[0076], ¶[0107]. FIG. 12 depicts power controller **340**. *Id.*, ¶¶[0105]-[0107].



FIGS. 14-17 depict varying “unit power control” schemes power controllers

can implement to control microsources' frequency-power output. *Id.*, ¶[0105], ¶[0110]-[0141]. FIG. 15 depicts an example “relationship between steady state unit power vs. frequency (P- ω)...for two exemplary microsources.” *Id.*, ¶[0122]. They have different power-frequency slopes that depend on “power set point, P_0 and the maximum power output, $P_{\max}$, of that microsource.” *Id.*, ¶[0122]-[0132].



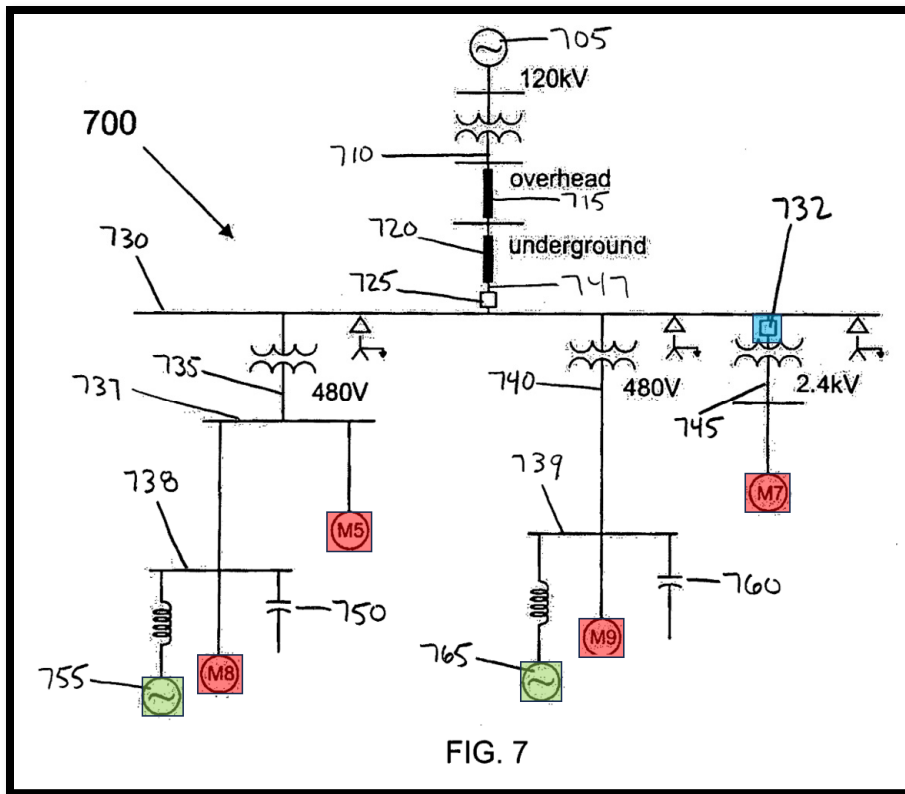
Power controller operates so that “operating characteristics for all the units converge at the point of maximum power and minimum frequency,” allowing “the power to increase more in the units that are less loaded (unit1) and increase less in the units that are more loaded (unit2).” EX1005, ¶[0117]-[0118]. Unlike natural frequency droop (e.g., EX1001, 6:28-43), Lasseter expressly controls frequency. EX1005, ¶[0012]; ¶[0015]-[0018], ¶[0057]-[0058].

Lasseter's disclosure focuses on situations where microsources can supply the connected loads in steady state, "assuming enough generation" to supply the loads or that total load is "smaller than sum of all generation." *Id.*, ¶[0137], ¶[0141]. The lines in FIGS. 14-17 representing the power-frequency relationship end at the minimum power, $P_{\min}$, and maximum power, $P_{\max}$. EX1003, ¶58. But "the minimum limit on frequency can be exceeded...if the limit on maximum power is also exceeded, *i.e.* there are more loads than generation." EX1005, ¶[0130]. This remains true for all unit-power schemes of FIGS. 14 and 17. *Id.*, ¶[0119], ¶[0141]. Lasseter's FIGS. 25(a)-25(b), implementing the power-frequency relationship of FIG. 17, also show power exceeding $P_{\max}$. *Id.*, FIGS. 25(a)-25(b) (power and frequency spike from D-E); EX1003, ¶58. $P_{\max}$ is a maximum rated power of the microsource, or at least it would have been obvious to set $P_{\max}$ as such—Lasseter teaches controlling power output between $P_{\min}$ and $P_{\max}$. EX1003, ¶58. Lasseter's reference confirms, calling $P_{\max}$ "the maximum rated power of the machine." EX1020, ¶[0112] (incorporated by reference into EX1005). Exceeding $P_{\max}$ is an "overload," per the '857 patent, because a load greater than $P_{\max}$ represents "a load" on the microsource that will "cause a departure from specifications for the power output from the source" in both a departure from the microsource's rated power specification ($P_{\min}$ - $P_{\max}$) and a departure below Lasseter's minimum-frequency specification. EX1003, ¶58. POSITA would have understood that operating a microsource beyond its maximum

rated power for long enough, if not stopped by a tripping a circuit breaker, causes damage to the microsource. EX1003, ¶58. Power is a function of voltage, current, and frequency. *Id.* (citing EX1022, 64).

$$P_{\text{ave}} = \text{Re}(VI^*) = |VI^*| \cos \phi$$

Lasseter, in certain embodiments, preemptively “disconnects” loads when it expects that “the combined power capacity of the microsources...is not adequate to supply the total load from loads.” EX1005, ¶[0099]. In one such embodiment, “the combined power capacity of the **microsources 755** and **765** is adequate to supply the combined load from **loads M5, M8, and M9**” but not **M7**. *Id.* “For this reason, when” the power system disconnects from the grid (during islanding), “**switch 732** can...open[] to disconnect...**load M7**.” *Id.*, FIG. 7.

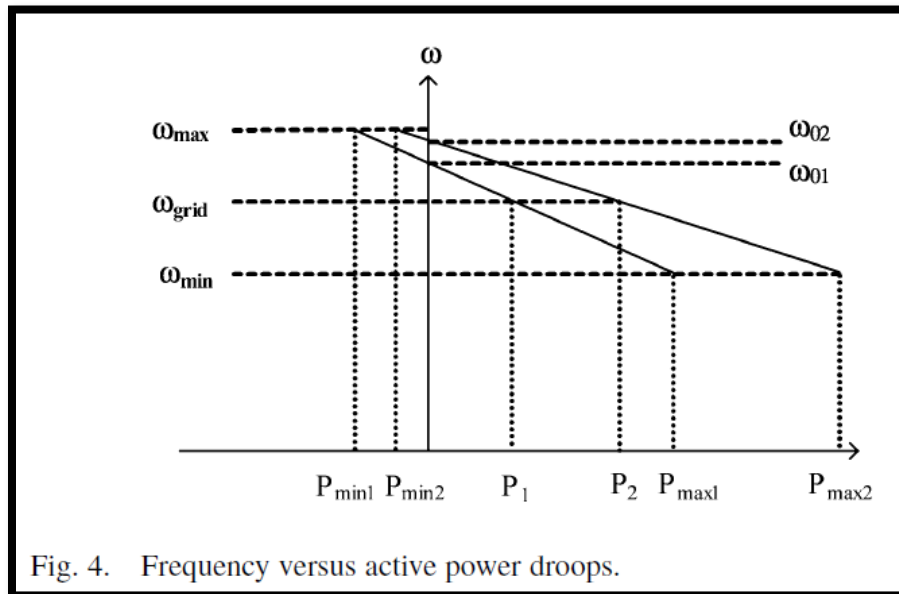


Thus, Lasseter acknowledges needing additional control strategies when load exceeds supply.

2. Lopes (EX1011)

Lopes concerns control strategies for islanded-DER operation with microsources like Lasseter's. EX1011, 1. Lopes "further developed" a "control scheme based on droop concepts to operate in terms of feeding a standalone ac system," a controlled-droop system similar to Lasseter. *Id.*, 8 (citing EX1015, an earlier Lasseter paper); EX1015 at 3, Fig 1, 6-7, FIGS. 8, 11-11-14. Like Lasseter, Lopes' inverters actively "control[] voltage and frequency on the ac system...through droops." EX1011, 3-4.

According to Lopes, DERs disconnecting from the grid “must have the ability to operate stably and autonomously.” EX1011, 1. Like Lasseter, as shown in Lopes’ Figure 4, Lopes’ microsources increase power generation by changing output frequency up to max-power outputs:



But when loads exceed generation, Lopes explains that there can be an “overload.” *Id.*, 4. “[H]igh imbalance between local load and generation may lead to large frequency deviations and transient overload of” inverters. *Id.*, 4. To address overloads, Lopes uses “load shedding strategies...to avoid large frequency and voltage excursions.” *Id.*, 2. “The amount of load to be shed is defined based on the amplitude of frequency deviation.” *Id.*, 5. Thus, Lopes advocates allowing “a temporary disconnection of less important loads...activated by under-frequency relays.” *Id.*, 6.

3. The Combination, Reasons to Combine, & Expectation of Success

Because POSITA would have recognized the benefit of combining Lasseter and Lopes—doing so would have been obvious. EX1003, ¶211, ¶¶69-83, ¶288. Indeed, according to the inventor (who prosecuted the '857 Patent), “such combinations of” power sources controlling AC frequency with load shedding systems “are readily apparent to the person of ordinary skill.” EX1002, 3; EX1016, 3, 5. Moreover, Lopes cites several microgrid-related-Lasseter papers. EX1015, EX1028, EX1029. As discussed, *supra* §III.A.1, Lasseter discloses methods of controlling power source frequency to alter output power in response to changing loads. While Lasseter addresses instances where microsources can fully supply steady-state power demanded by the connected loads, Lasseter acknowledges that “the combined power capacity of the microsources...is not” always “adequate to supply the total load.” *Id.*, ¶[0099]. Thus, Lasseter discloses a situation it does not explain how to address—where the combined generation capacity is insufficient to supply the potential total load. For the below reasons, it would have been obvious to supply generation capacity needed for expected steady-state operation of the connected loads and employ a responsive (rather than preemptive) load-shedding strategy, such as Lopes’, in Lasseter’s system to temporarily disconnect less important (e.g., non-critical) loads when necessary. EX1003, ¶¶71-72. Load shedding in response to frequency deviation was a well-known technique at the time.

Id. (citing EX1006, 7; EX1023, ¶¶[0002]-[0004]); EX1009, 8:63-9:41; EX1023, Abstract. POSITA would have further found it obvious to set the load-shedding threshold at or below Lasseter's minimum frequency, potentially allowing frequency deviation to the lower specified threshold as loading demands. EX1003, ¶¶71-72 (discussing how thresholds below minimum frequency/maximum power were common, citing EX1006, 7 and EX1005, FIG. 25(a); EX1023, ¶[0004]). POSITA would have been motivated to combine Lasseter with Lopes' frequency-deviation-load-shedding strategy for multiple reasons.

First, because Lasseter does not detail what to do when its microsources' generation capacity is inadequate to supply the total potential load, POSITA would have looked to Lopes and its responsive frequency-based load-shedding scheme for solutions. EX1003, ¶73. POSITA would have been motivated to apply responsive load shedding, as in Lopes, instead of providing excess generation capacity, which, as explained below, has drawbacks. Lopes explains, "[t]he key issue for successful MG islanded operation is the management of load shedding." EX1011, 7-8. POSITA would have further set the load-shedding threshold at or below Lasseter's minimum frequency to prevent overload or significant overload—including excursions beyond Lasseter's specified $P_{\max}$ —when the total load exceeds the available generation capacity. *Id.*; EX1003, ¶¶54-73. POSITA would have understood that thresholds below Lasseter's minimum frequency would beneficially

allow the system to operate through less significant excursions beyond $P_{\max}$, ensuring loads are not unnecessarily shed for manageable excursions (e.g., where the overload condition is not sustained). EX1003, ¶74 (discussing a less significant excursion in EX1005, FIG. 25(a) and collecting cites). Applying load shedding to Lasseter based on (or below) its minimum frequency would simply combine “familiar elements according to known methods,” *i.e.*, applying load shedding for its intended purpose of responsively eliminating loads to ensure sufficient generation capacity, to “yield predictable results,” *i.e.*, a variable total load appropriate for the available generation capacity. *KSR Intern. Co. v. Teleflex Inc.*, 550 U.S. 398, 401 (2007); EX1003, ¶75.

