

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,
Petitioner,

v.

ECOFACITOR, INC.,
Patent Owner.

IPR2022-00475
Patent 8,740,100 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
35 U.S.C. § 318(a)

I. INTRODUCTION

Petitioner, Google LLC, filed a Petition for *inter partes* review of claims 1–16 of U.S. Patent No. 8,740,100 B2 (Ex. 1001, “the ’100 patent”). Paper 2 (“Pet.”). Patent Owner, EcoFactor, Inc., filed a Preliminary Response opposing institution. Paper 6. We instituted an *inter partes* review of claims 1–16 of the ’100 patent on all grounds of unpatentability alleged in the Petition. Paper 7 (“Institution Decision” or “Inst. Dec.”).

After institution of trial, Patent Owner filed a Response (Paper 10, “PO Resp.”), Petitioner filed a Reply (Paper 12, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 13, “PO Sur-reply”).

An oral hearing was held on May 11, 2023, and the record contains a transcript of this hearing. Paper 23 (“475Tr.”). Additionally, with the agreement of the parties, the record also includes the transcripts of the oral hearings in IPR2022-00538 (Paper 21, “538Tr.”) and IPR2022-00473 (Paper 22, “473Tr.”), which involve similar issues regarding one of the references.

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 1–16 of the ’100 patent are unpatentable.

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 ’100 patent is the subject matter of (1) *Google, LLC v. EcoFactor, Inc.*, 4-21-cv-

03220 (N.D. Cal. April 30, 2021); (2) *EcoFactor, Inc. v. ecobee, Inc.*, 6-21-cv-00428 (W.D. Tex. April 28, 2021); and (3) *EcoFactor, Inc. v. LG Electronics USA, Inc.*, 8:22-cv-00103 (C.D. Cal. Jan. 21, 2022). Pet. 4; Paper 4, 2.

We also take official notice of two *inter partes* review proceedings that involve similar issues: *Google LLC v. EcoFactor, Inc.*, IPR2022-00473 (PTAB Feb. 2, 2022) and *Google LLC v. EcoFactor, Inc.*, IPR2022-00538 (PTAB Feb. 3, 2022).

B. Overview of the '100 Patent (Ex. 1001)

The '100 patent is titled “System, Method and Apparatus for Dynamically Variable Compressor Delay in Thermostat to Reduce Energy Consumption.” Ex. 1001, code (54). The '100 patent describes systems and methods for reducing the usage of a ventilation system. *Id.* at code (57).

The '100 patent discusses several problems with conventional HVAC systems. It explains that “rapid cycling of HVAC systems is both annoying to occupants and more stressful to the mechanical systems than less frequent cycling.” Ex. 1001, 1:51–53. According to the '100 patent,

[t]he need for a means to prevent[] rapid cycling is even more important for refrigerant-based systems . . . because there is a risk of significant physical damage to a compressor if it is turned on too soon after being turned off—if the refrigerant inside the compressor is still in liquid (and thus uncompress[i]ble) form when the compressor restarts, expensive mechanical failures are possible.

Id. at 2:3–10. The '100 patent explains that the “way most electronic systems approach this problem is to enforce, via the electronic circuitry, a compressor delay—that is, whenever the compressor is switched off, the

thermostat prevents it from restarting for a set interval, usual [sic] in the range of two to five minutes.” *Id.* at 2:25–31.

The ’100 patent also explains that HVAC systems can be a significant source of energy consumption. Ex. 1001, 5:7–26. The ’100 patent explains that

utilities have . . . sought to buy down demand by paying [customers] to use less electricity during periods of critical demand. This process is known as demand response, and many utilities pay customers significant sums for the right to ask (or require) the customer to reduce energy usage during such peak periods. In the case of residential air conditioning, such programs often require that air conditioners be turned off for several hours at a time, or for setpoints to be raised significantly during such peak events.

Id. at 5:17–26.

To address these problems, the ’100 patent describes a system for reducing the usage of a ventilation system. Figure 2 is reproduced below.

