

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ECOBEE TECHNOLOGIES ULC and GOOGLE LLC,
Petitioner,

v.

ECOFACITOR, INC.,
Patent Owner.

IPR2022-00969¹
Patent 8,596,550 B2

Before SCOTT B. HOWARD, PAUL J. KORNICZKY, and
BRENT M. DOUGAL, *Administrative Patent Judges*.

KORNICZKY, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Dismissing Motion For Collateral Estoppel
35 U.S.C. § 318(a)

¹ IPR2022-00355 (Google LLC) has been joined with IPR2022-00969.
Paper 17.

I. INTRODUCTION

ecobee Technologies ULC and Google LLC (“Petitioner”) filed a Petition for *inter partes* review of claims 17–23 of U.S. Patent No. 8,596,550 B2 (Ex. 1001, “the ’550 patent”). Paper 2 (“Pet.”). EcoFactor, Inc. (“Patent Owner”) filed a Preliminary Response opposing institution. Paper 7.

We instituted an *inter partes* review of claims 17–23 of the ’550 patent on all grounds of unpatentability alleged in the Petition. Paper 8 (“Institution Decision” or “Inst. Dec.”).

After institution of trial, Patent Owner filed a Response (Paper 12, “PO Resp.”), Petitioner filed a Reply (Paper 15, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 18, “PO Sur-reply”).

An oral hearing was held on August 18, 2023, and the record contains a transcript of this hearing. Paper 28 (“Tr.”). After the hearing, Petitioner and Patent Owner filed Supplemental Briefs Regarding Collateral Estoppel. Papers 25, 27.

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 17–23 of the ’550 patent are unpatentable. Petitioner’s motion for collateral estoppel is dismissed as moot.

II. BACKGROUND

A. *Related Proceedings*

As required by 37 C.F.R. § 42.8(b)(2), Petitioner and Patent Owner identify the judicial or administrative matters that would affect or be affected

by a decision in this proceeding. Petitioner and Patent Owner state the '550 patent is the subject matter of:

- (1) *Emerson Electric Co. v. EcoFactor, Inc.*, 1-21-cv-00317 (D. Del. March 1, 2021);
- (2) *Google, LLC v. EcoFactor, Inc.*, 3-21-cv-01468 (N.D. Cal. March 1, 2021);
- (3) *ecobee, Inc. v. EcoFactor, Inc.*, 1-21-cv-00323 (D. Del. March 2, 2021);
- (4) *Carrier Global Corp. v. EcoFactor, Inc.*, 1-21-cv-00328 (D. Del. March 3, 2021);
- (5) *EcoFactor, Inc. v. Google, LLC*, 6-22-cv-00350 (W.D. Tex. April 1, 2022);
- (6) *Certain Smart Thermostat Systems, Smart HVAC Systems, Smart HVAC Control Systems, And Components Thereof*, Inv. No. 337-TA-1258 (April 4, 2022) (“*Certain Smart Thermostat Systems*”); and
- (7) *ecobee Technologies ULC v. EcoFactor, Inc.*, IPR2022-00983. Pet. 76–77; Paper 5, 1.

B. *Overview of the '550 Patent (Ex. 1001)*

The '550 patent is titled “System, Method and Apparatus for Identifying Manual Inputs to and Adaptive Programming of a Thermostat.” Ex. 1001, code (54). The '550 patent describes a system and methods for controlling climate control systems such as heating, ventilation, and air conditioning (HVAC) systems. *Id.* at code (57).

According to the '550 patent, programmable thermostats, which control HVAC systems, offer two types of advantages over non-

programmable devices. Ex. 1001, 1:18–20. First, “programmable thermostats can save energy . . . because they automate the process of reducing conditioning during times when the space is unoccupied, or while occupants are sleeping, and thus reduce energy consumption.” *Id.* at 1:21–25. Second, “programmable thermostats can also enhance comfort” and “allows homeowners to anticipate [a] desired result by programming a pre-conditioning of the home.” *Id.* at 1:26–38. For example, “if the homeowner gets out of bed at 7 AM, setting the thermostat to change from the overnight setpoint of 64 degrees to 70 at 6 AM can make the house comfortable when the consumer gets up.” *Id.* at 1:38–41.

The ’550 patent, however, states “all of the advantages of a programmable thermostat depend on the match between the preferences of the occupant and the actual settings employed.” Ex. 1001, 1:45–47. “If the temperatures programmed into a thermostat do not accurately reflect the preferences of the occupants, those occupants are likely to resort to manual overrides of the programmed settings.” *Id.* at 1:64–67. “The need to correct the ‘mistakes’ of the thermostat is likely to annoy many users” and, “because people tend to overshoot the desired temperature when they make such manual changes, these overrides are likely to result in excessive heating and cooling, and thus unnecessary energy use.” *Id.* at 1:67–2:5. “That is, if a person feels uncomfortable on a summer afternoon when the setting is 73 degrees, they are likely to change it to 68 or 69 rather than 71 or 72 degrees, even if 72 degrees might have made enough of a difference.” *Id.* at 2:5–8.

Thus, the ’550 patent explains that it would be desirable to have a system and method which may adapt to the occupants’ manual temperature changes and incorporate the information contained in such gestures into

long-term programming and which accounts for both outside weather conditions and the thermal characteristics of individual homes in order to improve the ability to dynamically achieve the best possible balance between comfort and energy savings. Ex. 1001, 2:9–17. To achieve these goals, the '550 patent discloses systems and methods for incorporating manual changes to the setpoint for a thermostatic controller into long-term programming of the thermostatic controller. *Id.* at code (57). It discloses servers 106 which log the temperature readings from inside each house and the timing and duration of air conditioning cycles, and databases 300 which contain a history of the thermal performance of each house. *Id.* at 5:21–25. According to the '550 patent, this performance data allows “server 106 to calculate an effective thermal mass for each such structure — that is, the speed with the temperature inside a given building will change in response to changes in outside temperatures.” *Id.* at 5:22–29. Because the server will also log these inputs against other inputs including time of day, humidity, etc., the '550 patent explains that “the server will be able to predict, at any given time on any given day, the rate at which inside temperature should change for given inside and outside temperatures.” *Id.* at 5:30–34.

According to the '550 patent, this performance data also permits server 106 to calculate and automate setpoints and schedule future set point changes to reduce energy consumption, etc. Ex. 1001, 5:54–6:3; *see also*, e.g., *id.* at 5:63–6:1 (stating “for time0 the setpoint as scheduled by server 106 according to the standard setpoint programming (S0), and for time0 the setpoint as scheduled by server 106 according to the standard setpoint programming (S-1). In step 1004, the server retrieves any additional

automated setpoint changes C that have been scheduled for the thermostat by server 106.”).

The ’550 patent explains that its system compares “the actual setpoint at a given time for the thermostatic controller to an expected setpoint for the thermostatic controller in light of the scheduled programming” and “a determination is then made as to whether the actual setpoint and the expected setpoint are the same or different.” Ex. 1001, code (57). “Furthermore, a manual change to the actual setpoint for the thermostatic controller is compared to previously recorded setpoint data for the thermostatic controller.” *Id.* “At least one rule is then applied for the interpretation of the manual change in light of the previously recorded setpoint data.” *Id.*

C. *Illustrative Claim*

As mentioned above, Petitioner challenges claims 17–23 of the ’550 patent. Claim 17, the only independent claim, is reproduced below.² Ex. 1001, 9:26–10:17.

[17a] An apparatus for detecting manual changes to the set point for a thermostatic controller comprising:

[17b] at least a programmable communicating thermostat;

[17c] at least a remote processor;

² For ease of reference, we use Petitioner’s claim numbering scheme, added in brackets. *See* Pet. 21–43.

[17d] at least a network connecting said remote processor and said communicating [thermostat]³;

[17e] at least a database comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure;

[17f] computer hardware comprising one or more computer processors configured to use the stored data to predict a rate of change of temperatures inside the structure in response to changes in outside temperatures;

[17g] the one or more computer processors configured to calculate scheduled setpoint programming of the programmable communicating thermostat for one or more times based on the predicted rate of change, the scheduled programming comprising one or more automated setpoints;

[17h] at least a database that stores the one or more automated setpoints associated with the scheduled programming for said programmable communicating thermostat;

[17i] at least a database that stores actual setpoint programming of said programmable communicating thermostat; and

[17j] the one or more computer processors configured to compare the one or more automated setpoints associated with said scheduled setpoint programming with said actual setpoint programming.