Second, employing responsive load-shedding activated at or below Lasseter’s minimum frequency could avoid inefficiencies from excess generation capacities. Without responsive load shedding, systems must maintain more generative capacity than max-potential load. EX1003, ¶76. This is inefficient—typical loads do not constantly demand maximum power, resulting in unnecessary cost from unused generative capacity. *Id.* Indeed, there are cost, size, fuel consumption, and system complexity implications to having excess generative capacity in backup power sources. *Id.* In view of Lopes’ express example of power-management load shedding, POSITA would have found it obvious to ensure generative capacity was sufficient for typical operation, deploying Lopes’ load-shedding strategies when Lasseter reached or exceeded its minimum frequency and maximum-power output.

Id. Doing so would avoid excess-generative-capacity inefficiencies while always providing adequate power to the connected loads during typical operation. *Id.*

Third, Lasseter teaches that one could alternatively impose an express power-output limit, but this could result in providing less power than the loads demanded. EX1003, ¶77. While certain Lasseter embodiments “actively enforce[]” limits on power output, Lasseter describes this as a “disadvantage” compared to situations with “enough generation” to power the loads. EX1005, ¶[0137]. Supplying less than demanded power is undesirable, especially for critical loads (*e.g.*, life support). EX1003, ¶77. In contrast, shedding and reconnecting “less important” loads—only as needed—ensures critical loads can continue to receive power. *Id.*; EX1011, 4.

Fourth, POSITA would have been especially motivated to employ load shedding in systems where only some loads are truly critical. EX1003, ¶78. Hospitals provide a paradigmatic example: “interruption of power...can have life-threatening consequences.” EX1005, ¶[0007]. Under normal operation, DERs supply both critical loads (*e.g.*, life-support machines) and non-critical loads (*e.g.*, air conditioning). *Id.*, ¶[0099]; EX1003, ¶78. Lasseter discloses systems that preemptively disconnects non-critical loads (M7) (like air conditioning) in favor of critical loads (M5, M8, M9), EX1005, ¶[0099], such as life support. But because loads vary over time, there may be periods when both critical and non-critical loads can be adequately powered. *Id.*, ¶[0104]; EX1003, ¶78. In such circumstances—

where non-critical loads can sometimes remain online without jeopardizing critical ones—POSITA would have been motivated to delay Lasseter’s shedding of “less important loads” until necessary (and only do so “temporar[ily]”) to preserve adequate power for critical applications, as Lopes teaches. EX1011, 4; EX1003, ¶78.

Fifth, POSITA would have been motivated to combine Lasseter and Lopes to avoid drawbacks associated with Lasseter’s preemptive load disconnection. EX1003, ¶79; EX1005, ¶[0099]. Though this prevents loads from exceeding generation at times of high-power demand, it prevents power sources from powering said loads at times of low-power demand. EX1003, ¶79. Even if a power source cannot supply the maximum-possible load, it may be able to power all loads at times of low-power demand. *Id.*; EX1001, 7:5-22. Doing so could avoid costs associated with disconnecting lower-priority loads, like sensitive electronics that have restart times or manufacturing processes where interruption results in “wasted material in process that must be scrapped.” EX1005, ¶[0099]. Disconnecting low-priority loads can have drawbacks which need not be borne in all instances when systems employ Lopes’ load-shedding strategy rather than always preemptively disconnecting loads as Lasseter discloses. EX1003, ¶79.

Sixth, shedding loads only when necessary (as in Lopes) helps power sources operate near maximum-output (and most efficient), motivating POSITA. EX1003, ¶80. “Microsources are expected to operate most of their time with power outputs

near maximum because of the better efficiencies enjoyed at this higher operating points.” EX1005, ¶[0132]; EX1001, 3:21-36, 4:7-53. Preemptive load-shedding may result in shedding loads the microsource could have otherwise powered and have operated nearer to its maximum (more efficient) power output. EX1003, ¶80. Employing Lopes’ load shedding based on the frequency droop indicative of loading would result in a more efficient use of power resources. EX1003, ¶80.

POSITA would have reasonably expected success in the combination. EX1003, ¶81. It implements “well-known” benefits of load-shedding in response to decreased frequency for Lasseter’s microsource systems, which already decrease frequency as a function of increased loading. EX1005, Abstract; EX1003, ¶81 (quoting EX1006, 611). This implementation achieves predictable improvements (i.e., ensuring only loads that can be adequately powered are connected to Lasseter’s microsources) without impacting the operating principle of Lasseter’s microsource power-control systems. EX1003, ¶81.

Rather than impact it, this combination is a commonsense improvement to the operating principle of Lasseter’s microsources once outputting max-power. Further loading will not receive the demanded power. EX1003, ¶82. Lasseter already prescribes a minimum frequency for the max-power; Lopes supplies the obvious next step—shed loads at or below that frequency rather than persist with inadequate power delivery. EX1003, ¶82.

Combining Lasseter with Lopes would have been nothing more than integrating Lasseter's teachings with Lopes' "well-known" load-shedding techniques, both relating to DERs. EX1003, ¶¶82-83 (quoting EX1006, 611). The fundamental aspects of Lasseter's frequency manipulating power sources, bolstered by the beneficial aspects of Lopes' load-shedding scheme, result in a reasonable expectation of success. *Id.*

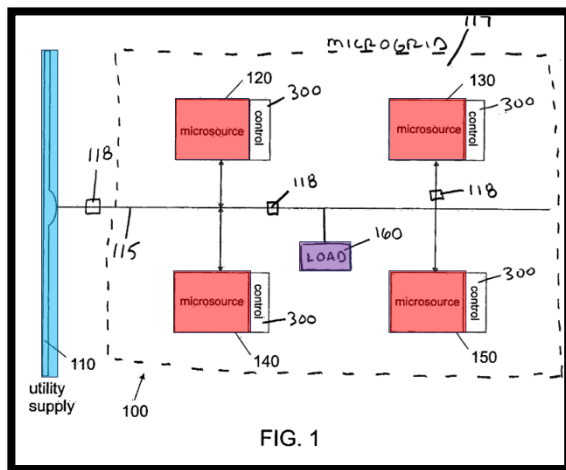
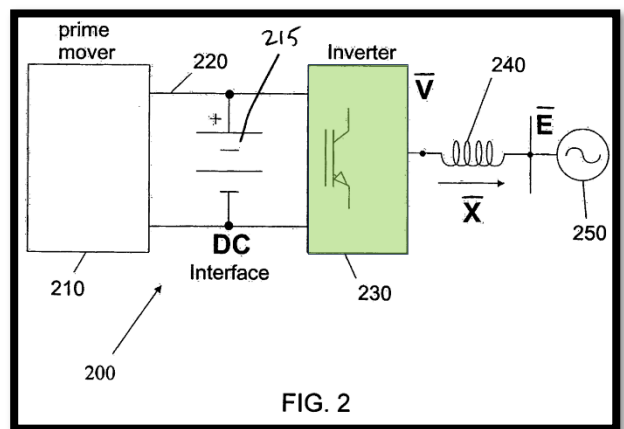
4. Claim Element Analysis

[17.pre] A power system which provides AC power with a changeably controlled AC frequency to assist in managing the loading thereof, the power system comprising:

If limiting, Lasseter's "distributed energy resource system" (DER) provides the claimed ***power system***. EX1005, Abstract, ¶[0063]; EX1003, ¶212. DERs comprise at least one "microsource" power source, and output ***AC power***'s "AC voltage or current at the required frequency." EX1005, ¶¶[0008]-[0011]; EX1003, ¶212. Frequency is ***controlled***—Lasseter discloses "control schemes for controlling the instantaneous frequency...from one or more microsources." *Id.*, ¶¶[0058]-[0061], ¶[0105]. This control ***assists in managing the*** DER's ***loading***, for frequency is controlled "in response to events such as islanding or new loads." *Id.*; EX1003, ¶212, ¶¶212-228.

[17.a] a power source comprising one or more DC to AC inverter which provides output AC power to one or more of a plurality of loads, the power source having a known at least one power source parameter corresponding to the maximum output power capability of the power source;

In Lasseter-Lopes, Lasseter's microsources are *a power source comprising an inverter*—microsources “may include” a DC/AC “inverter 230”/ “inverter 350.” EX1005, ¶[0070], ¶[0074], FIGS. 1-3. EX1003, ¶213, ¶¶213-217.



Further, inverter 230/350 provides output AC power to “one or more loads 160.” EX1005, ¶¶[0061]-[0064]. “[I]nverter 230 controls [the] phase of its output voltage,” which means that inverter 230/350 inverts the DC power from interface 220 to AC power in at least single or multiple phases. *Id.*, ¶¶[0073]-[0074], FIGS. 1-3, ¶[0010]; EX1003, ¶¶213-217. This makes inverter 230/350 a DC to AC inverter. EX1003, ¶214.

Moreover, Lasseter's microsources have *a known power source parameter*—“a set point unit power flow P_0 .” EX1005, ¶[0107]; EX1003, ¶215. Set points are *known*, per the '857 patent, because they are inputs to controller 300 that the

controller **300** stores and uses in subsequent operations. EX1005, ¶[0075], ¶¶[0107]-[0113]; EX1003, ¶215. POSITA would have understood or found it obvious that P_0 is stored in a memory of the controller **300**, given POSITA's understanding of controllers. EX1003, ¶215. Set points are a *parameter*, as defined by the '857 patent, because they are "a quantity of one or more property or attribute" and "treated as a constant" within Lasseter (although they "may at times change"). EX1003, ¶215.

P_0 , or other operating points, can at times be equal to $P_{\max}$. EX1005, ¶¶[0114]-[0115] ("operating points, shown in FIG. 14 with circles"), ¶[0125] ("operating points shown as circles" in FIG. 15); FIGS. 14, 15, 17; EX1003, ¶217. When they are, they *correspond* to the *maximum output power capability of the power source*. Additionally, Equation 9 shows P_0 mathematically *corresponds* to a microsource's "*maximum power output, $P_{\max}$* " as a function of the frequency slope m . *Id.*, ¶[0112]; EX1003, ¶217.

$m = \frac{2\pi\Delta f}{(P_o - P_{\max})}$	[Eq. 9]
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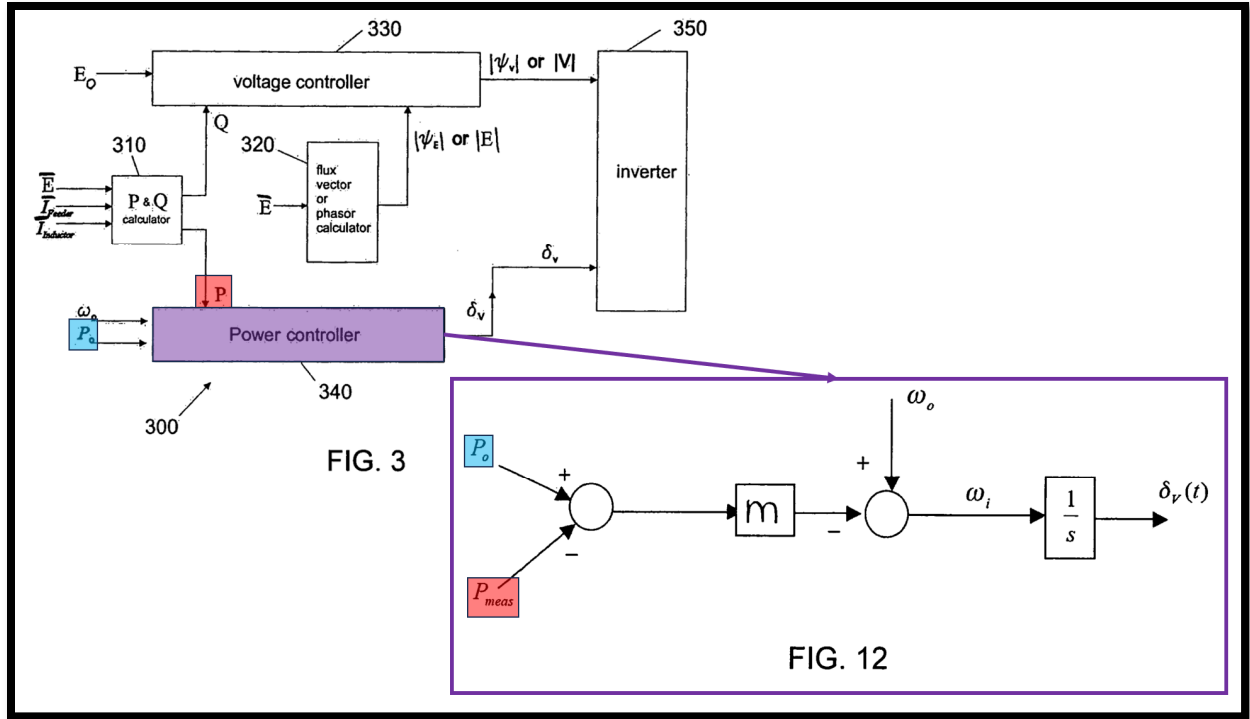
$P_{\max}$ is the *maximum output power capability of the power source*, because $P_{\max}$ is "the maximum power capacity $P_{\max}$ of the microsource," "the maximum rated power," and Lasseter endeavors to maintain output power at or below $P_{\max}$. EX1005, ¶[0128], ¶[0119], ¶[0129]; EX1020, ¶[0112] (incorporated by reference in EX1005).