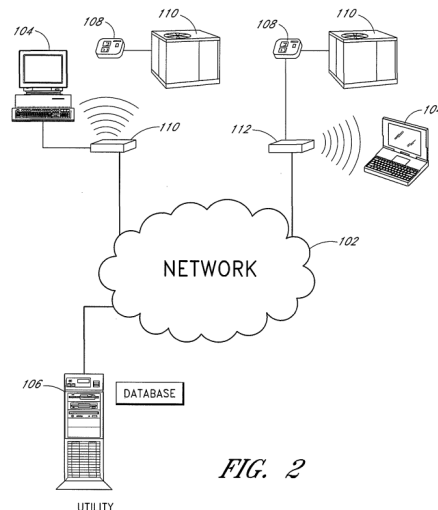


Figure 2 illustrates the system’s architecture including interactive communication network 102 connected to computers 104 and servers 106. Ex. 1001, 5:47–49. Thermostats 108 and HVAC units 110 are connected to network 102. *Id.* at 6:47–49. HVAC units 110 may be activated and

deactivated in response to signals from microprocessor 254 (not shown). *Id.* at 7:8–12. Servers 106 contain databases such as temperature database 400, thermostat settings database 500, energy bill database 600, HVAC hardware database 700, weather database 800, and others. *Id.* at 7:33–40.

Thermostat 108 measures and sends to server 106 information about the temperature in the building. Ex. 1001, 7:60–8:2. By comparing outside temperature, inside temperature, thermostat settings, cycling behavior of the HVAC system, and other variables, the system diagnoses and controls the HVAC system. *Id.*

According to the '100 patent, because server 106 logs the temperature readings from inside each house, as well as the timing and duration of air conditioning cycles, database 300 will contain a history of the thermal performance of each house. Ex. 1001, 8:20–24. 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 temperature. *Id.* at 8:24–28. Because the server also logs these inputs against other inputs including time of day, humidity, etc., 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 8:28–32. Thus, the ability to predict the rate of change in inside temperature in a given house under varying conditions may be applied by in effect holding the desired future inside temperature as a constraint and using the ability to predict the rate of change to determine when the HVAC system must be turned on in order to reach the desired temperature at the desired time. *Id.* at 8:33–38.

C. Illustrative Claim

The '100 patent contains 16 claims, all of which are challenged by Petitioner. Claims 1 and 9 are independent. Claim 1 is reproduced below.¹ Ex. 1001, 9:61–10:17.

1. **[a]** A system for reducing the usage of a ventilation system comprising:

[b.1] a thermostatic controller having at least two settings for a delay enforced by said thermostatic controller after said thermostatic controller turns said ventilation system off prior to allowing said thermostatic controller to signal said ventilation system to turn on again, **[b.2]** one setting being for a first interval, and at least a second setting for a second interval that is longer than said first interval; and

[c] a computer processor in communication with said thermostatic controller, **[d]** the processor configured to:

access stored data comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure;

[e] use the stored data to predict a rate of change of temperatures inside the structure in response to at least changes in outside temperatures; and

[f] evaluate one or more parameters including at least the outside temperature measurements and the predicted rate of change, and to determine whether to adopt said first interval or said second interval based upon the values of said parameters.

¹ For ease of reference, we use Petitioner's claim numbering scheme.

D. Evidence and Asserted Grounds

Petitioner relies upon the following evidence:

(1) U.S. Patent Application Publication 2004/0117330 A1 (Ex. 1004, “Ehlers”); and

(2) U.S. Patent 8,091,795 B1 (Ex. 1005, “McLellan”).

Petitioner relies on the testimony of Mr. Rajendra Shah. Exs. 1002; 1017. Patent relies on the testimony of John A. Palmer, Ph.D. Ex. 2009.

Petitioner challenges the patentability of the ’100 patent claims on the following ground (Pet. 12):

Ground	Claim(s) Challenged	35 U.S.C. § ²	Reference(s)/Basis
1	1–16	103(a)	Ehlers, McLellan

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) (2018). 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. 12. 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

² The ’100 patent was filed before the effective date (i.e., March 16, 2013) of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), and we apply the pre-AIA versions of 35 U.S.C. § 103. Our decision is not impacted, however, by which version of the statute applies.