³ Petitioner interprets “said communicating” to be the communicating thermostat. Pet. 26 n.3. Patent Owner does not contest Petitioner’s position. See PO Resp.

D. *Evidence and Asserted Grounds*

Petitioner relies upon the following evidence:

(1) U.S. Patent Publication 2004/0117330, published June 17, 2004 (Ex. 1004, “Ehlers”);

(2) U.S. Patent Publication 2005/0040250, published February 24, 2005 (Ex. 1005, “Wruck”);

(3) U.S. Patent 8,374,725 B1, issued February 12, 2013 (Ex. 1006, “Ols”); and

(4) U.K. Patent Application GB 2432016 A1, published September 5, 2007 (Ex. 1007, “Boait”).

Petitioner submits two declarations from David M. Auslander. Exs. 1002, 1023. Patent Owner submits a declaration from Dr. John A. Palmer. Ex. 2006.

Petitioner challenges the patentability of claims 17–23 of the ’550 patent claims on the following grounds (Pet. 10–11):

Ground	Claim(s) Challenged	35 U.S.C. § ⁴	Reference(s)/Basis
1	17–23	103(a)	Ehlers, Wruck
2	17–23	103(a)	Ols, Boait, Wruck

We briefly summarize the prior art references below.

⁴ The relevant sections of the Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284 (Sept. 16, 2011), took effect on March 16, 2013. Because the ’550 patent claims priority to an application filed before this date, our citations to 35 U.S.C. § 103 in this Decision are to its pre-AIA version. Our decision is not impacted, however, by which version of the statute applies.

1. *Overview of Ehlers (Ex. 1004)*

Ehlers is a U.S. patent application titled “System and Method for Controlling Usage of a Commodity.” Ex. 1004, code (54). Ehlers describes a system and method for managing delivery of energy from a distribution network to a building or other site. *Id.* at code (57). Ehlers’ system collects and stores information relevant to the temperature and other HVAC conditioning of a building. *Id.* ¶ 88.

Ehlers’ thermostat contains various scheduled temperature setpoints for the HVAC system, which are manually changeable by a user. Ex. 1004 ¶¶ 12, 116, 153–160. A user can also “override” a scheduled setpoint. *Id.* ¶¶ 116, 156, Fig. 4C.

Ehlers’ system tracks and learns the thermal gain characteristics of the home. In order to predict how long it will take for the HVAC system to heat or cool the building from one setpoint to another, it uses the rate of change in temperatures by calculating the rate at which inside temperature changes at any given outside temperature (“thermal gain rate”) for a given setpoint. Ex. 1004 ¶¶ 253–254, 256, 295, Fig. 3D. Ehlers uses this thermal gain rate to “compute[] the required effective set point offset needed to keep the HVAC cycle run time at [a] specified trigger level.” *Id.* ¶ 256. By utilizing the effect that the thermal gain rate has on HVAC run time, Ehlers’ system determines what future setpoint would minimize run time. *Id.*

Ehlers also teaches detecting and implementing a user’s manual changes to a setpoint. Ex. 1004 ¶¶ 242 (“the system 3.08 manages comfort for the customer site 1.04 by learning from the user’s inputs or adjustments to the system 3.08 to change or modify indoor air temperature”), 243 (controls are “modified as needed based on the user’s changes to the set

point at the thermostat 1.30D” and a “control algorithm [] learn[s] the user’s individual preferences and over time, eliminate[s] the need for the site 1.04 occupant to make any changes”).

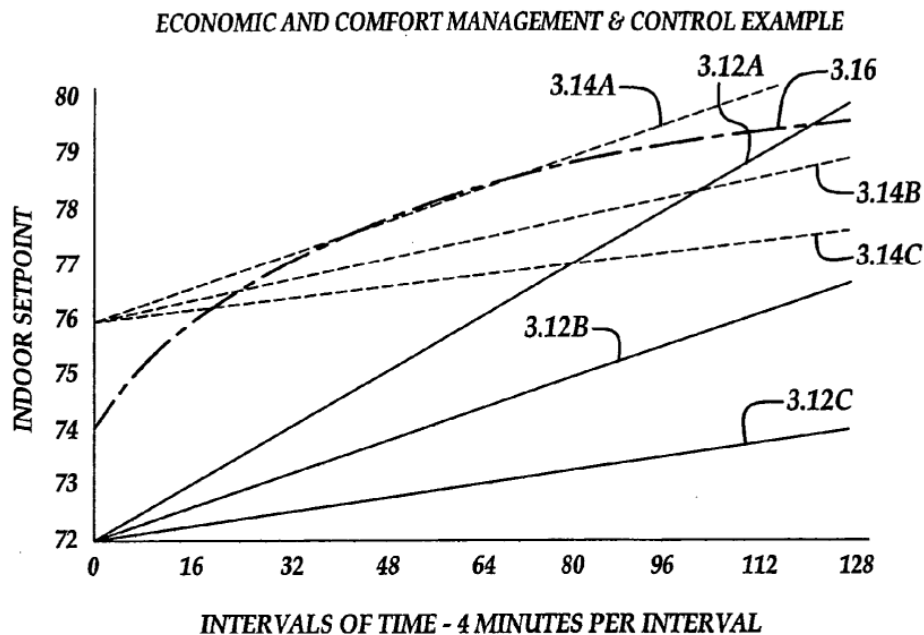
2. Ehlers and “Thermal Gain Rate”

Underlying a large portion of the dispute between the parties is what does the phrase “thermal gain rate” in Ehlers refer to. *See* PO Resp. 1, 13–21; Pet. Reply 3–12; Tr. 5:14–22, 6:8–16, 10:16–11:21 (Petitioner); Tr. 43:4–44:7 (Patent Owner). Accordingly, we address this dispute before applying the prior art to the claim limitations.

Petitioner argues that “thermal gain rate” in Ehlers is a measure of the rate of change of inside temperature. *See* Pet. 30–37; Pet. Reply 3–12; Tr. 6:10–12. According to Petitioner, it is measured when the HVAC is off. *See* Ex. 1023 ¶ 13; Pet. Reply 7 (Ehler’s “Fig. 3D shows the tracking of inside temperatures as they approach warmer outside temperatures, when the system cycles off from given setpoints (*i.e.*, from a particular setpoint, the system switches off and the inside temperature begins to rise).”). For support of its understanding, Petitioner focuses on Ehlers Figures 3D, 3E, and 3G and the description in paragraphs 253 through 256.

Patent Owner argues that “thermal gain rate” in Ehlers does not refer to a measure of the rate of change of the inside temperature. *See* PO Resp. 1, 13–21; PO Sur-reply 4–14. Instead, Patent Owner argues that it is the rate that energy is absorbed. *See* PO Resp. 14 (citing Ex. 2006 ¶ 38); PO Sur-reply 4; Tr. 44:1–4. For support of its understanding, Patent Owner, like Petitioner, focuses on Ehlers Figures 3D, 3E, and 3G and the description in paragraphs 253 through 256.

We begin our analysis with Ehlers Figure 3D, reproduced below.



Ehlers Figure 3D is a graph illustrating “an exemplary economic and comfort management control strategy.” Ex. 1004 ¶ 29. Figure 3D shows a graph showing the indoor set point (temperature) versus time.

The first set point for which data is available is 72 degrees F. The three trends illustrated as lines 3.12A, 3.12B, and 3.12C plot the thermal rate of gain in the site 1.04 for different outside temperatures. On the day represented by line 3.12A the outside temperature was 99 degrees F. On the day represented by line 3.12B, the outside temperature was 90 degrees F. On the day represented by line 3.12C, the outside temperature was 77 degrees F. The next set point for which data is illustrated is the set point of 76 degrees F. The three trends shown as lines 3.14A, 3.14B, and 3.14C illustrate the thermal rate of gain in the home 2.18 for the same outside temperatures plotted in the 3.12A, 3.12B, 3.12C data points. Ex. 1004

¶ 253. Ehlers describes this graph as a “thermal gain table” and it “show[s] the impact the set point versus outside temperature differential has over the thermal gain rate in the home.” Ex. 1004 ¶ 253. In the scenario illustrated in Figure 3D, the HVAC system is off. Ex. 1023 ¶¶ 13–15; Ex. 2006 ¶ 62.