[17.b] the output AC power having one or more timely power parameter which is sensed and compared to at least one corresponding power source parameter by a power source monitor which may be part of the power source or otherwise, the power source operating in response to the power source monitor to control the frequency of the output AC power to have at least a first frequency when the power source is not overloaded and a second frequency when the power source is overloaded including by supplying an excessive current for a period of time which if continued may risk damage or loss of power;

In Lasseter-Lopes, Lasseter’s microsources have *power-source monitors*—controller **300**. EX1005, ¶[0074]; EX1003, ¶¶218-225. Controller **300** senses voltage at the connection point, E, inductor current, $\bar{I}_{\text{inductor}}$ via “instantaneous voltage or current measurements” of *timely power parameter*, measured power P_{meas} . EX1005, ¶¶[0075]-[0077]; EX1003, ¶218. Controller uses calculator **310** to calculate P_{meas} “being injected by the microsource using the inductor current, $\bar{I}_{\text{inductor}}$.” *Id.*, ¶[0077]; EX1003, ¶218 (citing EX1022, 63-64).

$$P_{\text{ave}} = \text{Re}(VI^*) = |VI^*| \cos \phi$$

$\bar{I}_{\text{inductor}}$ and P_{meas} are *timely*, as defined by the ‘857 patent, because they are both based on “instantaneous current and voltage measurements.” *Id.* ¶[0075]; EX1003, ¶219. Thus, they are both “instant, real time, close to real time or a suitable time.” *Id.* $\bar{I}_{\text{inductor}}$ and P_{meas} are both *parameters*, as defined by the ‘857 patent, because they are “a quantity of...[an] attribute” of the microsources, *i.e.*, the instantaneous current and the output power, “which is treated as constant” throughout Lasseter (although it “may at times change”). EX1003, ¶219.



And as shown in Figure 12 and Equation 8, controller **300** *compares* P_{meas} to the *corresponding power source parameter*—“set point unit power flow P_o .” *Id.*, ¶¶[00106]-[0109], ¶[0112], ¶[0122]; EX1003, ¶220.

$$\omega_i = \omega_o - m(P_o - P_{\text{meas}}) \quad [\text{Eq. 8}]$$

Lasseter’s microsources thus *operate in response to* controller **300** *to control the frequency of the output AC power* when “reducing the operating frequency of the inverter to increase [their] unit output power.” EX1005, Abstract, ¶¶[0074]-[0077]; ¶¶[0086]-[0090]. Controller **300** includes “power controller **340** in FIG. 3,”

which “uses...the measured power P_{meas} ,” i.e., Real Power P ,¹ “to control the instantaneous operating frequency ω_i of the inverter.” *Id.*, ¶¶[0105]-[0113]. As shown in Equation 8, when P_{meas} exceeds power-set point, P_0 , frequency decreases from its *first frequency* ω_0 . *Id.*, EX1003, ¶221.

$$\omega_i = \omega_0 - m(P_0 - P_{\text{meas}})$$

[Eq. 8]

In Lasseter-Lopes, “maximum power is reached at minimum frequency in all units,” and where “load exceeds the aggregate power capacity of the units,” the microsource exceeds its “minimum operating frequency.” EX1005, ¶¶[0113]-[0119], ¶[0130], ¶[0015]; FIGS. 14-17. EX1003, ¶222. The microsources are operating at ω_0 and frequencies above the minimum frequency are operating below

¹ Figure 12 depicts power controller **340** (from Figure 3) receiving the following inputs: ω_0 , P_0 , and Real Power P to control ω_i . Figure 12’s power controller also receives ω_0 and P_0 as inputs to control ω_i , but labels its power input as P_{meas} . Though Figure 12 adds the “measured” subscript, Lasseter explains that Real Power P is calculated by P&Q calculator **310** based on measurements. EX1005 ¶[0073], ¶[0077]; EX1003, ¶98. Thus, Real Power P and P_{meas} refer to the same thing. EX1003, ¶98.

$P_{\max}$ and are *not overloaded*. *Id.* When operating at the *first frequency* ω_0 , the microsources are not overloaded, as defined by the '857 patent, because they are operating within their rated power specification, between $P_{\min}$ and $P_{\max}$. EX1005, FIGS. 14-17; EX1003, ¶¶222-23. In other words, load on a microsource between the minimum power, $P_{\min}$, and maximum rated power, $P_{\max}$, will not “cause a departure from specifications for the power output from the power source.” EX1003, ¶¶222-23.

Operating below the minimum frequency, above $P_{\max}$, would be a *second frequency* associated with an *overload*. EX1003, ¶224. POSITA would have understood or found obvious that operating below this frequency, beyond $P_{\max}$, for longer than a “certain time interval” (as taught by Lopes, EX1011, 4) could cause “[i]nverter overcurrents,” or insufficient power being provided to loads, resulting in power loss at the loads or damage to the power source. EX1011, 4, (*excessive current being supplied*); EX1003, ¶224. Indeed, because P_{meas} is a function of I_{inductor} (as discussed in [17a]), when P_{meas} exceeds $P_{\max}$, the value of I_{inductor} is an *excessive current*. EX1003, ¶224. Operating below the minimum frequency and beyond $P_{\max}$ would constitute the power source being *overloaded*, as defined by the '857 patent. *Supra* §III.A.1; EX1003, ¶224.

In this configuration, microsources would “balance generation and consumption inside the MG” by increasing power output with

“proportional...frequency deviation.” EX1011, 3. When this leads to a “high imbalance between local load and generation,” loads are shed “by under-frequency relays” to *alleviate* this overload. *Id.*, 4; EX1003, ¶225.

[17.c] a processor circuit comprising one or more processors responsive to the output AC power and operating in response to the occurrence of the second frequency to control the coupling of output AC power to at least one load of the one or more loads thereby helping to prevent or alleviate an overload of the power source.

In Lasseter-Lopes, Lopes supplies “controllable loads” and an algorithm for “shedding” them “based on the amplitude of frequency deviation.” EX1011, 4-5. Load shedding *controls the coupling of A.C. power to the load*, for load shedding “[a]llow[s] a temporary disconnection of less important loads.” *Id.* Shedding these loads can rectify a “high imbalance between local load and generation,” *helping to prevent or alleviating* “frequency deviations and transient overload[s]” including an *overload of the power source*, as defined by ’857 patent, *e.g.*, excursions beyond Lasseter’s $P_{\max}$. *Id.*; EX1003, ¶¶226-28; *supra* 17.b.

Moreover, Lopes’ load-shedding algorithm *operates in response to* “the amplitude of the frequency deviation” (reflecting changes in output A.C. power), specifying “a certain amount of load” to be “automatically shed through the activation of under-frequency load shedding relays” based on the “frequency deviation” to *the second frequency*. EX1011, 6; EX1003, ¶227. As discussed, POSITA would have been motivated to implement Lopes with specified frequency

deviations corresponding to below a given microsource's minimum frequency. *Id.*, 3, FIG. 4; EX1003, ¶227.

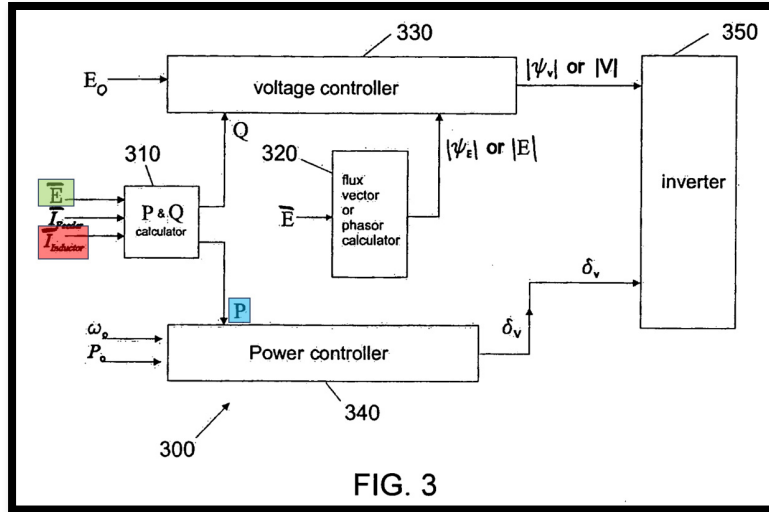
Finally, Lopes' load-shedding algorithm is implemented on "controllers located at loads or groups of loads [load controller (LC)]" and "under-frequency relays," which POSITA would have understood constitute *processor circuits comprising one or more processors*. EX1011, 1, 2, 4, 6, FIG.1; EX1003, ¶228. Indeed, given that processor circuits were well known and their benefits well understood, it would also have been obvious to implement the load-shedding algorithm on a processor circuit to benefit from the speed and convenience of modern computing and control systems. EX1003, ¶228 (citing EX1021, EX1024, EX1025, and EX1027 as examples of processors in load shedding applications); *cf.* EX1005, ¶[0169] ("Digital Signal Processor").

[18.] A power system as claimed in claim 17 wherein the at least one power source parameter of a) corresponds to at least one of the power source not being overloaded or being overloaded.

In Lasseter-Lopes, Lasseter's the microsource's *power source parameter*—"set point unit power flow P_0 ,"—corresponds to a microsource's non-overloaded state when less than $P_{\max}$ and an overloaded state when equal to $P_{\max}$ or beyond. *Id.*, ¶[0107]; EX1003, ¶229; *supra* 17.b.

[19.] A power system as claimed in claim 17 wherein in b) the one or more timely power parameter includes at least a voltage of the output AC power and is compared to the at least one power source parameter of a) which includes at least a voltage amount.

In Lasseter-Lopes, **system voltage E** (*a voltage of the output AC power*) is a *timely power parameter* that is compared to *power source parameter*, E_{P0} (*a voltage amount* corresponding to P_0 at a given $\bar{I}_{\text{inductor}}$). EX1005, ¶[0075]. **System voltage E** is *timely* as defined by the '857 patent, for it is determined via “instantaneous voltage measurements,” *i.e.*, “instant, real time, close to real time or a suitable time.” EX1005, ¶[0075]. EX1003, ¶230, ¶¶230-35. **System voltage E** is a *parameter*, as defined by the '857 patent, because it is “a quantity of...[an] attribute” of the microsources, *i.e.*, the voltage, “which is treated as constant” throughout Lasseter (although it “may at times change”). EX1003, ¶304. Indeed, the '857 patent lists voltage as example parameter. EX1001, 10:11-20. Controller **300** (*power source monitor*) includes calculator **310**. EX1005, FIG. 3. “[C]alculator **310** can calculate...**real power P** being injected by the microsource using the inductor current, $\bar{I}_{\text{inductor}}$.” EX1011, ¶[0077]. Figure 3 shows **system voltage E** as the voltage input to calculator **310** that calculates P_{meas} :

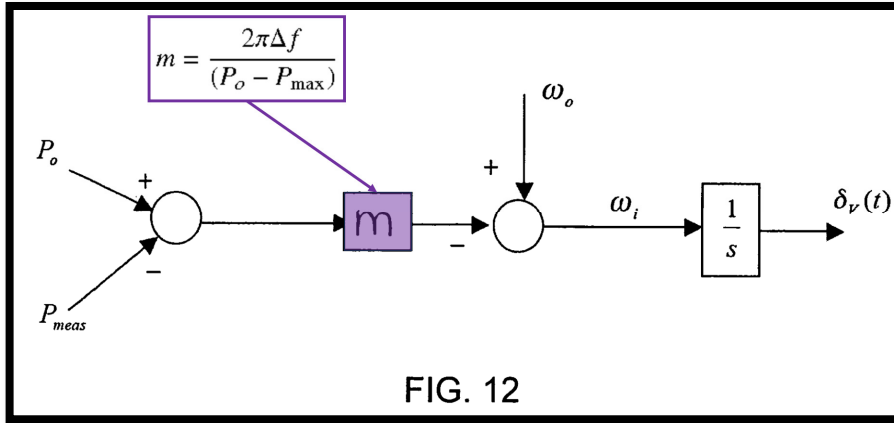


System voltage E is used the *voltage of the output AC power* with $\bar{I}_{\text{inductor}}$ to calculate P_{meas} . EX1005, ¶[0077], ¶[0190], FIGS. 1-4, 12; EX1003, ¶231 (citing EX1022, 63-64).