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.³ *Graham v. John Deere Co. of Kan. City*, 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 asserts that the level of ordinary skill:

encompassed a person with at least 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

³ The parties have not directed us to any objective evidence of non-obviousness.

industry experience. Additional relevant industry experience may compensate for lack of formal education or vice versa.

Pet. 24 (citing Ex. 1002 ¶ 27).

Patent Owner states that a person of ordinary skill in the art would have “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. 7 (citing Ex. 2009 ¶ 27).

The ’100 patent is directed to a system for controlling an HVAC system. *See* Ex. 1001, 9:61–10:17 (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. 2009 ¶ 27, *with* Ex. 1002 ¶¶ 26–28. 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 note that both parties agreed that the level of skill is not determinative to the outcome of the case. 473Tr. 24:21–25:3 (Petitioner), 26:1–7 (Patent Owner).

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 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).

Petitioner states that “the Board need not construe the claims to apply the claims to the prior art.” Pet. 12. Patent Owner argues that “[t]he claim terms of the ’100 patent should be given their plain and ordinary meaning.” PO Resp. 7 (citing Ex. 2009 ¶ 31).

“[W]e need only construe terms ‘that are in controversy, and 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). Because an express construction is not needed to resolve any of the disputes in this proceeding, we do not expressly construe any claim terms. *See id.*

D. Relative Credibility of Experts

Petitioner argues that Mr. Shah has significantly more experience than Dr. Palmer and that we “should take the relative experience of the experts into account when assessing their credibility.” Reply 6–7 (quoting *Tr. of Columbia Univ. v. Illumina, Inc.*, 620 F. App’x 916, 922 (Fed. Cir. 2015)).

Patent Owner argues that “Dr. Palmer’s experience, and his opinions in this matter, are equally valuable as those of Mr. Shah.” PO Sur-reply 2–4.

We decline to find Dr. Palmer less credible based solely on the relative experience of the witnesses. There is no dispute that both of the witnesses are at least as skilled as a person having ordinary skill in the art. *See* Ex. 1002 ¶ 28; Ex. 1003 (Mr. Shah’s curriculum vitae); Ex. 2009 ¶ 27; Ex. 2010 (Dr. Palmer’s curriculum vitae). Therefore, both Mr. Shah and Dr. Palmer may give expert testimony. *See Kyocera Senco Indus. Tools Inc. v. ITC*, 22 F.4th 1369, 1376–77 (Fed. Cir. 2022) (“To offer expert testimony from the perspective of a skilled artisan in a patent case—like for claim construction, validity, or infringement—a witness must at least have ordinary skill in the art.”).

We see nothing in Mr. Shah’s greater experience that would give him greater insight as to what a person having ordinary skill in the art — as opposed to someone with significantly more experience — would find obvious. Petitioner does not identify a single patent case in which a court has discounted the testimony of an expert based on the relative experience of the two experts. Although Petitioner directs us to *Illumina* (*see* Reply 7), the issue in that non-precedential decision was whether the PTAB committed reversible error by not resolving the dispute as to the level of ordinary skill in the art, not the relative weight to be given to qualified experts. *See Illumina*, 620 F. App’x at 921–22.

Instead, in judging the credibility of experts, we focus on whether the witness offers corroboration for his opinions, whether the witness provides opinions that are consistent with the prior art, and the witness’ cross-examination testimony.

E. Ground 1: Asserted Obviousness of Claims 1–16 Over Ehlers and McLellan

Petitioner asserts that claims 1–16 are unpatentable under 35 U.S.C. § 103 as being obvious over Ehlers (Ex. 1004) and McLellan (Ex. 1005). Pet. 12–68.

Below, we present a brief overview of Ehlers and McLellan and then we address Petitioner’s contentions.