There appears to be little dispute between the parties as to what is being shown in Figure 3D. Both experts testify that “[t]he lines appear to reflect temperatures rather than rates of energy increase.” Ex. 2006 ¶ 39; *see also* Ex. 1023 ¶¶ 13–14. We agree with Petitioner that “the ‘rate of thermal gain,’ or ‘thermal gain rate,’ in Ehlers is ‘the rate of change in temperature inside the structure (for a given outside temperature), which is depicted by the slope of the lines depicted in Figure 3D,’” which is “the difference between inside temperature measurements divided by the span of time between the measurements.” Ex. 1002 ¶ 101 (citing Ex. 1004 ¶¶ 253, 256, Fig. 3E, Fig. 3G (depicting use of “thermal gain rate per hour”)). “[T]he data in Fig 3D illustrates the thermal gain rate from a specific starting temperature and for a single, specific outside temperature when the HVAC system is OFF.” Ex. 2006 ¶ 66; *see also* Ex. 1023 ¶¶ 13–14. Stated differently, Figure 3D graphs the change of temperature over time based on a given starting internal temperature (set point) and an external temperature. Because Ehlers states that these lines “plot the thermal rate of gain” and “illustrate the rate of thermal gain” (Ex. 1004 ¶ 253), a person having ordinary skill in the art would recognize that the slope of the line is the thermal gain rate. *See* Ex. 1002 ¶ 101. That is, the slope of the line, which represents the thermal gain rate, is the rate of change of the internal temperature over time during periods in which the HVAC is turned off.

Ex. 1023 ¶¶ 11, 13–14. Therefore, Petitioner’s definition of thermal gain rate is consistent with Ehlers Figure 3D.

Petitioner’s definition is also consistent with the description of “thermal gain rate” elsewhere. For example, Ehlers states that Figure 3F shows “the rate of thermal gain per hour would be set at 3 degrees F. per hour.” Ex. 1004 ¶ 255. That is, Ehlers specifically states that thermal rate gain is a measure of the change of internal temperature over time. *See* 1004 ¶ 255; Ex. 1023 ¶ 10. And, because it is discussing an increase in the internal temperature, this means that the HVAC is cycled off at that time. *See* Ex. 1023 ¶ 13–14.

We cannot reconcile Patent Owner’s definition of thermal rate gain with the description of Figure 3D or the example in paragraph 255. As discussed above, Ehlers states that Figure 3D “plot[s] the thermal rate of gain” and “illustrate[s] the rate of thermal gain.” Ex. 1004 ¶ 253. As the lines plot temperature over time, the lines do not show the rate that energy is absorbed over time. Instead, as discussed above, it shows the rate of temperature change over time while the HVAC system is off. *See also* Ex. 1002 ¶¶ 101; Ex. 1023 ¶¶ 13–14.

Moreover, Patent Owner’s definition is inconsistent with the statement in paragraph 255 discussed above, which clearly equates the thermal gain rate with a measure of change of temperature over time. *See* Ex. 1004 ¶ 255 (“For the maximum savings setting, the dead band in this example would be raised to 3 degrees F. and the rate of thermal gain per hour would be set at 3 degrees F. per hour.”).

Accordingly, we determine that “thermal gain rate” means the rate of temperature change over time while the HVAC system is off.

Patent Owner makes a number of arguments disputing Petitioner's understanding of thermal gain rate. For the reasons set forth below, we disagree with those arguments.

Patent Owner argues that “the phrase ‘thermal gain rate’ is well understood by a [person having ordinary skill in the art] to be the rate at which energy is absorbed.” PO Resp. 14 (citing Ex. 2006 ¶ 38). But the only evidence Patent Owner cites is the conclusory statement of Dr. Palmer repeating the Response without any citation. *See* Ex. 2006 ¶ 38. Because Dr. Palmer's testimony does not provide any evidentiary support, we find it not credible and give it no weight. *See Xerox Corp. et al. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15 (PTAB Aug. 24, 2022) (precedential) (holding that a conclusory declaration is entitled to little weight when it is a substantial restatement of the party's arguments without any additional supporting evidence or reasoning); 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”). Moreover, it is inconsistent with the use of “thermal gain rate” discussed in paragraph 255, which clearly uses the phrase to refer to the rate of temperature change over time.

Patent Owner also argues that its understanding of thermal gain rate in Ehlers is consistent with Ehlers Figures 3D, 3E, and 3G. *See* PO Resp. 14–21; PO Sur-reply 3–11. We agree that there is some support for Patent Owner's understanding in Figures 3E and 3G. However, we cannot look at Figures 3E and 3G in isolation. Instead, we must also consider whether Patent Owner's interpretation is consistent with Ehlers Figure 3D. And, for the reasons discussed above, it is not. Instead, as Petitioner and Dr. Auslander persuasively argue, Figure 3D clearly demonstrates that

thermal gain rate in Figure 3D refers to the rate of change of the internal temperature.

Patent Owner also argues “if ‘thermal gain rate’ meant ‘rate of change of temperature,’ then the illustrations of Fig. 3E and Fig. 3G would indicate that the temperature was continuously increasing by 1 to 3 degrees per hour, for a total of nearly 42 [degrees] F. over the 24-hour period, regardless of the operation of the HVAC.” PO Resp. 20 (citing Ex. 2006 ¶ 44); *see also* PO Resp. 16–17 (arguing thermal gain rate in Figure 3E cannot be a change of internal temperature because the temperature does not change); PO Resp. 17–20 (making a similar argument with regard to Figure 3G); PO Sur-reply 6–11. According to Patent Owner, that is “directly contrary to Ehlers[’] own usage.” PO Resp. 20.

Patent Owner’s argument does not account for how a HVAC system operates. During normal operation, an HVAC system cycles on and off to maintain a fairly constant inside temperature. Ex. 1023 ¶ 20 (citing Ex. 1022, 20:2–22:22, 23:19–22; 107:16–109:18). As Dr. Auslander explains, “if the setpoint is 72 degrees F., the HVAC system may cycle on when the temperature rises to 73 degrees F., stay on until the temperature drops to 71 degrees F., cycle off, and then repeat that cycle when the temperature again reaches 73 degrees F.” *Id.* A person of ordinary skill in the art would have understood, while the temperature is kept fairly constant (within a narrow band) the system is cycling on and off, and during the off cycle, the temperature inside the structure rises at approximately the predicted rate of thermal gain. *Id.* ¶ 21.

Similarly, a person of ordinary skill in the art would have understood that, in Ehlers’ Figs. 3E and 3G, the thermal gain rate is that “learned”

information that predicts what will happen at any given point of time for a given setpoint and a given outside temperature, when the system cycles off. Ex. 1023 ¶ 24 (citing Ex. 1004 ¶¶ 253–256). Patent Owner’s suggestion that this thermal gain rate would indicate a continual increase in inside temperature over 24 hours straight, even with the HVAC operating normally to maintain the setpoint, is not logical given the disclosure in Ehlers. *Id.* The skilled artisan would know that normally operating HVAC systems cycle on and off such that the inside temperatures is kept within a narrow band, which is also explicitly described in Ehlers with respect to Figs. 3E and 3G. *Id.* (citing Ex. 1004 ¶¶ 254–256; Ex. 1001, 5:9–12 (stating that when an HVAC system “turns on[] the inside temperature stays constant”)). Ehlers’ Figures 3E and 3G show that the system is operating normally (*i.e.*, cycling on and off at runtime rates), as opposed to staying on 100% of the time, which would happen if the inside temperature was continuously rising. *Id.*

Accordingly, for the reasons set forth above, we find, consistent with Petitioner’s understanding, that Ehlers uses the term “thermal gain rate” to mean the rate of change of inside temperature when the HVAC system is off.