Moreover, P_0 and P_{max} *include voltage amounts* E_{P0} or E_{max} —which are thus *power source parameters corresponding to the maximum output power*—for a given current $\bar{I}_{\text{inductor}}$. EX1003, ¶¶232-235 (P is a function of V and I , citing EX1022, 63-64).

Finally, controller **300** compares P_{meas} , P_0 , and P - ω slope m (which is a function of P_{max} , EX1005, Eq. 9) to change frequency as shown in Equation 8 and Figure 12:

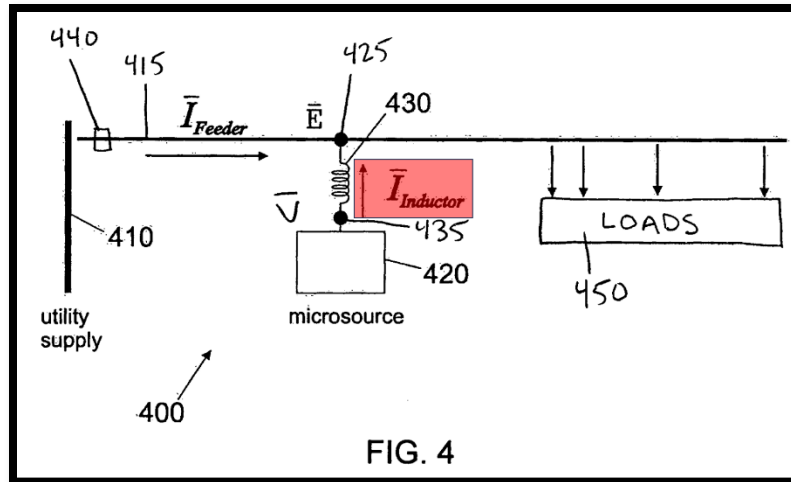
$$\omega_i = \omega_0 - m(P_0 - P_{\text{meas}}) \quad [\text{Eq. 8}]$$



Alternatively, *timely power parameter* P_{meas} and *power source parameter* P_0 *include voltages* of the output AC power. P_{meas} and P_0 are compared. *Supra* [17.b].

[20.] A power system as claimed in claim 17 wherein in b) the one or more timely power parameter includes at least a current of the output AC power and is compared the at least one power source parameter of a) which includes at least a current amount.

In Lasseter-Lopes, $\bar{I}_{\text{inductor}}$ is the *current of the output AC power* and a *timely power parameter*. *Supra*, [17b], [19]. $\bar{I}_{\text{inductor}}$ is used to calculate P_{meas} , and P_{meas} is *compared to the power source parameter* P_0 . *Id.* P_0 also *includes a current amount*, because power is a function of current. EX1003, ¶236 (“ $P=VI \cdot \cos \phi$ ”). And, where P_{meas} operates at P_0 , $\bar{I}_{\text{inductor}}$ is the current associated with this power level at the output voltage $\bar{E}$. EX1003, ¶236. Thus, the claimed comparison is performed by Lasseter in the power domain, instead of the current domain. EX1003, ¶236.

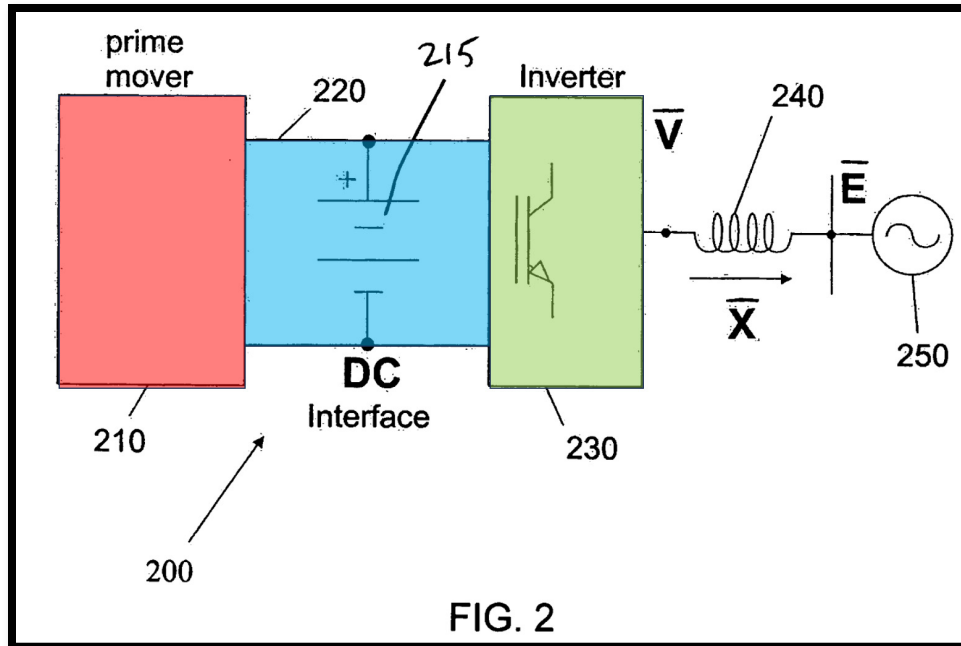


[21.pre] An electronic power system which provides single or multiple phase AC power having parameters including but not limited to voltage, current and frequency, the AC frequency being changeably controllable to assist in managing the loading of the power system, the power system comprising at least:

Supra, [17.pre], [17.a] (phases). **Parameters** of any AC circuit **include voltage, current, and frequency**. *Supra* [19]; EX1003, ¶237, ¶¶237-240. Frequency is a “parameter” within the language of ’857 patent, because it is “a quantity of...[an] attribute” of the microsources, i.e., the maximum rated power, “which is treated as constant” throughout Lasseter (although it “may at times change”). EX1003, ¶295.

[21.a] a power source comprising one or more DC to AC inverter circuit which receives DC power from a DC power source and converts it to AC power having a changeably controlled frequency;

Supra [17.a] (power source), [17.b] (changeable frequency), [21.pre] (DC-AC). The **inverter circuit 230/350** receives DC power from a DC power source when **prime mover 210** or battery 214 outputs DC power through **DC interface 220**. EX1005, ¶[0073], ¶[0070], FIG. 2, ¶[0010]; EX1003, ¶238.



[21.b] a power source monitor circuit which may be part of the power source or otherwise operating in response to the operating condition of the power source to control the AC power frequency to be one of a plurality of frequencies including at least a first frequency which represents when the power source is being operated with loading that does not create an overload and a second frequency which represents when the power source is being operated with loading that if continued will risk damage to or loss of power by the power source;

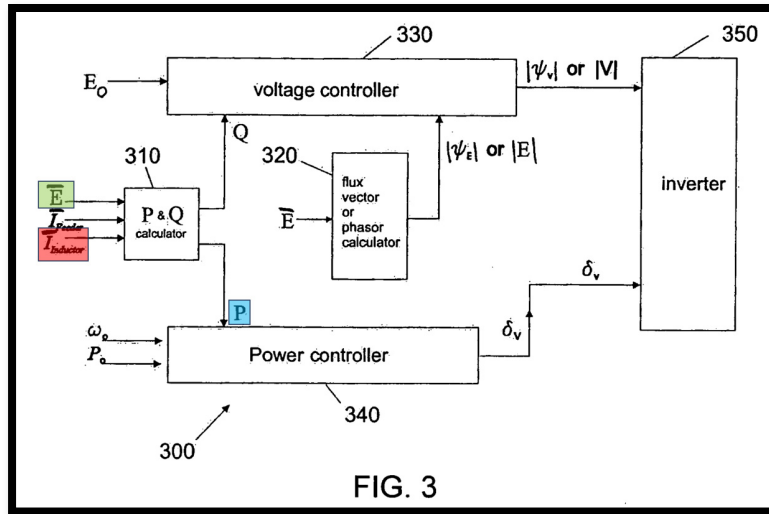
Supra [17.b]. Lasseter-Lopes' controller 300 is *operating in response to an operating condition of the power source to control the AC power frequency*, because it compares a measured power, P_{meas} , (*an operating condition of the power source*) to a "set point unit power flow P_0 " to determine the desired instantaneous operating frequency, ω_i , *i.e.*, the first or second frequency. EX1005, ¶¶[00106]-[0109], Eq. 8, ¶[0112], ¶[0122], FIG. 12; EX1003, ¶239.

[21.c] the power system further comprising a coupling circuit for controllably coupling at least some of the AC power from the power source to at least a first load of one or more loads, the coupling being responsive to the frequency of the output AC power in a manner such that it performs at one or more of helping to prevent overloading; helping to mitigate overloading or helping to not increase the overloading of the power source.

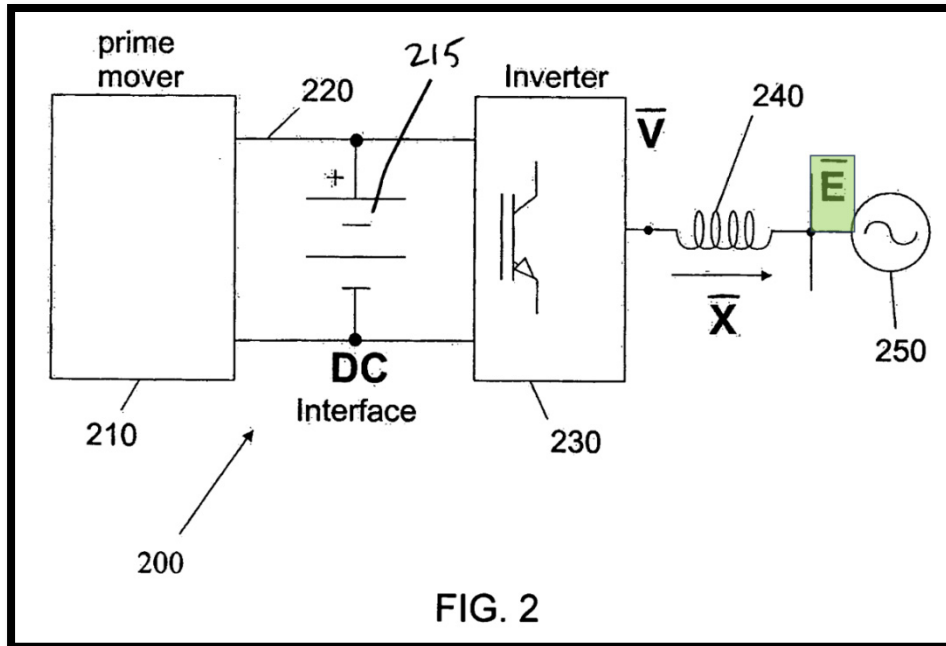
Supra [17.c]. Lasseter-Lopes’ “under-frequency relays” are ***a coupling circuit for controllably coupling at least some of the AC power from the power source to at least a first load.*** EX1003, ¶240. Because they actively shed loads in response to certain frequency deviations of the microsources, EX1011, 4, 6, Lopes’ under-frequency relays are ***responsive to the frequency of the output AC power.*** EX1003, ¶240. Based on this responsiveness, under-frequency relays disconnect “less important loads” to correct an “imbalance between local load and generation” capabilities of the power source, ***helping to prevent overloading, mitigate overloading, or not increase overloading of the power source.*** EX1011, 4; EX1003, ¶240; *supra*, [17.b].

[22.] A power system as claimed in claim 21 wherein in b) the power source monitor circuit is responsive to the operating condition of the power source which is a voltage of the AC power to control the AC power frequency.

Controller **300** (***power source monitor circuit***) is responsive to ***a voltage of the AC power, system voltage E.*** “The P & Q calculator **310** can calculate...**real power P** being injected by the microsource using the inductor current, **$\bar{I}_{\text{inductor}}$** .” EX1011, ¶[0077]. Figure 3 shows **system voltage E** as the voltage input to calculator **310** that calculates **P_{meas}** .



System voltage E is the *voltage of the AC power* and used together with $\bar{I}_{inductor}$ to calculate P_{meas} (to which frequency control is responsive). EX1005, ¶[0077], ¶[0190], FIGS. 1-4, 12; EX1003, ¶[241-43] (citing EX1022, 63-64); *supra* [21.b]. Because controller 300 operates in response to P_{meas} to change frequency, *supra* [19], and because P_{meas} changes based on system voltage E , controller 300 is responsive to the voltage of the AC power. EX1003, ¶[241-43].



[23.] A power system as claimed in claim 21 wherein in b) the power source monitor circuit is responsive to a voltage of the AC power dropping below a known voltage to control the AC power frequency to be the second frequency.