1. Overview of Ehlers (Ex. 1004)

Ehlers is a U.S. patent publication titled “System and Method for Controlling Usage of a Commodity.” Ex. 1004, code (54). Ehlers describes managing “delivery of energy from a distribution network to one or more sites.” *Id.* at code (57). Figure 1B of Ehlers, reproduced below, illustrates an energy management system. *Id.* ¶¶ 20, 72.

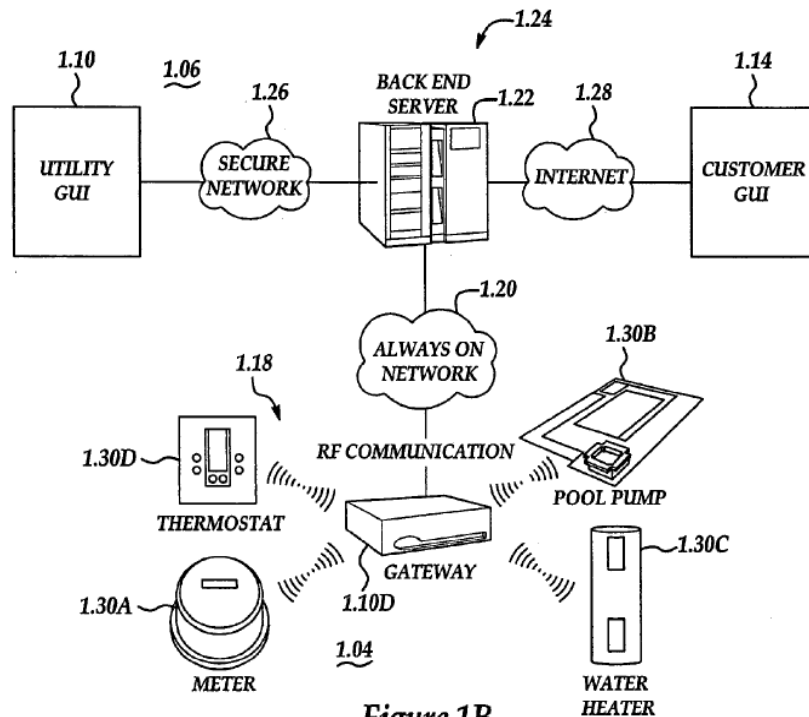


Figure 1B of Ehlers illustrates a customer site 1.04, and a utility 1.06 that generates and/or transmits electricity to the customer site. *Id.* ¶¶ 59–60. A gateway node 1.10D at the customer site communicates with a utility control system 1.12. *Id.* ¶ 72. The customer site 1.04 can include a number of systems that use electricity and communicate with the gateway, such as electricity meter 1.30A, water heater 1.30C, and advanced thermostat device 1.30D. *Id.* ¶ 76.

The customer is able to monitor and control the devices through user interface 1.14 and the utility may also monitor the devices and control their usage of electricity. Ex. 1004 ¶¶ 69, 77–78. In this way, the utility may implement a Power Supply Program designed to alleviate or reduce energy demand during peak periods. *Id.*

Figure 3B of Ehlers, reproduced below, is a block diagram of an advanced thermostat device. Ex. 1004 ¶¶ 28, 229.