3. *Overview of Wruck (Ex. 1005)*

Wruck is a U.S. patent application titled “Transfer of Controller Customizations.” Ex. 1005, code (54). Wruck describes a system that allows a personal digital assistant (PDA) or wireless device to control, configure, set, and adjust programmable thermostats of air management systems. *Id.* at code (57), ¶¶ 2–5. It permits the user to control the

temperature setpoint and temporarily override scheduled temperature setpoints. *See, e.g., id.* ¶¶ 5, 14–15, 104. If the user’s temporary setpoint is entered, and the difference between the temporary setpoint and other temperature setpoints is not equal to zero, the temporary setpoint may be displayed. *Id.* at Table 28, ¶ 110.

4. *Overview of Ols (Ex. 1006)*

Ols is a U.S. patent titled “Climate Control.” Ex. 1006, code (54). Ols describes a climate control/HVAC system using a thermostat. *Id.* at 3:16–34, Fig. 1A. Ols’s thermostats connect to controllers, which connect over networks to a server. *Id.* Ols’s system collects and stores information relevant to conditioning a building, including the indoor temperature (*id.* at 6:30–31), and outdoor temperature (*id.* at 19:1–2). Ols’s thermostat uses various temperature setpoints, which may be scheduled to reflect desired temperatures at different times. *Id.* at 23:1–17, 31:33–36. A user may manually change these setpoints and input a user-desired temperature. *Id.* at 21:5–17 (a “user may input a value representing a new desired temperature,” where “the new desired temperature value (or another new set point) may be saved by a key press to a button”), 31:29–37 (“User desired temperature 1022 is the temperature that was input by the user without any modification.”).

Ols also teaches analyzing historical loads needed to change the temperature and climate of different rooms in order to enable businesses to manage their energy consumption more efficiently. Ex. 1006, 11:53–56. For example, “temperature inputs are analyzed, and the control algorithm learns the appropriate current action to take based on evaluations of what has

happened in the past” and “learning from historical data, the adjustment to the parameter may be computed to take into account the slower temperature response as a result of the higher load that is normally in the room.” *Id.* at 12:6–9, 12:27–30. Ols teaches that its setpoint temperature is a “computed value to which the temperature of the room is to be set,” and that this calculated setpoint temperature may be different from the user desired temperature, based on environmental conditions, “in order to conserve energy and/or to better meet other needs of the system or of that location.” *Id.* at 31:29–42.

5. *Overview of Boait (Ex. 1007)*

Boait is a U.K. patent application titled “Electronic Control Units for Central Heating Systems.” Ex. 1007, code (54). Boait describes an “automatic electronic control unit for controlling the operation of a central heating system where the time settings are determined automatically from a detection of the user's activity and lifestyle habits.” *Id.* at code (57). Boait’s system includes “a manual temperature setting device that can be manually activated by an operator to modify at least one of the first and second temperature profiles.” *Id.* at 6. Boait further discloses “[t]he specific thermal capacity of the house Q (Joules/°C) and the specific heating load L (Watts/°C of temperature difference between the inside and outside of the house) are calculated by the electronic control unit from the gradient of the fall in temperature overnight, and the rise in temperature when the central heating boiler is supplying heat” *Id.* at 20.

III. ANALYSIS

A. *Legal Standards*

Petitioner bears the burden of persuasion to prove unpatentability, by a preponderance of the evidence, of the claims challenged in the Petition. 35 U.S.C. § 316(e). This burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

As mentioned above, Petitioner’s challenge is based on obviousness. Pet. 10–11. A claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved based on underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in the record, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. *Level of Ordinary Skill in the Art*

The level of ordinary skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). The person of ordinary skill in the art is a hypothetical person presumed to have known the relevant art at the time of the invention. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). In

determining the level of ordinary skill in the art, we may consider certain factors, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *Id.*

Petitioner states a person of ordinary skill in the art would have had “a (1) Bachelor’s degree in engineering, computer science, or a comparable field of study, and (2) at least five years of (i) professional experience in building energy management and controls, or (ii) relevant industry experience. Additional relevant industry experience may compensate for lack of formal education or vice versa.” Pet. 20 (citing Ex. 1002 ¶¶ 23–25).

Patent Owner states a person of ordinary skill in the art would have had “a bachelor’s degree in engineering, computer science, or a comparable field, with 2-3 years’ experience in temperature controls, embedded control systems, electronic thermostats, or HVAC controls, or similarly relevant industry experience, with relevant experience substituting for education and vice versa.” PO Resp. 6 (citing Ex. 2006 ¶ 26).

The ’550 patent is directed to a thermostat controller. *See* Ex. 1001, 9:26–10:17 (claim 1). This aligns more closely with the level of skill proposed by Patent Owner — which focuses on thermostats and HVAC control systems — than the one proposed by Petitioner — which focuses on energy management and controls. *Compare* Ex. 2006 ¶ 26, *with* Ex. 1002 ¶¶ 23–25. Accordingly, we adopt Patent Owner’s proposed definition. However, we consider the parties’ positions on the level of ordinary skill in the art to be substantially similar and our decision would be the same under either definition.

C. *Claim Construction*

In an *inter partes* review, the claims are construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 42.100(b) (2021). This claim construction standard includes construing the claim in accordance with the ordinary and customary meaning of such claims as understood by one of ordinary skill in the art. *Id.*; *see also Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005). In construing claims in accordance with their ordinary and customary meaning, we consider intrinsic evidence such as the specification and the prosecution history of the patent. *Phillips*, 415 F.3d at 1315–17. Extrinsic evidence, including expert and inventor testimony, dictionaries, and treatises, may also be used but is less significant than the intrinsic record. *Id.* at 1315. Usually, the specification is dispositive, and it is the single best guide to the meaning of a disputed term. *Id.* Any special definitions for claim terms must be set forth in the specification with reasonable clarity, deliberateness, and precision. *See In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

Additionally, only terms that are in controversy need to be construed, and these need be construed only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Matal*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

Petitioner states that we should use the claim constructions which “Patent Owner itself agreed to in the ITC investigation captioned *Certain Smart Thermostat Systems*.” Pet. 11 (citing Ex. 1012, 17). The claim constructions are:

'550 Patent Term	Stipulated Construction
“compare”/“comparing”	“analyze/analyzing to determine one or more similarities or differences between”
“rate of change of temperatures inside the structure”	“the difference between inside temperature measurements divided by the span of time between the measurements”
“setpoint”	“a temperature setting for a thermostat to achieve or maintain”
“automated setpoint”	“a computer-calculated temperature setting for a thermostat to achieve or maintain”

Id. As to the term “database” recited in the claims, Petitioner contends that a person of ordinary skill in the art would have understood that a database, in the context of the ’550 patent, is “a collection of data stored on a data structure, where multiple databases can be stored on one data structure” and “the plain and ordinary meaning of database is ‘an organized collection of data.’” *Id.* at 12 (citing Ex. 1002 ¶ 43; Ex. 1018, 165).

Patent Owner states the “claim terms of the ’550 patent should be given their plain and ordinary meaning” and “Petitioner and Dr. Auslander have applied the claim constructions from the 1258 Investigation for this IPR.” PO Resp. 8 (citing Ex. 2006 ¶ 31). Patent Owner states that it uses “the same constructions as used by Petitioner and Dr. Auslander in his declaration.” *Id.* (citing Ex. 2006 ¶ 32).

We determine that no construction of the claims is necessary for this Decision. *See Nidec*, 868 F.3d at 1017.

D. *Ground 1: Asserted Obviousness of Claims 17–23 Over Ehlers and Wruck*

Petitioner asserts that claims 17–23 are unpatentable under 35 U.S.C. § 103 as being obvious over Ehlers (Ex. 1004) and Wruck (Ex. 1005). Pet. 21–48. Patent Owner opposes. PO Resp. 21–45.

For reasons below, we determine Petitioner has shown, by a preponderance of the evidence, that claims 17–23 are obvious over Ehlers and Wruck. Below, we address the parties’ contentions.

1. *Claim 17*

Petitioner, relying on Dr. Auslander’s testimony, provides a limitation-by-limitation comparison of Ehlers and Wruck to independent claim 17. Pet. 21–46.

a) *Preamble 17a: An apparatus for detecting manual changes to the set point for a thermostatic controller comprising*

Petitioner contends that Ehlers and Wruck each teach the preamble. Pet. 21–24. Patent Owner does not separately address the preamble. *See* PO Resp.