In Lasseter-Lopes, controller **300** (*power source monitor circuit*) measures both current and voltage of the AC output and is therefore responsive to *voltage of the AC power*. *Supra* [22]. Assuming the power source provides a substantially constant current $\bar{I}_{\text{inductor}}$, when the output *system voltage E* drops—such as from large circulating reactive currents caused by loads attached to the system—the measured real power $P_{\text{meas}} = E \times \bar{I}_{\text{inductor}} \cos(\phi)$ correspondingly decreases. EX1003, ¶244. Thus, even without a change in current, controller **300** remains responsive to the *voltage of the AC power*, and as *system voltage E* drops below a known voltage E_0 , frequency would change to the second frequency. EX1003, ¶244. POSITA would

have understood or found obvious that large voltage drops can damage power sources if not corrected promptly and would, therefore, be motivated to implement such voltage-responsive frequency control. EX1003, ¶244.

[25.] A power system as claimed in claim 21 wherein in b) the power source monitor circuit is responsive to a wattage of the AC power rising above a known wattage to control the AC power frequency to be the second frequency.

In Lasseter-Lopes, P_{meas} and P_0 are quantified in *wattage* because watts are a unit of power. EX1003, ¶¶245-246. *Power source monitor* (controller 300) compares the *wattage of the AC power* (P_{meas}) to a *known wattage*: “set point unit power flow P_0 .” EX1005, ¶[0107]; *supra* [21.b], [17.a] (P_0 is “known”).

$$\omega_i = \omega_0 - m(P_0 - P_{\text{meas}})$$

[Eq. 8]

Controller 300 “uses... P_0 and... P_{meas} to control the instantaneous operating frequency ω_i of the inverter.” EX1005, ¶[0107], FIGS. 3, 12. When P_{meas} *rises above known wattage* P_0 (P_{max}), *supra* [17.a], controller 300 *responds* by decreasing inverter frequency ω_i *to be the second frequency* according to Equation 8. EX1005, ¶¶[0105]-[0108]; EX1003, ¶¶245-246; *supra* [21.b].

[27.pre] An electronic power system which provides AC power, the power system comprising at least:

Supra [17.pre]; EX1003, ¶¶247-249, ¶212.

[27.a] an AC power source having one or more DC to AC inverter which converts DC power to AC power having a changeably controlled frequency, the AC power source having at least one timely operating parameter from which an overload of the AC power source may be determined;

Supra [17.a] (power source), [17.b] (changeable frequency, timely operating parameter, overload); [21.pre] (frequency parameter); EX1003, ¶247.

[27.b] a power source monitor, which may be part of the power source or otherwise, operating in response to the at least one timely operating parameter to control the AC power frequency to have a timely one of a plurality of frequencies including least a first frequency when there is no overload and a second frequency when there is an overload;

Supra [17.b], [21.b] (operating in response, overload). The determined frequency is an “instantaneous frequency” and thus timely, as defined by the ’857 patent, because it is “instant, real time, close to real time or a suitable time.” EX1005, ¶[0075]; EX1003, ¶248.

[27.c] the power system further comprising a coupling circuit for controllably coupling the AC power to at least a first load of the one or more loads, the first coupling being responsive to the loading of the AC power source in a manner that it performs at least one of helping to prevent, or helping to mitigate, overloading of the power source.

Supra [17.b], [17.c], [21.c]. The under-frequency relays are ***responsive to the loading of the AC power source*** because the frequency in Lasseter-Lopes is varied based on loading. *Supra* [21.c]; EX1003, ¶249.

[28.] A power system as claimed in claim 27 wherein in b) the power source monitor is responsive to the at least one timely operating parameter which is a voltage of the AC power to control the AC power frequency.

Supra [19], [22].

[29.] A power system as claimed in claim 28 wherein in b) when a voltage of the AC power drops below a known voltage the AC power frequency is controlled to be the second frequency.

Supra [23].

[30.] A power system as claimed in claim 27 wherein in b) the power source monitor is responsive to the at least one timely operating parameter which is a current of the AC power to control the AC power frequency.

Supra [17.b], [20].

[31.] A power system as claimed in claim 30 wherein in b) when a current of the AC power increases above a known current the AC power frequency is controlled to be the second frequency.

Supra [17.b], [20]. Although Lasseter describes $P_{\max}$, at a given operating voltage, power and current are directly related. EX1003, ¶¶253-254 (citing EX1022, 63-64). Knowing $P_{\max}$ and the operating voltage, like Lasseter, necessarily entails knowing the corresponding maximum current, $\bar{I}_{\text{inductor}}$ at $P_{\max}$, injected by the microsource. *Id.*; EX1005, ¶[0075]; EX1003, ¶¶253-254. Thus, when Lasseter is controlling the AC power frequency, based on power, to the second frequency, it does so when a current of the AC power increases above a ***known current***. EX1003, ¶¶253-254.

[32.] A power system as claimed in claim 27 wherein in b) the power source monitor circuit is responsive to the at least one timely operating parameter which is a wattage of the AC power.

Supra [17.b] (P_{meas} is timely) [25].

[33.] A power system as claimed in claim 32 wherein in b) when a wattage of the AC power increases above a known wattage the AC power frequency is controlled to be the second frequency.

Supra [25], [21.b], [17.a] (P_0 is “known”).

[34.pre] An electronic power system which provides AC power to one or more loads, the power system comprising at least:

Supra [17.pre]-[17.a]; EX1003, ¶¶257-64.

[34.a] an AC power source having one or more DC to AC inverter which converts DC power to AC power which may be controlled to change to different known frequencies, the AC power source having at least one timely operating parameter from which an overload of the AC power source may be determined;

Supra [17.a] (power source), [17.b] (changeable frequency, timely operating parameter, overload).

[34.b] a power source monitor operating in response to the at least one timely AC power source operating parameter to control the AC power frequency to have a timely one of a plurality of frequencies including least a first frequency when there is no overload and a second frequency when there is an overload;

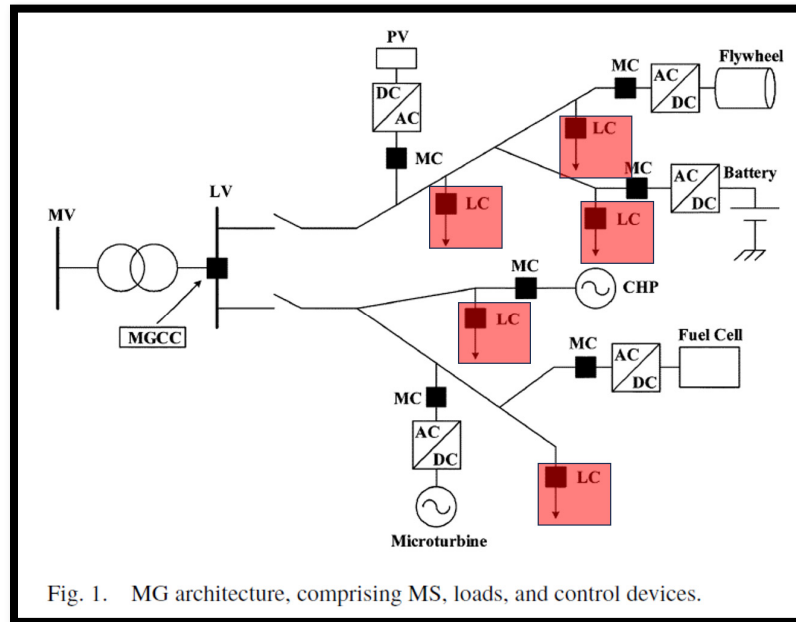
Supra [17.b], [21.b] (operating in response).

[34.c] the power system further comprising a first coupling circuit for controllably coupling the AC power to at least a first load of the one or more loads in a manner to mitigate overloading of the power source after the AC power takes on the second frequency; and

In Lasseter-Lopes, Lopes’ load-shedding algorithm is implemented on “controllers located at loads or groups of loads [load controller (LC)].” EX1011, 2, FIG.1. LCs operate “controllable loads” via an algorithm for “shedding” loads “based on the amplitude of frequency deviation.” EX1011, 4-5. “[C]ontrollable

loads” can shed and reconnect via the LCs that “serve as interfaces,” (*a first coupling circuit*), “to *control* loads through the application of an interruptibility concept.”

EX1011, 2.



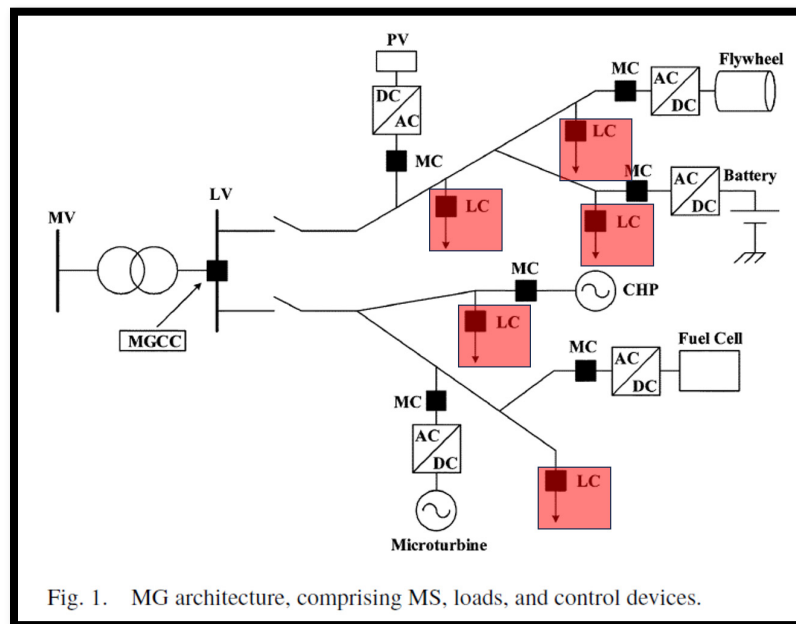
Alternatively, Lopes *controls the coupling of* loads via “under-frequency relays,” (*a first coupling circuit*), which *couple output AC power to loads*, activating load shedding to *mitigate* “frequency deviations and transient *overload[s]*.” EX1011, 2, 4, 6, FIG. 1; EX1003, ¶¶260-62; *supra*, [17.b]

Moreover, the under-frequency relays (or LCs and relays, collectively) respond to “the amplitude of the frequency deviation,” which reflects changes in output A.C. power. EX1011, 5; EX1003, ¶¶260-62. They specify “a certain amount of load” to be “automatically shed through the activation of under-frequency load shedding relays” based on the “frequency deviation.” EX1011, 6. As discussed,

POSITA would have been motivated to implement Lopes with known frequency deviations corresponding to (or below) a given microsource's minimum frequency (the *second frequency*). *Id.*, 3, FIG. 4; EX1003, ¶262.

[34.d] further comprising a second coupling circuit for controllably coupling the AC power to at least a second load of the one or more loads, the second coupling circuit being responsive to at least one AC power source timely operating parameter, which may be the same as or different than the at least one timely operating parameter of b) to perform at least one of i) prevent an overload, ii) alleviate an overload or iii) prevent further overload if the power source is already overloaded.

In Lasseter-Lopes, Lopes discloses multiple “under-frequency load shedding relays” (plural) and LC load “controllers located at loads.” EX1011, 2, 6, FIG. 1; EX1003, ¶¶263-264. Figure 1 depicts five such controllers:



Because these relays/LCs perform the same load control functions as the first load coupling circuit, *supra* [34.c]; EX1003, ¶264, these are *second-fifth coupling*

circuits for controllably coupling the AC power to at least a second load of the one or more loads. Based on the same *operating parameter* as the first coupling circuit (frequency), these under-frequency relays/LCs *prevent an overload, ii) alleviate an overload or iii) prevent further overload if the power source is already overloaded.* *Supra* [17.b], [21.c]; EX1003, ¶264.

[35.] An electronic power system as claimed in claim 34 wherein in d) the second coupling circuit is responsive to the at least one AC power source timely operating parameter which is a voltage of the AC power.

In Lasseter-Lopes, *the at least one AC power source timely operating parameter* includes voltage. *Supra* [19]. Frequency changes via controller **300** are responsive to *a voltage of the AC power*, system voltage E. *Supra* [22]-[23]. Moreover, System voltage E is *timely* as defined in the '857 Patent. *Supra* [19]. Because Lopes' under-frequency relays (which includes the *first* and *second coupling circuits*) are responsive to frequency deviations, *supra* [34.c]-[34.d], and because the frequency deviations are responsive to system voltage E, *supra* [22]—Lopes' under-frequency relays are responsive to *the at least one AC power source timely operating parameter which is a voltage of the AC power.* EX1003, ¶265.