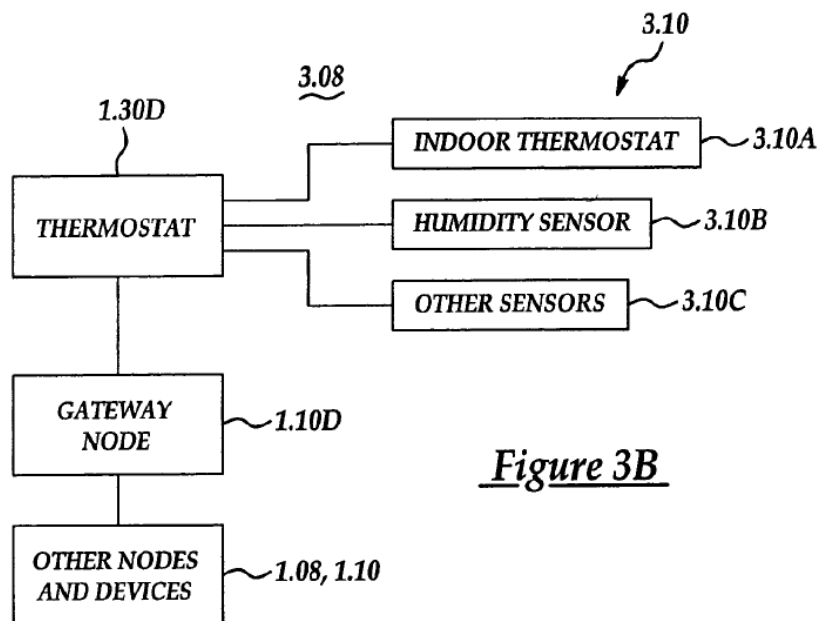


Figure 3B

Advanced thermostat device 1.30D in Figure 3B is part of a temperature and environmental sensing and control system 3.08, with thermostat 1.30D being a node having a node processor, a memory and a two-way communications

channel. *Id.* ¶ 229. Thermostat 1.30D is coupled to sensors 3.10 adapted to sense one or more parameters related to indoor or outdoor air quality (temperature, humidity, etc.). *Id.* ¶ 231. Thermostat 1.30D may also receive external information through gateway node 1.10D, such as the local weather forecast. *Id.* Based on this data and information, thermostat 1.30D controls other devices 1.08 (such as a HVAC system) to manage air quality. *Id.*

Ehlers explains that system 3.08 learns from the user's inputs or adjustments to the system to change or modify indoor air temperature. Ex. 1004 ¶ 242. The system can then monitor and control temperature and humidity levels. *Id.* For example, if the customer initially sets the thermostat at 72° F, the system maintains a relationship between the temperature and humidity level sensed, and, as the humidity level of the home rises in summer, the effective setpoint is automatically lowered to maintain a consistent level of comfort. *Id.* ¶ 243. “[T]he system 2.18 may have to lower the effective set point from that established by the customer by 3 degrees F. for every 10% of relative humidity that is sensed to retain the comfort level in the site.” *Id.*

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. 10–19; Reply 7–12; 538Tr. 8:5–22:16 (Petitioner), 30:14–41:20 (Patent Owner); 475Tr. 5:10—9:5. 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. 48–55; Reply 7–12; 538Tr.

9:6–12; 475Tr. 5:21–6:9. According to Petitioner, it is measured when the HVAC is off. *See* Ex. 1002 ¶ 134; Reply 7–8 (“*Ehlers ’330 teaches calculating the rate at which temperature inside a structure changes over time at different outside temperatures when the HVAC system is ‘OFF,’ as illustrated in Figure 3D.*” (emphases added)). 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. 10–19; PO Sur-reply 4–14; 538Tr. 30:14–15; 475Tr. 26:16–25, 28:23–29:8. Instead, Patent Owner argues that it is the rate that energy is absorbed. *See* PO Resp. 11 (citing Ex. 2009 ¶ 36); 538Tr. 30:16–17. 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.