We agree with Petitioner. Ehlers discloses a system that involves managing a thermostatic controller, such as the thermostat of a house. *See, e.g.,* Ex. 1004, code (57), ¶¶ 90–92, 190–191, 66, Fig. 2E. Petitioner demonstrates that Wruck discloses that “if the user enters a new ‘temporary setpoint,’ it will be displayed on the thermostat if the new user-entered setpoint is different from the scheduled setpoint.” Ex. 1002 ¶ 79 (citing Ex. 1005, Table 28, ¶ 110).

b) Limitation 17b: at least a programmable communicating thermostat

Petitioner contends that Ehlers and Wruck each teach this limitation. Pet. 24–25. Patent Owner does not separately address this limitation. *See* PO Resp.

We agree with Petitioner. “Ehlers’s system contains a programmable communicating thermostat in the form of thermostat device 1.30D, which is in communication with gateway node 1.10D via a network” and the “temperature setpoint of Ehlers’s HVAC system is manually changeable to a user’s desired temperature setpoint.” *See, e.g.*, Ex. 1002 ¶¶ 80, 81; Ex. 1004 ¶¶ 12, 13, 153–160, 228, 239, 244, 253–256, 281, 308, 309, 316–324, 320. Thus, a user can override a scheduled setpoint, which is programmed. Ex. 1002 ¶ 81 (citing Ex. 1004 ¶¶ 116, 118, 156, 316, 354, Fig. 4C).

Wruck also teaches this limitation by disclosing a programmable thermostat that communicates with a PDA device. Ex. 1005 ¶¶ 62–64, Fig. 2.

c) Limitation 17c: at least a remote processor

Petitioner contends that Ehlers and Wruck each teach this limitation. Pet. 25–26. Patent Owner does not separately address this limitation. *See* PO Resp.

We agree with Petitioner. Ehlers discloses a remote processor in the form of a gateway node and that “each node 1.10 in the system 1.02 includes a node processor 2.02 and memory 2.04.” Ex. 1004 ¶ 268; *see also* Ex. 1004 ¶¶ 244, 253, 295; Ex. 1002 ¶ 84. We agree with Petitioner that the “gateway node is (or includes) a computer processor so that it can, among other things, control devices, administer demand reduction programs, and store data.”

Pet. 25 (citing Ex. 1004 ¶¶ 137, 142, 145, 147, 150, 180, 268; Ex. 1002 ¶ 84).

Wruck also teaches this limitation by disclosing a PDA or PC which may be utilized to process information regarding, and configure operation of, the programmable thermostat. *See, e.g.*, Ex. 1005 ¶¶ 62, 63, Fig. 2; Ex. 1002 ¶ 87.

d) Limitation 17d: at least a network connecting said remote processor and said communicating [thermostat]

Petitioner contends that Ehlers and Wruck each teach this limitation. Pet. 26–27. Patent Owner does not separately address this limitation. *See* PO Resp.

We agree with Petitioner. Ehlers discloses that its “remote processor communicates with the programmable communicating thermostat (thermostat 1.30D) via a network RF communication.” Ex. 1002 ¶ 89. Figure 1B of Ehlers is reproduced below:

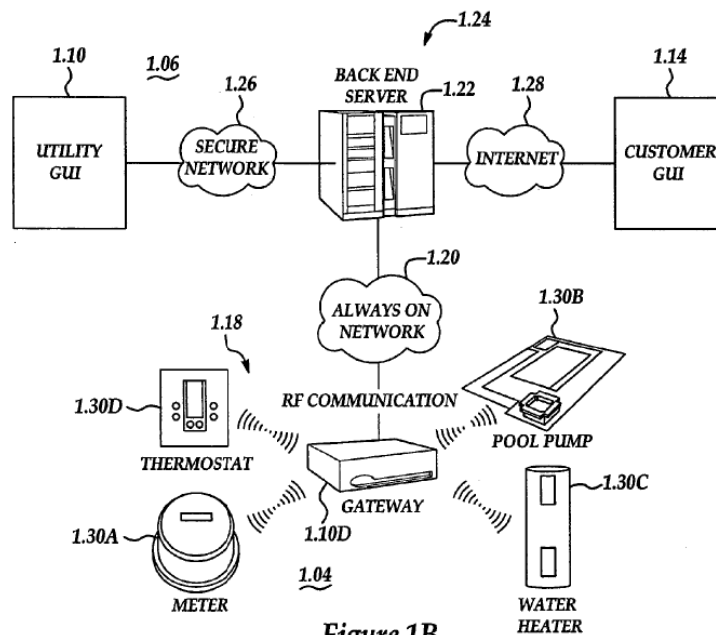


Figure 1B is a diagrammatic illustration of Ehlers' energy management system. Ex. 1004 ¶ 20. Ehlers' thermostat 1.30D connects to gateway 1.10D, which includes the claimed remote processor. Ex. 1004 ¶¶ 61–62; Ex. 1002 ¶ 89. The gateway node 1.10D communicates with the thermostat 1.30D via a RF communication network. Ex. 1004 ¶¶ 61–62, 72–76, 84, 150, 152–153; Ex. 1002 ¶ 89.

Wruck also teaches this limitation by disclosing that the thermostat 11 may be connected via a network, and that thermostat information may be transmitted on a network communications bus 84. Ex. 1005 ¶¶ 135, 144; Ex. 1002 ¶ 90.

- e) *Limitation 17e: at least a database comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure*

Petitioner contends that Ehlers teaches this limitation. Pet. 26–27. Patent Owner does not separately address this limitation. See PO Resp.

We agree with Petitioner. Ehlers' system stores temperature data and “includes ‘indoor air temperature sensor 3.10A’” which takes internal temperature measurements taken within a structure. Ex. 1004 ¶ 230; Ex. 1002 ¶ 91. Ehlers explains that “various data elements are stored within the system 1.02” and “the data may be stored in gate way node 1.10D” or in other nodes in the system. Ex. 1004 ¶ 268 (“each node 1.10 . . . includes . . . memory 2.04”); see also *id.* ¶¶ 84, 244, 253, 295; Ex. 1002 ¶ 91. Ehlers' system “measures inside temperature over time and calculates various thermal gain rates which represent how the temperature inside the structure changes in response to a different outdoor temperature, given different initial

starting setpoint temperatures.” Ex. 1002 ¶ 92; Ex. 1004, Fig. 3D (which “depicts actual inside temperature measurement data, which were recorded every 4 minutes”), ¶¶ 253, 256.

f) Limitation 17f: computer hardware comprising one or more computer processors configured to use the stored data to predict a rate of change of temperatures inside the structure in response to changes in outside temperatures

Petitioner argues that Ehlers teaches or suggests this limitation.

Pet. 30–37. Petitioner argues that Ehlers teaches a system that “tracks and learns about the thermal gain characteristics of the home.” *Id.* at 31 (quoting Ex. 1004 ¶ 253). As discussed above, Ehlers does this by tracking the thermal gain rate — that is the rate of change of temperature over time while the HVAC is off — for different setpoints and outside temperatures.

Ex. 1004 ¶ 253; *see* Section II.D.2 above; *see also* Ex. 1002 ¶¶ 98–108;

Pet. 30–37. In other words, Ehlers teaches calculating thermal gain rates for different indoor set points and outside temperatures that represent a predicted rate of change of the temperature inside the structure. Ex. 1002 ¶¶ 103–104.

Petitioner argues that Ehlers uses this data to predict changes in temperature inside the structure in response to at least changes in outside temperatures in connection with certain energy management functions.

Pet. 34 (citing Ex. 1002 ¶ 104). The thermal gain rate is used to determine a new offset temperature in order to save energy. *Id.* (citing Ex. 1004 ¶ 256; Ex. 1004 ¶ 104). In this way, Ehlers predicts that the thermal gain rate it computed in the past represents a speed at which temperatures inside the structure will change in response to changes in outside temperatures at the

current time or at a future time. Ex. 1002 ¶ 104. This predicted thermal gain rate can be used to determine what future setpoint would not increase HVAC run time over a future period of time to “compute[] [a] required effective setpoint offset.” *Id.* (citing Ex. 1004 ¶ 256; Ex. 1004 ¶ 104).