[36.] An electronic power system as claimed in claim 35 wherein in d) the second coupling circuit is responsive to a voltage of the AC power increasing above a known value.

Supra [22]-[23], [35]. Assuming the power source provides a substantially constant current $\bar{I}_{\text{inductor}}$, when the output *system voltage E* increases, the measured

real power $P_{\text{meas}} = E \times \bar{I}_{\text{inductor}} \cos(\phi)$ correspondingly increases. EX1003, ¶266. Thus, even without a change in current, controller **300** remains responsive to the *voltage of the AC power*, and as *system voltage E* increases above a known voltage E_0 , frequency would decrease proportionately to the second frequency. EX1003, ¶266. Thus, Lopes' under-frequency relays are *responsive to a voltage of the AC power increasing above a known value*. EX1003, ¶266.

[37.] An electronic power system as claimed in claim 34 wherein in d) the second coupling circuit is responsive to the at least one AC power source timely operating parameter which is a current of the AC power.

Supra [17.b], [20].

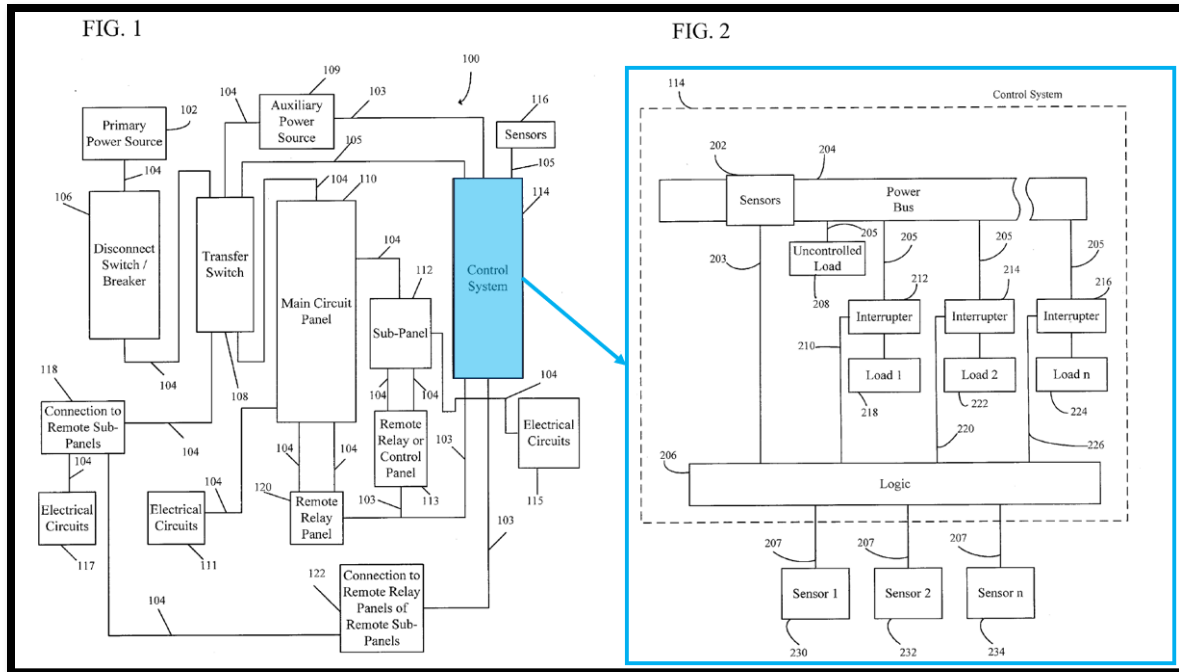
[38.] An electronic power system as claimed in claim 35 wherein in d) the second coupling circuit is responsive to a current of the AC power increasing above a known value.

Supra [31].

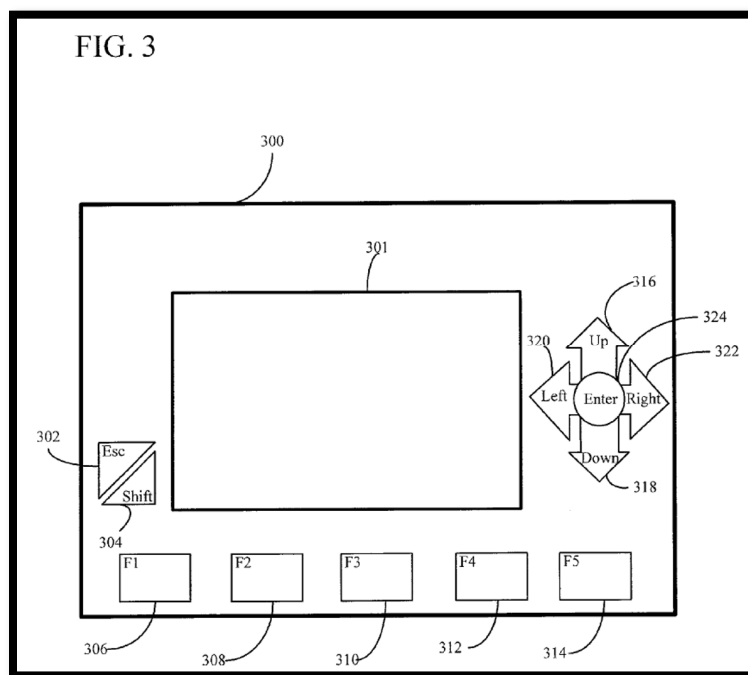
B. [GROUND 1B] – Claims 24 And 26 Are Obvious Over Lasseter-Lopes-Baldassarre

1. Baldassarre (EX1021)

Baldassarre's *control system 114* controls loads powered by auxiliary power sources after utility-power interruptions. EX1021, Abstract, ¶[0016], ¶[0023], ¶[0096]. Baldassarre manages electrical loads through current interrupting relays, connecting and disconnecting loads responsive to power-source conditions. EX1021, ¶[0058], ¶[0090], FIGS. 1-2. The “current interrupters” are “in series electrical connection with loads” and power source. EX1021, ¶[0090], FIGS. 1-2.



Baldassarre discloses user interactive device **300**, allowing users to program load priorities and sequence load shedding and reconnection. EX1021, ¶¶[0075]-[0076], ¶¶[0095]-[0103], ¶[0108], FIG. 3.



2. The Combination, Reasons to Combine, & Expectation of Success

Because POSITA would have recognized the benefits of combining Lasseter-Lopes with Baldassarre, it would have been obvious. EX1003, ¶¶180-88, ¶269-70. As discussed, Lasseter-Lopes discloses microsources that vary output frequency responsive to loading, automatically shedding loads via LCs and under-frequency relays. *Supra* Part III.A.1-3. Though Lopes discusses shedding loads based on relative importance (shedding different amounts of loads “based on the amplitude of frequency deviation”) and reconnecting loads gradually, EX1011, 3-6, Lopes does not discuss implementation, hardware, or a user-interface for setting load priorities. Baldassarre supplements Lopes, disclosing a processor-based control system with a user interface that automatically disconnects and restores loads based on user-defined priorities and real-time system conditions. EX1021, ¶¶[0075]-[0103], FIG. 3. POSITA would have been motivated to combine Baldassarre’s priority-based load-management control—including its user interface, load priorities and time and sequenced disconnect/reconnection of loads—with the Lasseter-Lopes system to enable user control of load-shedding critical and non-critical loads. EX1003, ¶181. Lopes’ load-shedding control could be augmented with Baldassarre’s load-management control, or Baldassarre’s load-management control implemented in place of Lasseter-Lopes’ adjusted, as needed, to accommodate Lasseter-Lopes’ system. EX1003, ¶181.

First, Lasseter-Lopes provides the control logic—frequency deviation and load-shedding thresholds—but not how users specify load-shedding or reconnection priority. POSITA would have looked to Baldassarre’s control system, including its user interface and load-priority programming, as an obvious solution—providing hardware and software structure for setting load priorities, implementing time-based reconnection, and sequentially restoring power. EX1021, ¶¶[0056]-[0058], ¶¶[0061]-[0065], ¶¶[0083]-[0089], ¶¶[0093]-[0109], ¶¶[0121]-[0127], FIGS. 1, 5-7; EX1003, ¶182. Integrating Baldassarre’s user interface with Lasseter-Lopes’ distributed controllers yields a system that not only sheds loads automatically when frequency drops, but does so according to priorities set by a user—a desirable improvement for any DER with load-shedding capabilities. EX1003, ¶182. Incorporating these aspects of Baldassarre into Lasseter-Lopes would simply be “a combination of familiar elements according to known methods,” (applying load-control systems with user interfaces and load-priority logic), to “yield predictable results,”—a load-shedding system allowing for user-definable priorities. *KSR*, 550 U.S. at 401; EX1003, ¶182.

Second, POSITA would have been motivated to combine Lasseter-Lopes with Baldassarre because Baldassarre solves a problem Lasseter-Lopes leaves unaddressed: conventional systems could not “continuously update the priorities of particular electrical loads in real time” or “allow a user to select in real-time which

loads are essential.” EX1021, ¶[0007]. Combining Lasseter-Lopes’ frequency control and frequency-based load shedding with Baldassarre’s user-configurable interface enables user-tailored load-shedding schemes—avoiding the inflexibility of fixed frequency thresholds, improving system usability, efficiency, and safety. EX1003, ¶183.

Third, implementing Baldassarre’s control system 114 with the LCs and under-frequency relays of Lasseter-Lopes would have been straightforward and predictable. EX1003, ¶184. Lopes’ LCs and under-frequency relays would function as frequency-responsive devices that open at predetermined-frequency deviations, and Baldassarre’s control systems would provide a user-programmable means for managing and coordinating those relays. EX1021, ¶¶[0094]-[0104], ¶¶[0110]-[0119]; EX1003, ¶184. Through Baldassarre’s processor-based controller and user-interactive device, users define load priorities, specify load-shedding conditions, and specify load restoration sequences. EX1021, ¶¶[0021]-[0027], ¶¶[0032]-[0034], ¶[0056], ¶¶[0090]-[0095]. POSITA would have recognized integrating this control scheme with Lopes’ distributed load controllers (LCs) and under-frequency relays would enable user-determined prioritization of load shedding without altering the basic LC/relay operation, while eliminating the need to configure each individually at its respective load site. EX1003, ¶184. This approach is a predictable combination of known microprocessor-based control systems to achieve improved coordination

and configurability in managing frequency-responsive load shedding. *KSR*, 550 U.S. at 417.

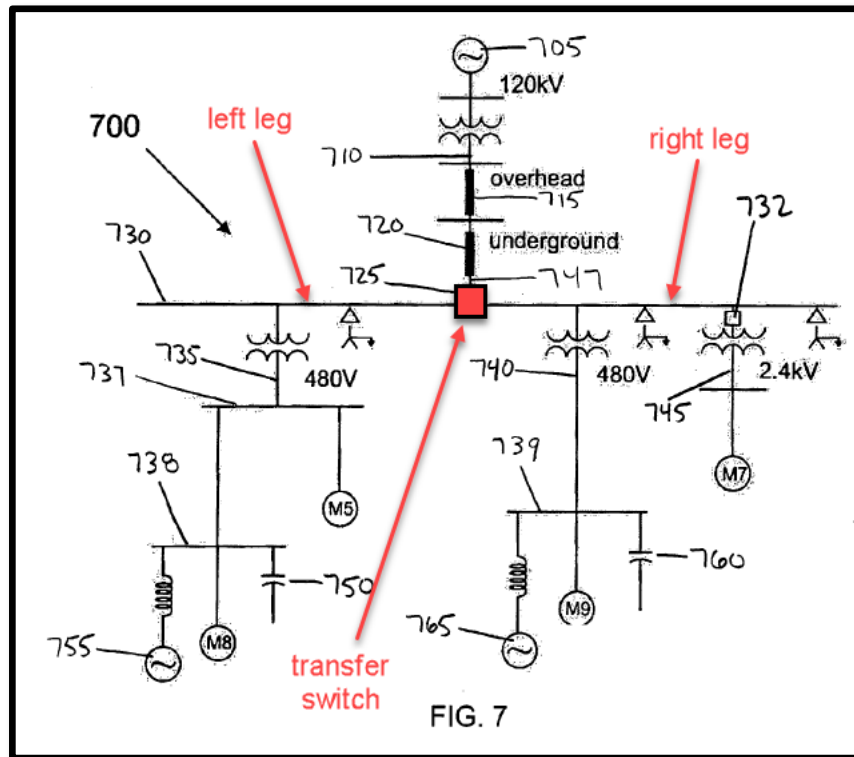
Fourth, POSITA would have been motivated by Baldassarre's additional benefit: real-time adjustment of load priorities. EX1021, ¶¶0016], ¶¶0030], ¶¶0053], ¶¶0081], ¶¶0103]. While Lasseter-Lopes discloses relative load importance, EX1011, 4, it does not disclose *when* the importance is implemented. Because a user's needs change, POSITA would have employed Baldassarre's user interfaces to permit users to change load priorities as desired. EX1003, ¶¶185-185.