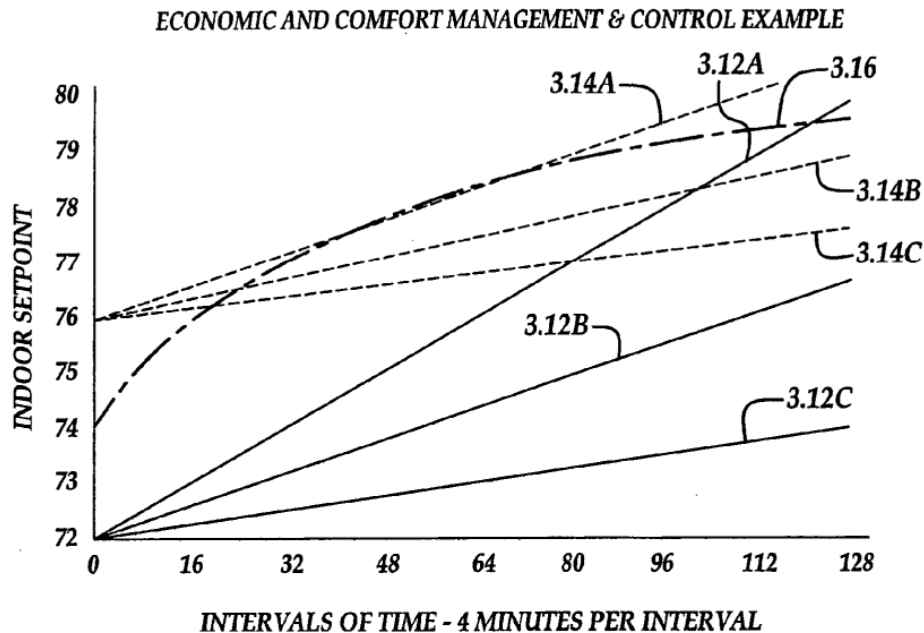


Figure 3D

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. 1002 ¶ 134 (“[I]t would be apparent to a [person having ordinary skill in the art] reviewing Figure 3D that *during the period in which the above-depicted thermal gain rates are recorded, the HVAC system is OFF* and is not working to actively cool the home to maintain the setpoint.” (emphasis added)); Ex. 2009 ¶ 59.

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. 2009 ¶ 37; *see also* Ex. 1017 ¶ 7 (“The x axis of Figure 3D represents time in minutes and the y axis of Figure 3D represents temperature in degrees Fahrenheit.”); Ex. 1002 ¶ 135. And a person having ordinary skill in the art would recognize that “the thermal gain rate is *related to* the slope of the line (which would be rate of change of temperature).” Ex. 2009 ¶ 37; *see also* Ex. 1017 ¶ 7 (“Each of the lines depicted in Figure 3D thus represents ‘rates’ at which the temperature (y axis) in the structure changes over time (x axis).”); Ex. 1002 ¶ 135. “[T]he data in Fig 3D discloses the changes in inside temperature from a specific starting temperature and for a single, specific outside temperature when the HVAC system is OFF.” Ex. 2009 ¶ 64; *see also* Ex. 1002 ¶¶ 134–135; Ex. 1017 ¶¶ 6–7. 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 — which Dr. Palmer admits is the rate of change of temperature over time (Ex. 2009 ¶ 37) — is the thermal

gain rate. *See* Ex. 1002 ¶¶ 134–135. 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. 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. 1017 ¶ 7. And, because it is discussing an increase in the internal temperature, this means that the HVAC is cycled off at that time. *See* Ex. 1017 ¶ 16.

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 ¶¶ 134–135.

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. 11 (citing Ex. 2009 ¶ 36). But the only evidence Patent Owner cites is the conclusory statement of Dr. Palmer repeating the Response without any citation. *See* Ex. 2009 ¶ 36. 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. 11–19; PO Sur-reply 8–11. 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 Mr. Shah 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. 18 (citing Ex. 2009 ¶ 42); *see also* PO Resp. 14–15 (arguing thermal gain rate in Figure 3E cannot be a change of internal temperature because the temperature does not change); PO Resp. 15–18 (making a similar argument with regard to Figure 3G); PO Sur-reply 6–10. According to Patent Owner, that is "directly contrary to Ehlers['] own usage." PO Resp. 18.

Patent Owner's argument does not account for how an HVAC system operates. During normal operation, an HVAC system cycles on and off. Ex. 1017 ¶ 16. The percentage of time the system is on "increases or decreases to balance the thermal gain rate of the structure—*e.g.*, to keep the *net* rate of change in indoor temperature over time at or close to zero." *Id.* That is, in the cooling context, although there is a gain in temperature when the HVAC is off, this is balanced by a negative gain (or decrease) in temperature when the HVAC is on. *Id.* A person having ordinary skill in the art would recognize that the positive and negative gain balance to keep the internal temperature at or near the set point. *Id.* ¶¶ 16–17. "In other words, the HVAC system cycles ON and OFF to effectively balance out the

overall full cycle average rate of change of inside temperature at or near zero.” *Id.* ¶ 17; *see also id.* ¶¶ 16–21 (explaining how Figures 3E and 3F are consistent with Petitioner’s understanding of thermal gain rate). Thus, contrary to Patent Owner’s argument, applying Petitioner’s understanding of thermal gain rate will not result in an internal temperature of 100 degrees F. *See* PO Sur-reply 8.