Some of Patent Owner’s arguments focus on Petitioner’s alleged misunderstandings of the meaning of thermal gain rate as used in Ehlers. *See* PO Resp. 23–33; PO Sur-reply 3–12. For the reasons discussed above in Section II.D.2, we do not agree with these arguments. We do not repeat the arguments or our findings here. However, we address Patent Owner’s other arguments below.

Patent Owner argues that Ehlers’ Figure 3D, and thus the thermal gain rate, only relates to when the HVAC is off. PO Resp. 26–28. We agree with Patent Owner’s factual description of what is shown in Ehlers’ Figure 3D and the effect of turning the HVAC system on. However, Patent Owner’s argument is inapposite because claim 17 does not require that the predicted rate of change be based upon any particular status of the HVAC system.

Patent Owner also argues that “[t]here is no discussion in Ehlers ’330, and neither Petitioner nor Dr. Auslander identifies [sic] one, of predicting changes in inside temperatures based on changes in outdoor temperatures.” PO Resp. 28 (citing Ex. 2006 ¶ 64). Specifically, Patent Owner first argues that “calculating a setpoint is not a prediction, it is developing an instruction for the control system.” *Id.* (citing Ex. 2006 ¶ 65). Similarly, Patent Owner argues that Ehlers balances the future setpoint which results in a thermal gain rate which would not increase HVAC run time. *Id.* at 28. Second, Patent Owner argues that, at best, Ehlers “illustrates the thermal gain rate from a specific starting temperature and for a single, specific outside

temperature when the HVAC system is OFF.” *Id.* at 29. According to Patent Owner, Ehlers “does not provide an overall thermal gain rate for a building, nor does it involve considering changes to outside temperatures.” *Id.* (citing Ex. 2006 ¶ 66).

We do not agree with Patent Owner’s arguments. Ehlers calculates the thermal gain rate so that it can make predictions about future inside temperatures, including predictions based on changes in outside temperatures. *See* Ex. 1002 ¶¶ 103–104; Ex. 1017 ¶¶ 11, 14. For example, Ehlers describes how the system uses the thermal gain rate data to “manage costs and comfort.” Ex. 1004 ¶ 252. Ehlers further describes how the “computed thermal gain rate” is used to “compute[] the required effective set point offset needed to keep the HVAC cycle run time at [a] specified trigger level.” Ex. 1004 ¶ 256; *see also* Ex. 1017 ¶¶ 11–24 (providing a detailed explanation). Additionally, as discussed above, Ehlers uses the thermal gain rate to make predictions to adjust energy consumption and save energy. Ex. 1002 ¶ 104; Ex. 1004 ¶ 256. These predictions are all based on the thermal gain rate, which varies based on the outside temperature. *See* Ex. 1004, Fig. 3D. Because the predicted rate of change of internal temperature — that is, the thermal gain rate — varies based on the outside temperature, the prediction is based on changes in outside temperature.

We determine that Petitioner has proven, by a preponderance of the evidence, that Ehlers teaches or suggests claim limitation 1f.

- g) *Limitation 17g: the one or more computer processors configured to calculate scheduled setpoint programming of the programmable communicating thermostat for one or more times based on the predicted rate of change, the scheduled programming comprising one or more automated setpoints*

Petitioner contends that Ehlers teaches this limitation. Pet. 37–39; Sur-reply 13–16. According to Petitioner, Ehlers’ “system 3.08” computes thermal gain rates and then uses those thermal gain rates to perform various computations to manage the system. Pet. 37 (citing Ex. 1004 ¶¶ 252–256). Petitioner explains that, “[i]n doing so, the Ehlers’s system calculates scheduled setpoint programming of the programmable communicating thermostat for one or more times based on the predicted rate of change, the scheduled programming comprising one or more automated setpoints, or ‘a computer-calculated temperature setting for a thermostat to achieve or maintain.’” *Id.* (citing Ex. 1002 ¶ 109).

Petitioner explains that “system 3.08 uses the thermal gain rate to calculate a future setpoint (or automated setpoint) which would not increase HVAC run time.” Pet. 37 (citing Ex. 1002 ¶ 110). Petitioner states that Ehlers teaches that “such calculations can be done pursuant to a ‘control program,’ where a calculated setpoint may be ‘offset’ from a target setpoint by a few degrees in order to reduce run time.” *Id.* at 37–38 (citing Ex. 1004 ¶ 256; Ex. 1002 ¶ 110). Petitioner further states that this “is done so that the run time of the system can be minimized, while the new ‘calculated’ setpoint is reasonably close to what was originally targeted” and “[t]his control of the system constitutes scheduled setpoint programming of the thermostat for one or more times based on the predicted rate of change.” *Id.* at 38 (citing Ex. 1004 ¶ 256; Ex. 1002 ¶ 110). In addition, Petitioner states that “system

3.08 uses the thermal gain rates to predict recovery time and/or to control the ‘ramping rate at which the system 3.08 would permit the temperature to rise within the site 1.04 as it moved from one set point to a higher or lower one to achieve economic benefit.’” *Id.* at 38 (citing Ex. 1004 ¶¶ 246, 255, Fig. 3F; Ex. 1002 ¶ 111).

Petitioner contends that it would have been obvious “to configure a gateway node to perform the disclosed calculations because it would be more convenient for an energy company to do so” and a person of ordinary skill in the art would have understood that Ehlers’ “gateway node is a part of ‘system 3.08’ and can be used to perform the claimed calculations.” Pet. 39 (citing Ex. 1004 ¶¶ 268, 246, 253–256; Ex. 1002 ¶¶ 112–113).

Patent Owner argues that Petitioner’s contentions are erroneous because Ehlers “only describes using setpoints provided by the customer or user,” and Ehlers “does not describe providing or calculating a new setpoint at a first time.” PO Resp. 34; *see id.* at 34–38; PO Sur-reply 14–16. According to Patent Owner, Ehlers’ offset setpoints should not count as automated because the user can restrict how far the offset may deviate from the user’s setting. PO Resp. 35–36 (citing, for example, Ex. 1004 ¶ 255 (stating “primary control parameter would be tied to the number of degrees from the set point that the customer would make available to the system 3.08 to achieve economic benefits. This parameter would start with the set point established by the CUSTOMER (for this example 72 degrees F.)”), ¶ 325 (“thermostat scheduling panel 4.36 permits the customer to select the occupancy mode which will be used for various time periods during the day.”)).

We do not agree with Patent Owner. Petitioner demonstrates that Ehlers uses its predicted thermal gain rates to calculate a new “offset” setpoint as inside temperature changes in response to outside temperatures. Ex. 1022 ¶ 22; Ex. 1004 ¶¶ 253–256. The offset setpoint is selected to reduce the HVAC runtime to conserve energy (*i.e.*, the new setpoint requires less runtime than the prior setpoint). Ex. 1023 ¶ 22.

We agree with Petitioner that Ehlers describes calculating a new setpoint that is different from the one selected by a user. *See* Pet. Reply 14–15 (citing Ex. 1004 ¶¶ 141 (“setpoints are offset”; “original setpoint (prior to the offset change)”), 150 (“can change the heating and cooling setpoint(s) and offset values of the thermostat”), 255 (“permit the system in this example to vary the temperature in the home from the normal set point of 72 F by the 4 degree offset ...”), 256 (“computes the required effective set point offset”).

These changes to a manual setpoint are automated because the computer selects the new setting. Ex. 1023 ¶¶ 25–26; Ex. 1022, 65:6–66:21, 68:7–22, 121:5–122:16. We agree with Petitioner that even if a user affects boundaries for the adjustment, the system determines what the specific, new setpoint will be and when to use the new setpoint. Ex. 1023 ¶ 27.

We determine that Petitioner has proven, by a preponderance of the evidence, that Ehlers teaches or suggests claim limitation 1g.