POSITA would have reasonably expected success. EX1003, ¶186. Each reference addresses managing power sources to maintain stable operation when loads vary. Lopes even contemplates "adopt[ing] standard protocols and open technologies...using off-the-shelf, low-cost, widely available, and fully-supported hardware and software components." EX1011, 2. Baldassarre's controller performs conventional relay switching using processor logic, while Lasseter-Lopes' control systems already use microcontrollers and relay-based load interfaces. EX1021, ¶186; EX1011, ¶¶0025], ¶¶0090]-[0091]. Integrating Baldassarre's programmable interface and relay hardware with Lasseter-Lopes' load-shedding control logic would have required only routine design adaptation and would predictably improve functionality: user-configurable, frequency-responsive load management in DERs. EX1003, ¶186.

Fifth, POSITA would have found it obvious to incorporate Baldassarre's teaching of detecting overloads by monitoring distortion in the AC output's sine wave within the Lasseter-Lopes system to improve overload detection. EX1003, ¶270; EX1021, ¶[0059]. Baldassarre explains that its "control system may sense the power through other means as well, such as...sine waves...to determine when the auxiliary power source is overloaded." EX1021, ¶[0059]. POSITA would have recognized that evaluating sine-wave distortion provides an additional indication of loading, consistent with and additive to Lasseter-Lopes' current- and voltage-based sensing, thereby increasing the reliability of overload detection. EX1003, ¶270. Without altering the operation of Lopes' load controllers or under-frequency relays, Baldassarre's approach could be another manner used to assess whether the microsources in the DER are overloaded, EX1021, ¶[0059], and to delay reconnection of lower-priority loads to avoid further stressing the power source, EX1003, ¶270. POSITA would have a reasonable expectation of success in the combination because it is simply "a combination of familiar elements according to known methods," *i.e.*, multiple methods of detecting overload conditions, to "yield predictable results," *i.e.*, identifying overloads with more accuracy. *KSR*, 550 U.S. at 401; EX1003, ¶¶270, 278-282.

Also, POSITA would have found it obvious to incorporate Baldassarre's multi-terminal transfer switch in Lasseter-Lopes, such as at the connection between

utility supply feeder and the two legs of the power bus (*e.g.*, utility supply feeder **710** and left and right legs of power bus **730** of FIG. 7), enabling switching between utility supply and the power bus legs. POSITA would have been motivated to use the multi-terminal transfer switch because it is one of few ways to connect utility supply to a power bus with a transfer switch. EX1003, ¶187. POSITA would also have been motivated knowing that this configuration would allow one leg of the bus to operate normally in connecting/disconnecting from the grid at the switch while allowing the other leg to be not used, either by being disconnected from the switch or not selected via the switch, such as for safe maintenance/construction of the leg and the microsources and loads connected to it. *Id.* POSITA would have had a reasonable expectation of success because it is simply “a combination of familiar elements according to known methods,” (applying a multi-terminal switch between multiple power paths), to “yield predictable results”—a switch operating to select power paths. *KSR*, 550 U.S. at 401; EX1003, ¶¶187-188.



EX1005, FIG. 7.

3. Claim Element Analysis

[24.] A power system as claimed in claim 21 wherein the AC power has a sine wave distortion parameter and in c) the coupling circuit is additionally responsive to the AC power sine wave distortion to performs at one or more of helping to prevent overloading; helping to mitigate overloading or helping to not increase the overloading of the power source.

As depicted in Lasseter, AC power is typically delivered in “sinusoidal” waves. EX1005, ¶[0101], FIGS. 10(a)-(b). POSITA would have understood, or at least found it obvious, that sinusoidal AC power will experience *sine wave distortion* because no AC power transmission is perfectly sinusoidal. EX1003, ¶[271-272].

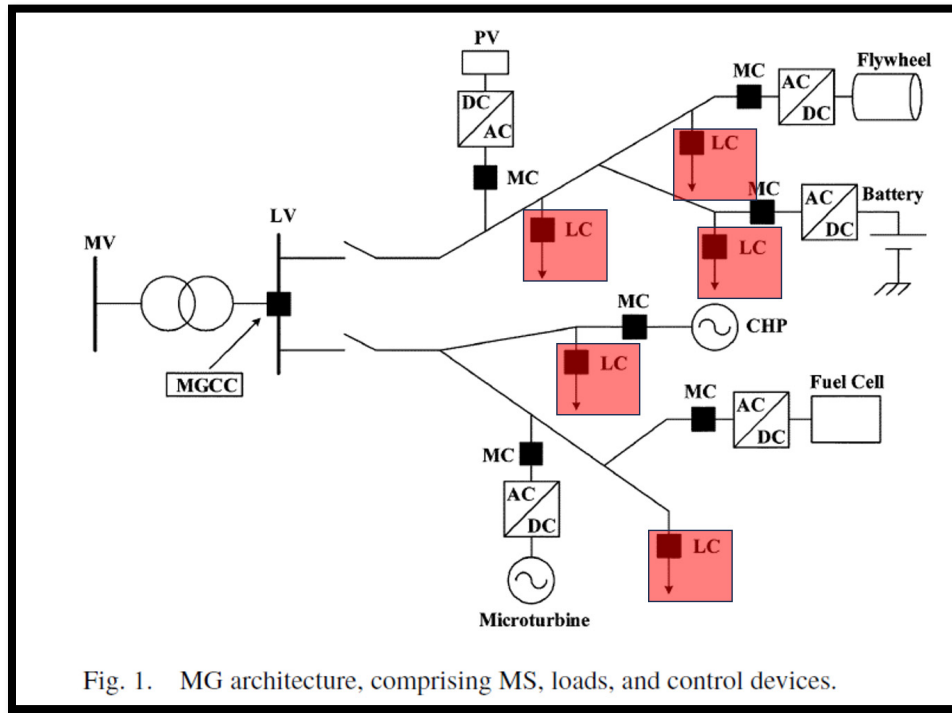
Baldassarre notes that its “control system may sense the power through other means as well, such as...sine waves...to determine when the auxiliary power source

is overloaded.” EX1021, ¶[0059], *supra* [17.b], Part III.A.1. Without affecting the operating principle of Lopes’ LCs or Lopes’ under-frequency relays, Lasseter-Lopes-Baldassarre could evaluate the sine waves to determine whether the DER’s microsources are overloaded, EX1021, ¶[0059], and delay reconnection of low-priority loads to help *prevent, mitigate, or not increase the overloading of the power source*.

[26.] A power system as claimed in claim 21 wherein in c) the coupling circuit comprises a contactor having input terminals for electrically connecting to the power source and output terminals for electrically connecting to the first load and providing AC power thereto when the contactor is closed, the coupling circuit further comprising a user interface whereby the user may configure the manner in which the coupling circuit responds to the frequency of the AC power to open the contactor thereby disconnecting the AC power from the first load.

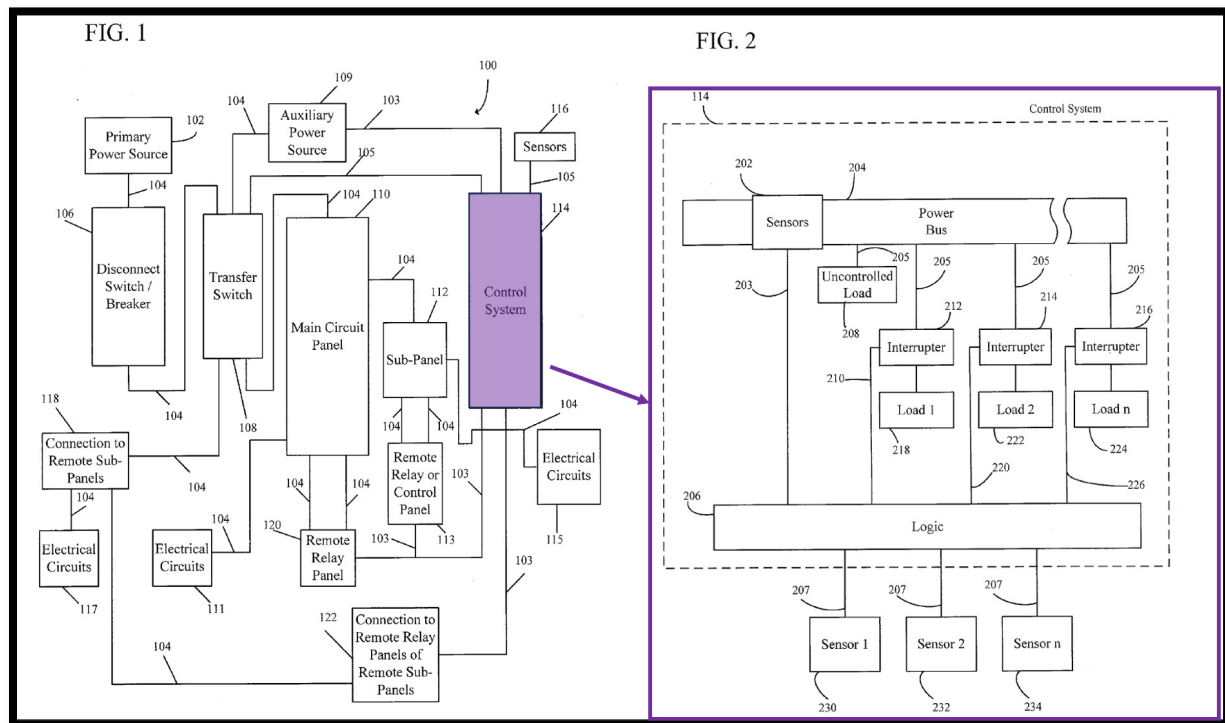
Supra Lasseter-Lopes [17.c]. Lopes depicts LCs (*coupling circuits*) being in line with loads. EX1011, 2, FIG. 1; EX1003, ¶¶273-77. Because “LC serve as interfaces to control loads through the application of an interruptibility concept,” EX1011, 2, POSITA would have understood or found obvious that LCs are, include or control *contactors* that can break the connection between the power source and load. EX1003, ¶273. Additionally, Lopes’ under-frequency relays (*coupling circuits*) allow for “temporary disconnection” of loads and are, or include, *contactors*. EX1011, 4. The ability to “disconnect” or “interrupt[]” indicates (or POSITA would at least found it obvious) that the contactors have *input terminals for electrically connecting* the microsource and *output terminals for electrically*

connecting to the loads, providing AC power when the contactor is closed. Indeed, as the LCs are depicted in FIG. 1, the power flowing through these physically wired terminals is what is being disconnected or interrupted. EX1003, ¶¶273-274.



Also POSITA would have found it obvious to implement Lopes' relays as, or in a similar manner to, Baldassarre's current interrupters. POSITA would have found motivation in Baldassarre as an example having "[d]etailed illustrative embodiments" and with stated advantages. EX1021, ¶[0046], ¶¶[0052]-[0056]; EX1003, ¶274. Baldassarre's FIG. 2 depicts control system 114, including *contactors* that it calls "current interrupters 212, 214, and 216" or "relays." EX1021, ¶[0090], ¶[0091], ¶[0086]; EX1003, ¶274. The interrupters/relays have *input terminals for electrically connecting* to a power source output and *output terminals*

for electrically connecting output power to loads **218**, **222** and **224**—“power bus **214** supplies power to interrupters **212**, **214**, and **216** via electrical wires **205**,” and interrupters **212**, **214**, and **216** “are in series electrical connection with loads **218**, **222** and **224**.” *Id.* A relay or interrupter connected in series between a power source output and a load has input and load terminals. EX1003, ¶274.