Patent Owner also argues that Petitioner ignores Mr. Shah’s admission that “his interpretation of the phrase ‘thermal gain’ may not have the meaning that he attributes to it in applying the language of Ehlers, saying ‘The thermal gain rate[] depends on how you interpret the language.’”⁴ PO Sur-reply 5 (quoting Ex. 2013, 27:13–14) (alteration in original); *see also* PO Resp. 11 (quoting Ex. 2013, 27:13–14). According to Patent Owner, “[o]nly Dr. Palmer’s opinion is supported by the consistent and repeated disclosures in Ehlers, all of which confirm that the ‘thermal gain rate’ is not, and cannot be, a ‘predicted rate of change in temperature.’” PO Sur-reply 5–6.

We do not agree. First, as discussed above, Dr. Palmer’s interpretation is not consistent with Ehlers. To the contrary, as discussed above, Dr. Palmer’s interpretation of thermal rate gain is inconsistent with Ehlers’ description of Figure 3D and ignores the clear disclosure of paragraph 255.

Second, Patent Owner takes Mr. Shah’s testimony out of context. As the very next sentence — a sentence that Patent Owner chose not to include

⁴ Here and elsewhere, the parties refer to “Ehlers” as “Ehlers ’330.” We have modified all quotes to change “Ehlers ’330” to “Ehlers.”

in its Sur-reply — makes clear, Mr. Shah is testifying as to how Ehlers uses the term:

Q. Okay. And you would agree that the thermal gain rate of a building is different when the HVAC system is on than when the HVAC system is off?

MS. LAUGHTON: Objection. Form.

THE WITNESS: The thermal gain rate as -- depends on how you interpret the language. *But the way Ehlers is looking at it, the thermal gain rate is the gain* -- thermal gain from the outside to the inside based on, as we say, the outside and the inside temperatures, the difference between them and the structure of the building and the materials and the -- you know, that can insulate or not. So that's the primary driver for the thermal gain rate.

Ex. 2013, 27:9–21 (emphasis added). Although thermal gain rate may have different meanings depending on the context, Mr. Shah's testimony is about how it is used in Ehlers.

Patent Owner also argues that "Petitioner's conclusions are clearly incorrect and are not supported by the testimony of Mr. Shah." PO Sur-reply 9. According to Patent Owner, Mr. Shah testified during cross-examination that "thermal gain is not a rate of temperature change because Ehlers expressly states" that the system has a fixed set point. PO Sur-reply 9–10 (citing Ex. 1004 ¶ 254). Specifically, Patent Owner argues Mr. Shah testified as follows: "So whatever heat is being absorbed from the outside, the cooling of the HVAC system matches it in order to keep the inside temperature almost the same as the set point. That's what this graph is showing." *Id.* at 10 (quoting Ex. 2013, 28:7–11).

We do not agree with Patent Owner that there is anything inconsistent between the cited testimony and Petitioner's position. Mr. Shah testified as

to what happens during an HVAC cycle as the HVAC cools the interior to counterbalance the heat being absorbed. Ex. 2013, 28:7–11. But at no time did Mr. Shah equate the heat being absorbed with the thermal gain rate. *See* Ex. 2013, 28:7–11. Instead, earlier in the same answer that Patent Owner relies on, Mr. Shah clearly links thermal gain rate with the increase in the interior temperature due to heat outside:

But the way Ehlers is looking at it, the thermal gain rate is the gain -- thermal gain from the outside to the inside based on, as we say, the outside and the inside temperatures, the difference between them and the structure of the building and the materials and the -- you know, that can insulate or not.