- h) Limitation 17h: at least a database that stores the one or more automated setpoints associated with the scheduled programming for said programmable communicating thermostat*

Petitioner contends that Ehlers teaches this limitation. Pet. 39–40. Petitioner demonstrates that by disclosing that “various data elements are stored within the system 1.02, [where] the data may be stored in gateway node 1.10D [including] . . . [a] history of temperature set points for the day” (Pet. 39–40 (citing Ex. 1004 ¶¶ 268–309)), a person of ordinary skill in the art would have understood that Ehlers’ scheduled programming data would store the “scheduled” setpoints in the various nodes (*id.* (citing Ex. 1004 ¶¶ 121, 171, 145, 116, 150, 157, 239, 224, 268, 85, 326; Ex. 1002 ¶ 114)). Petitioner demonstrates that it would have been obvious to “store automated setpoints associated with the scheduled programming for the programmable communicating thermostat so that these setpoints can be implemented according to their scheduled times.” *Id.* at 40 (citing Ex. 1002 ¶ 114). A person of ordinary skill in the art would have understood that it would have been obvious to “utilize a ‘database’ to store the automated setpoints, for example in the memory of the gateway node 1.10D” and that “that multiple databases may be located on the same data structure within, for example, gateway node 1.10D, to store setpoint information.” *Id.* (citing Ex. 1004 ¶¶ 150, 153–157, 268; Ex. 1002 ¶ 115).

Other than its arguments relating to limitation 17g discussed above, Patent Owner does not separately address this limitation. We determine that Petitioner has proven, by a preponderance of the evidence, that Ehlers teaches or suggests claim limitation 1h.

- i) *Limitation 17i: at least a database that stores actual setpoint programming of said programmable communicating thermostat*

Petitioner contends that Ehlers teaches this limitation. Pet. 40–43. Petitioner demonstrates that Ehlers’ system stores, with the programmable communicating thermostat, actual setpoints of the HVAC system. *Id.* at 40–41 (citing Ex. 1002 ¶ 116). Petitioner explains that Ehlers teaches that “various data elements are stored [including a] . . . history of temperature set points for the day” (*id.* at 41 (Ex. 1004 ¶¶ 268, 278)) and that “[u]sing the user interface 1.14, the customer may view or generate a variety of reports to view historical information about their homes and the devices 1.08 within’ and that such reports ‘include . . . Daily temperature reports displaying temperature and setpoints in, e.g., 15-minute intervals” (*id.* (quoting Ex. 1004 ¶¶ 123–124) (alterations in original)).

According to Petitioner, a person of ordinary skill in the art would have recognized that “tracking patterns in changes to setpoints which are ‘initiated by the occupant’ would involve Ehlers[’] system storing actual setpoints of the HVAC system” and it would have been obvious “to store actual setpoints of the HVAC system in order to facilitate tracking patterns in changes made to setpoints of the HVAC system which are ‘initiated by the occupant.’” Pet. 41–42 (citing Ex. 1004 ¶¶ 268, 308, 309; Ex. 1002 ¶ 118).

Petitioner also explains that Ehlers teaches and/or suggest that

(1) “the programmable communicating thermostat records the actual setpoints” (Pet. 42 (citing Ex. 1004 ¶ 253 (“FIG. 3d shows two set points for the home 2.18 that the thermostat 1.30D has recorded.”); Ex. 1002 ¶ 119));

(2) “thermostat 1.30D is a node having a node processor 2.02 [and] memory 2.04” (Pet. 42 (citing Ex. 1004 ¶¶ 229, 268; Ex. 1002 ¶ 119)); and

(3) “any node 1.10 in the system may assume the processing and/or the control of one or more devices and/or the storage of system data 1.02” (Pet. 42 (citing Ex. 1004 ¶ 268)). Thus, Petitioner contends that it would have been obvious for “the thermostat 1.30D to record and store actual setpoints of the HVAC system because the thermostat is the location at which the setpoint is maintained and implemented” and that “memories of, e.g., thermostat 1.30D or gateway node 1.10D would include multiple collections of data, including for storing setpoint information.” *Id.* (citing Ex. 1004 ¶¶ 116, 141, 150, 155; Ex. 1002 ¶ 119).

Patent Owner does not separately address this limitation. We determine that Petitioner has proven, by a preponderance of the evidence, that Ehlers teaches or suggests claim limitation 1i.

j) *Limitation 17j: the one or more computer processors configured to compare the one or more automated setpoints associated with said scheduled setpoint programming with said actual setpoint programming*

Petitioner contends that Ehlers singly and the combined teachings of Ehlers and Wruck render obvious this limitation. Pet. 43–46.

As to Ehlers singly, Petitioner contends that, because Ehlers’ system can detect a manual change to a setpoint, as described in limitations 17a and 17i above, a person of ordinary skill in the art would have understood that, in order to track and learn from the user’s changes to setpoints, “Ehlers’s system would logically detect when a user has made a manual change to the

setpoint.” *Id.* at 43–44 (citing Ex. 1004 ¶¶ 242–243, 268, 308, 309; Ex. 1002 ¶ 124).

Petitioner also demonstrates that a person of ordinary skill in the art would have known to compare the user’s “actual” setpoint programming with “automated” setpoints in the scheduled setpoint programming. Pet. 44. As Petitioner explains, to “determine whether two numbers are same or different from each other, a [person of ordinary skill in the art] would have understood that they would be compared.” *Id.* (citing Ex. 1002 ¶ 125). Ehlers does not specify the precise manner in which its system detects when a user has manually changed the setpoint but does use “a comparison between values to determine whether to take certain actions.” *Id.* (citing Ex. 1002 ¶ 125; Ex. 1004 ¶ 215 (“In one embodiment, this decision may be based on a simple comparison between the actual cost and a predetermined value which may have been input by the customer.”)). Ehlers also teaches tracking user setpoint changes to learn how the user’s desired setpoints differ from the automated setpoints. *Id.* at 46 (citing Ex. 1004 ¶¶ 242–243, 268, 308, 309; Ex. 1002 ¶ 128).

In response to Petitioner’s contentions about Ehlers, Patent Owner does not dispute that Ehlers “detect[s] when a user has made a manual change to the setpoint on the thermostat,” but argues that Ehlers does not teach or suggest claim limitation 17i because Ehlers does not compare an actual setpoint with an automated setpoint calculated by a computer, as discussed above in connection with claim limitation 17g. PO Resp. 38–39 (citing Ex. 2006 ¶¶ 88–89; Ex. 1004 ¶¶ 255, 325).

We disagree with Patent Owner’s argument for the reasons discussed above in connection with limitation 17g. Petitioner demonstrates that a

person of ordinary skill in the art would have known to compare the user's "actual" setpoint programming with "automated" setpoints in the scheduled setpoint programming. Ex. 1002 ¶ 125. Patent Owner does not address Petitioner's contention or explain why a person of ordinary skill in the art would not compare the automated setpoint with the actual setpoint programming in order to determine whether they are the same or different from each other, and thus detect a manual change.

As to the combined teachings of Ehlers and Wruck, Petitioner explains that, "to the extent comparing one setpoint to another was not already obvious from Ehlers," it would have been obvious from Ehlers and Wruck "to compare an automated setpoint associated with scheduled setpoint programming with the actual setpoint programming in order to determine whether they are the same or different from each other, and thus detect a manual change." Pet. 45–46 (citing Ex. 1002 ¶ 128). Wruck teaches that it was known to compare two temperature setpoints, and display a user's temporary temperature setpoint if it is different from the original setpoint. *Id.* at 44 (citing Ex. 1005 ¶ 110, Table 28; Ex. 1002 ¶ 126). More specifically, as shown in Table 28 below, Wruck teaches to determine whether the "Delta value" between the "actual temporary setpoint" and the original, scheduled temperature setpoint is not equal to zero, and if so, to display the temporary temperature setpoint. *Id.* (citing Ex. 1005, Table 28, ¶ 110; Ex. 1002 ¶ 126).

Table 28, with Petitioner's annotations, is reproduced below.