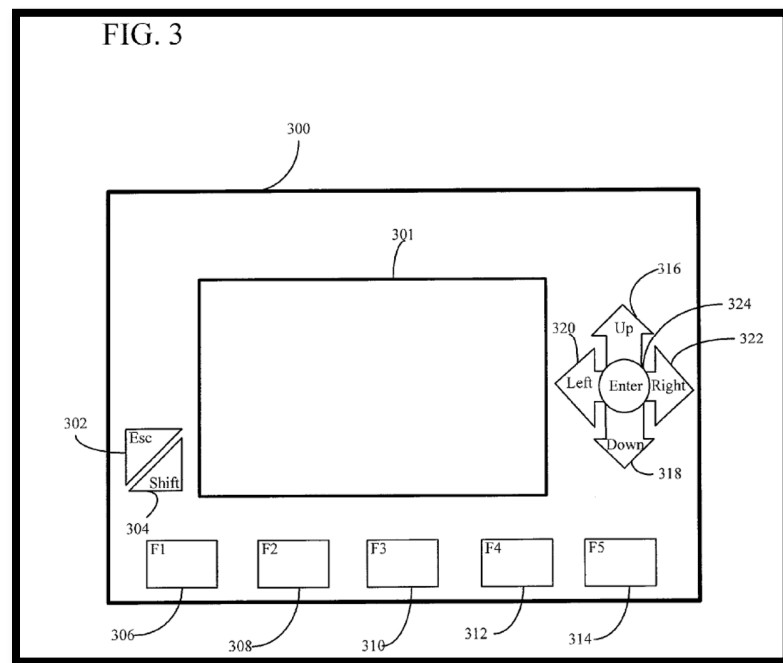


“[C]ontrol system **114** may be coupled to...at least one sub-panel via electrical wires **104**” (*control electrical terminal*). EX1021, ¶[0089]. POSITA would have understood or found obvious that these wires connect the relays to the processor-based control circuitry, enabling the controller to actuate the relays while minimizing wiring complexity. EX1003, ¶275. Indeed, via this terminal, control system **114** “may manage the controlled loads, which may be located in circuit

panels, sub-panels, and/or remote sub-panels via relays.” EX1021, ¶[0091], ¶[0086].

When shedding loads, “control system **114** sends a signal,” and relays start “breaking (e.g., deactivating the load) the connection from the auxiliary power source to the load.” EX1021, ¶[0094]. The same is true of Lasseter-Lopes-Baldassare.

As discussed, POSITA would have been motivated to use Baldassarre’s control system **114** and user interactive device **300** to control Lopes’ under-frequency relays’ operating parameters. *Supra* Part III.C.2; EX1003, ¶276. Baldassarre’s “user interactive device **300** is a graphical *user interface*.” EX1021, ¶[0097].



In the combination, “user interactive device **300** is used for controlling control system **114**.” EX1021, ¶[0076], ¶[0082]-[0083], FIGS. 1-3. “Control system **114** controls electrical circuits **111**, **115**, and **117** based on a predetermined priority list

established by a user.” EX1021, ¶[0086]. “Upon installation of the system, the user can program the microprocessor to shed and restore the various controlled loads in any desired sequence, according to the user’s priorities.” EX1021, ¶[0095]. By changing the order in which loads are shed, *the user may configure the manner in which the coupling circuit responds* to changes in loading, which are communicated to Lopes’ LCs and under-frequency relays as changes in *frequency of the AC power*. EX1011, 4, 6. Lasseter’s microsources all maintain constant frequency. EX1005, ¶[0113], ¶[0119], FIGS. 14-15, 17, 27. As discussed above, POSITA would have found it obvious to use Baldassarre’s user interface to set different frequencies at which each load would shed, thereby opening the respective relay, *disconnecting the AC power from the first load*. EX1003, ¶277.

C. [GROUND 1C] – Claims 35-36 Are Obvious Over Lasseter-Lopes-Tsukida

1. Tsukida et al. (EX1023)

Tsukida discloses “managing a power system” using an “underfrequency level detection unit” to determine the magnitude of frequency drop in a power system. EX1023, Abstract. When the “frequency drops resulting from power generation shortage,” Tsukida’s system “sheds loads [chosen] in advance” based on the degree of underfrequency, the time the system is in an underfrequency state, and the voltage output to the loads. *Id.* ¶¶[0029]-[0041], FIG. 1-2.

2. The Combination, Reasons to Combine, & Expectation of Success

Because POSITA would have recognized the benefits of combining Lasseter-Lopes with Tsukida, it would have been obvious. EX1003, ¶¶278-282, ¶369. POSITA would have been motivated to incorporate Tsukida's load-shedding into Lasseter-Lopes to improve the process for selectively shedding loads responsive to frequency deviations. EX1023, Abstract; EX1003, ¶278. In the Lasseter-Lopes combination, Lopes' LC and under-frequency relays shed loads responsive to frequency. *Supra* [66.c]. Lopes also indicates that there is a time "required for load shedding application." EX1011, 4. But Lopes is silent as to the particular algorithm by which those LCs and relays operate. EX1003, ¶278. Thus, POSITA would have found it obvious to implement load-shedding like Tsukida's in Lasseter-Lopes. EX1003, ¶¶278-282, ¶369.

First, while Lopes refers to LC and under-frequency relays for load shedding at certain thresholds, EX1011, 4-5, Lopes only generally discusses its load-shedding algorithm. Tsukida supplements Lopes by teaching a specific underfrequency load shedding and the associated logic for so doing. EX1023, ¶¶[0029]-[0042], ¶¶[0046]-[0050]-[0057], ¶¶[0060]-[0068], ¶¶[0075]-[0080], ¶¶[0082]-[0090]. POSITA implementing Lasseter-Lopes would have looked to Tsukida to determine appropriate operations for Lopes' under-frequency relays to perform. EX1003, ¶279. Indeed, applying Tsukida's load shedding in Lasseter-Lopes would simply be "a

combination of familiar elements according to known methods,” *i.e.*, applying load shedding for its intended purpose of controlling a load, to “yield predictable results,” *i.e.*, load shedding based on frequency, voltage and time. *KSR*, 550 U.S. at 401; EX1003, ¶279.

Second, POSITA would have been motivated to incorporate Tsukida’s load shedding in Lasseter-Lopes because it would avoid false-positives. EX1003, ¶280. In particular, Tsukida distinguishes between under-frequency caused by an overload and that caused by an “out-of-step condition,” only shedding loads in the former case. EX1023, ¶¶[0038]-[0039], ¶¶[0064]-[0065]. While Lopes discusses shedding loads based on frequency deviations at certain thresholds, EX1011, 4-5, Lopes does not disclose any mechanism to prevent unnecessary shedding when the system is merely “out of step.” Incorporating Tsukida’s load shedding would improve Lasseter-Lopes by preventing false-positive sheds and ensuring load shedding occurs only under true overload conditions. EX1003, ¶280.

Third, POSITA would have been motivated to incorporate Tsukida because it provides staggered load shedding based on progressive time intervals. EX1003, ¶281. Lopes refers to determining that an underfrequency exists for a certain time intervals before load shedding occurs, EX1011, 4-5, but Lopes does not discuss what exemplary time intervals. Tsukida supplies this information and gives exemplary timing schemes. EX1023, ¶[0037], ¶¶[0047]-[0049]. For example, Tsukida provides

exemplary tables of frequency deviations and corresponding time intervals:

	SET VALUE Hz	TIME Sec	LOAD TO BE SHED %
L1a L1b L1c L1d	48.5	0.5	4
		1.0	4
		2.0	4
		3.0	4
		4.0	4
		5.0	4
		6.0	4
		7.0	4
L2a L2b L2c L2d	48.0	0.2	8
		0.5	8
		1.0	4
		2.0	4
		3.0	4
		4.0	4

EX1023, FIG. 3, ¶¶[0030]-[0038], ¶¶[0045]-[0050]. Tsukida thus supplies concrete implementation guidance that would enhance the performance of the Lasseter-Lopes system. EX1003, ¶281.

POSITA would have reasonably expected success in the above-discussed combination of Tsukida and Lasseter-Lopes. EX1003, ¶281. Lopes already discloses using processors to execute a load-shedding strategy. Tsukida provides the strategy for determining to shed loads and teaches several additional advantages. Thus, the result of the Lasseter-Lopes-Tsukida combination would have been predictable to POSITA, and POSITA would have expected it to work. *Id.*

3. Claim Element Analysis

[35.] An electronic power system as claimed in claim 34 wherein in d) the second coupling circuit is responsive to the at least one AC power source timely operating parameter which is a voltage of the AC power.

Lasseter-Lopes discloses a plurality of coupling circuits. *Supra* Lasseter-Lopes [34.c]. In the combination, Tsukida teaches including an “underfrequency load shedding protection system **11a** [that] comprises an input processing unit **19a** that receives the voltage **V1a** detected by the voltage transformer **38a**” (***timely operating parameter which is voltage of the AC power***). EX1023, ¶[0028]. From the voltage parameter, *supra* [19], the system “judges the underfrequency level” and “outputs a load shedding command,” thereby, it is ***responsive to the at voltage***. *Id.*; EX1003, ¶¶283-85.

Additionally, Tsukida’s “input processing unit **19a** receives the voltage **V1a**...and at the same time, obtains a voltage value **Va** and outputs it to the underfrequency level detection unit.” *Id.*, ¶[0029]. The detection unit ***responds to the voltage of AC power*** by “output[ting] the logical value ‘1’ when the voltage value **Va** of the voltage **V1a** is equal to or less than a predetermined value.” The value is incorporated into circuitry logic to determine whether to “output[] the load shedding commands **a1** to **a4** to loads **A1** to **A4**.” *Id.*, ¶¶[0030]-[0040], ¶¶[0061]-[0071], ¶¶[0081]-[0090]. The system uses voltage to “distinguish[] the drop phenomenon of the power system frequency **f** due to the out of step from the drop

phenomenon of the power system frequency f due to the power generation shortage of the power system” to ensure that loads are not shed “in the case of the drop phenomenon of the power system frequency f due to the out of step.” *Id.*, ¶¶[0038]-[0039], ¶¶[0064]-[0065]. The same would be true of Lassetter-Lopes-Tsukida.

Additionally, Tsukida also teaches a “V/F relay that operates when the ratio (V/F) of the generator terminal voltage to the power system frequency exceeds a predetermined value.” *Id.*, ¶[0093]. When the “voltage rises in a state in which the power system frequency f has dropped,” the V/F relay “parallel[s]” the generator “off the power system” to create a “power generation shortage of the entire power system.” *Id.* POSITA would have understood, or found obvious, that the V/F relay must detect voltage independent of frequency to determine the V/F ratio. EX1003, ¶¶283-85. Further, POSITA would have understood, or found obvious, that the V/F relay decouples loads from the source when it “parallel[s] the generator” to “short[] the entire power system.” *Id.*; EX1023, ¶[0093]. The same would be true of Lassetter-Lopes-Tsukida.

[36.] An electronic power system as claimed in claim 35 wherein in d) the second coupling circuit is responsive to a voltage of the AC power increasing above a known value.

In the combination, Tsukida teaches an “undervoltage relay 33a” that signals to shed load “when the voltage...is equal to or less than a determined value.” EX1023, ¶[0033], ¶[0064]. If not less than the determined value (***above a known***

value), the “undervoltage relay[] 33a” has “not detected any undervoltage.” *Id.*, ¶¶[0035], ¶[0061], ¶[0071], ¶[0090]. When the voltage *increases* above the determined value, load is not shed (*responsive to the voltage of AC power increasing above a known value*). *Id.*, ¶¶[0064]-[0068], ¶¶[0071]-[0072], ¶¶[0084]-[0091]. The same would be true of Lasseter-Lopes-Tsukida. EX1003, ¶¶286-87.

Alternatively, Lopes already discloses that “frequency/active power droop” causes load shedding. EX1011, 5-6. Lopes uses under frequency relays (LCs) to respond to “the amplitude of the frequency deviation”—disconnecting loads when voltage is low and reconnecting when power is restored. EX1011, 2, 4, 5; *supra* [19], [22]. Because Lopes teaches its disconnection is “temporary,” POSITA would have known or found it obvious that loads in Lopes are reconnected when voltage returns above a known value, meaning the circuit is *responsive to a voltage increasing above a known value*. EX1003, ¶¶286-287.

IV. CONCLUSION

The Challenged Claims are unpatentable.

V. FEES

Petitioner authorizes charge of fees to Deposit Account 06-1050.

VI. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8(a)(1)

A. Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1)

Generac Power Systems, Inc. is the real party-in-interest.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

The '857 Patent is the subject of civil action *PSLC LLC v. Generac Power Systems, Inc.*, 2-24-cv-01270 filed October 7, 2024. Petitioner is not aware of any disclaimers, reexamination certificates, or IPR petitions addressing the '857 Patent.

C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel.

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D. Service Information

Please address all correspondence and service to the address listed above.

Petitioner consents to electronic service by email at IPR58936-0002IP2@fr.com

(referencing No. 58936-0002IP2 and cc'ing PTABInbound@fr.com).

Respectfully submitted,

Dated October 10, 2025

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(Control No. IPR2026-00023)

CERTIFICATION UNDER 37 CFR § 42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for Inter Partes Review totals 11,139 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

Dated October 10, 2025

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) et seq. and 42.105(b), the undersigned certifies that on October 10, 2025, a complete and entire copy of this Petition for Inter Partes Review and all supporting exhibits were provided by Federal Express, to the Patent Owner, by serving the correspondence address of record as follows:

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