TABLE 28

Thermostat Data	Display	Display Dependency	Report Text Description	Comments
version.major	A		FirmwareVersion: 0.0.19	
version.minor				
version.bug				
version.commVer	V		ComVersion: 1	
version.rePgmVer	V		ReProgrammerVersion:	
status3.subBaseType	A		SubBaseID: T7350D, 3H3C	
subBase.connected	V		CommunicatingSubBase: Yes	
statusAnalog.spaceTemp	A		RoomTemperature: 75 F.	
statusAnalog.dischTemp	D	configured	DischargeAirTemp: 105 F.	config.dischAirSensor
statusAnalog.spaceHumidity	D	configured	Room RH: 33%	config.humiditySensor
statusAnalog.oDTemp	D	configured	OutdoorAir: 25 F.	config.oDAirSensor
statusAnalog.remoteStPtOffset	D	configured	RemoteSetPtOffset: 2 F.	config.remoteSetPoint
statusAnalog.temporarySetPt	D	value < > 0	TemporarySetPt: 76 F.	Display actual temporary setpoint if Delta value < > 0

Ex. 1005, 16. Annotated Table 18 is a portion of Table with Petitioner's yellow annotations. Pet. 44. Wruck states that thermostat operating data may be monitored and a Table 28 may provide data values with display dependency indications. Ex. 1005 ¶ 110.

In addition to its arguments regarding Ehlers, Patent Owner argues that (1) Wruck does not disclose a “calculated setpoint,” (2) Wruck does not explain Table 28 or what Table 28’s “Delta value” is (PO Resp. 41–42 (citing Ex. 2006 ¶¶ 92–94)), and (3) “nothing in Wruck requires that ‘Delta value’ be the difference between user setpoint and calculated setpoint” (*id.* at 44 (citing Ex. 2006 ¶ 95). Patent Owner also argues that “[e]ven assuming *arguendo* that the ‘Delta value’ is a difference between the actual temporary setpoint and the scheduled setpoint, that is not ‘a difference value based on comparing an actual setpoint at the first time for said thermostatic controller to the first automated setpoint for said thermostatic controller’ as required in claim element [17j].” *Id.* at 44 (citing Ex. 2006 ¶ 96).

We do not agree with Patent Owner’s arguments. First, Patent Owner misstates claim limitation 17j, which only requires “comparing” the two setpoints, not determining “a *difference value* based on comparing” the two

setpoints. Second, Patent Owner’s argument that Wruck does not teach the claimed automated and scheduled setpoints improperly attacks Wruck individually when Petitioner’s challenge is based on the combined teachings of Ehlers and Wruck. *Game & Tech Co. v. Wargaming Grp. Ltd.*, 942 F.3d 1343, 1352 (Fed. Cir. 2019). Here, Petitioner argues that Ehlers, not Wruck, teaches the claimed automated and scheduled setpoints and relies on Wruck’s teachings for comparing two temperature setpoints (and, if they are different, displaying the new temporary temperature setpoint). Finally, as both Dr. Auslander and Dr. Palmer agree that “Delta value” is known to mean a comparison between two values and a change (Ex. 1023 ¶ 30; Ex. 1022, 134:1–39), Petitioner persuasively demonstrates that a person of ordinary skill in the art would have understood that Wruck’s “Delta value” in Table 28 is the difference between two temperatures (one of which is the “actual temporary setpoint”). *See, e.g.*, Ex. 1005, Table 28 (stating the units for the Delta value and temporary setpoint is “Fahrenheit” (i.e., temperature)), ¶¶ 5, 14–15 (discussing that users control the temperature setpoint and temporarily override scheduled temperature setpoints).

We determine that Petitioner has proven, by a preponderance of the evidence, that Ehlers teaches or suggests claim limitation 17j.

k) Motivation to Combine Ehlers and Wruck

Petitioner contends that Ehlers teaches or suggests all of the limitations in claim 17. *See* Pet. 18–19. Petitioner explains that, based on Ehlers alone, it would have been obvious to compare automated setpoints associated with the scheduled setpoint programming with the actual setpoint programming. *Id.* at 19. Petitioner relies on Wruck for “an example of how

the manually entered setpoint override may be determined—by comparing a user desired setpoint with a calculated setpoint—such that if the difference in setpoints is not equal to zero, the system may display the new setpoint.” *Id.* (citing Ex. 1005, Table 28, ¶ 110; Ex. 1002 ¶ 64).

Patent Owner argues that a person of ordinary skill in the art would not have been motivated to combine Ehlers and Wruck because (1) Wruck does not explain what Table 28’s “Delta value” is or how it is obtained (PO Resp. 22–23 (citing Ex. 2006 ¶¶ 53, 57–59)), (2) “nothing in Wruck requires that ‘Delta value’ be the difference between two different temperature setpoints (*id.* at 22), and (3) Wruck does not disclose “calculating a setpoint” (*id.* (citing Ex. 2006 ¶ 58)).

We do not agree with Patent Owner’s arguments for the reasons discussed above in connection with limitation 17j. We determine that Petitioner has proven, by a preponderance of the evidence, that a person of ordinary skill in the art would have motivated to combine the teachings of Ehlers and Wruck.

l) Objective Evidence of Non-obviousness

Patent Owner alleges that it has data showing that the invention in the ’550 patent satisfied a long-felt but unmet need and Dr. Auslander, Petitioner’s expert, praised the invention in a Forward of a report containing this data. PO Resp. 62–63. Patent Owner’s argument is woefully deficient because Patent Owner does not produce the alleged data or Dr. Auslander’s Forward much less identify a nexus between the data and the claimed invention. This lack of evidence and nexus renders Patent Owner’s proffered objective evidence uninformative to the obviousness

determination. *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1311–12 (Fed. Cir. 2006) (“Evidence of commercial success, or other secondary considerations, is only significant if there is a nexus between the claimed invention and the commercial success.”).

m) Conclusion

After reviewing Petitioner’s and Patent Owner’s arguments and supporting evidence, we determine that Petitioner has proven, by a preponderance of the evidence, that Ehlers and Wruck render obvious independent claim 17.

2. Claims 18–23

Claims 18–23 depend directly or indirectly from independent claim 17. Ex. 1001, 10:19–36. Petitioner, citing the supporting declaration of Dr. Auslander, provides a limitation-by-limitation comparison of Ehlers and Wruck to claims 18–23. Pet. 46–48.

Patent Owner relies on its arguments related to claim 17 for the patentability of claims 18–23. PO Resp. 45.

We determine that Petitioner has proven, by a preponderance of the evidence, that Ehlers and Wruck render obvious claims 18–23.

E. Ground 2: Asserted Obviousness of Claims 17–23 Over Ols, Boait, and Wruck

Petitioner asserts that claims 17–23 are unpatentable under 35 U.S.C. § 103 as being obvious over Ols (Ex. 1006), Boait (Ex. 1007), and Wruck (Ex. 1005). Pet. 45–62.

Because we have determined claims 17–23 are unpatentable as obvious over Ehlers and Wruck, and therefore dispositive as to all challenged claims, we need not reach the grounds over Ols, Boait, and Wruck for purposes of our Decision. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (non-precedential) (recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding” and, thus, agreeing that the Board has “discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”).

F. *Motion re Collateral Estoppel*

Petitioner filed a Supplemental Brief Regarding Collateral Estoppel requesting that issue preclusion be applied against Patent Owner as to the application of Ehlers and Wruck. Paper 25. More specifically, Petitioner requests that Patent Owner be prevented from relitigating three issues: (1) the meaning of “thermal gain” in Ehlers; (2) whether Ehlers and Wruck teach or suggest comparing setpoints recited in claim limitation 17f; and (3) whether Ehlers teaches or suggests the claimed using and calculating functions recited in claim limitations 17f and 17g. *See, e.g.*, Paper 25, 6. Patent Owner opposes Petitioner’s request. Paper 26.

Because we determine that claims 17–23 are rendered obvious by Ehlers and Wruck, we dismiss Petitioner’s motion as moot.

IV. CONCLUSION⁵

For the reasons discussed above, we determine Petitioner has proven, by a preponderance of the evidence, that all of the challenged claims are unpatentable, as summarized in the following table:

Claims	35 U.S.C. §	Reference(s) /Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
17–23	103	Ehlers, Wruck	17–23	
17–23	103	Ols, Boait, Wruck ⁶		
Overall Outcome			17–23	

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 17–23 of U.S. Patent No. 8,596,550 B2 have been shown to be unpatentable;

FURTHER ORDERED that Petitioner’s motion for collateral estoppel is *dismissed*; and

⁵ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. §§ 42.8(a)(3), (b)(2).

⁶ As explained above, we need not reach the ground involving Ols, Boait, and Wruck because the ground over Ehlers and Wruck is dispositive of all challenged claims.

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Patent 8,596,550 B2

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