Ex. 2013, 27:14–20.

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. *McLellan (Ex. 1005)*

McLellan is a U.S. patent titled “Intelligent Thermostat Device with Automatic Adaptable Energy Conservation Based on Real-Time Energy Pricing Transfer of Controller Customizations.” Ex. 1005, code (54). McLellan describes an intelligent thermostat device and methods for retrieving and displaying real-time energy demand and energy pricing and automatically adapting energy usage based on real-time fluctuations in the energy pricing. *Id.* at code (57), 1:9–14.

According to McLellan, its intelligent thermostat device controls heating, ventilation and air conditioning (HVAC) systems and restricts the operation of an HVAC system in order to save energy. Ex. 1005, 6:1–10,

5:3–13, 8:9–11, 9:41–54. McLellan teaches different “delays” which prevent the HVAC system from turning on for a period of time after it has turned off—a “safety delay,” a “random delay,” and a “cycling feature” whose use results in a delay. *Id.* at 9:41–53, 12:20–32, 18:4–44.

McLellan explains that the “safety delay” protects the compressor by enforcing a minimum time before the compressor can restart after turning off:

The IT device 100 controls the turning on of the HVAC system 305 and/or heat pump (not shown). If the compressor of the HVAC system 305 and/or heat pump (not shown) is started too soon after being turned off damage can occur to the compressor(s). The IT device 100 employs a safety delay before turning on a compressor. After the safety delay, the IT device 100 will start the compressor

Ex. 1005, 9:41–47.

As to the “random delay,” McLellan states:

When the energy price level decreases such that a setback associated with a higher energy level is removed thereby allowing the current temperature setpoint to revert to a lower temperature (or higher in the winter), the IT device 100 enforces a 1–4 minute random delay before activating the HVAC system 305.

Ex. 1005, 9:48–53. Thus, at the end of a setback period when the HVAC is off due to a higher temperature setpoint, the IT device prevents the compressor from turning on immediately, instead signaling the compressor to wait between 1 and 4 minutes before signaling the compressor to start. *Id.*

McLellan explains that the “cycling feature” is another way of controlling and restricting the energy demand of HVAC system 305:

The cycling feature is another way of controlling the energy demand of the HVAC system 305. When enabled, the HVAC system 305 will follow a customizable cycle. This cycle will

enforce a period of time during which the operation of the HVAC system 305 will be restricted.

Ex. 1005, 12:20–24, 18:20–25. The purpose of the cycling feature “is to have each HVAC system 305 in a given home, office or building under a slightly different cycle so that a percentage of the HVAC systems are always off at any specific time.” *Id.* at 12:24–28. McLellan explains that the “cycle length is the amount of time that the heating and air conditioning system is restricted.” *Id.* at 12:11–13.

4. *Claim 1*

Petitioner provides a limitation-by-limitation comparison of Ehlers and McLellan to the challenged claims, citing the declaration of Mr. Shah. Pet. 26–60.

a) *Claim preamble 1a: A system for reducing the usage of a ventilation system comprising:*

Petitioner contends that Ehlers teaches the preamble.⁵ Pet. 26–29. Patent Owner does not separately address this limitation. *See* PO Resp.

We agree with Petitioner. Ehlers discloses “a system for controlling an HVAC system” and a “system and method [to] manage delivery of energy from a distribution network to one or more sites” such as, for example, a residence or home. Ex. 1004, code (57), ¶¶ 190–191; Ex. 1002 ¶ 92. Ehlers’s system may reduce the use of a ventilation system by

⁵ The parties do not address whether the preamble is limiting. Because Petitioner shows that the recitation in the preamble is satisfied by the prior art, there is no need to determine whether the preamble is limiting. *See Nidec*, 868 F.3d at 1017.

“control[ling] specified devices 1.08” such as the HVAC system. Ex. 1004 ¶¶ 137–138, 141, 150, 252–256; Ex. 1002 ¶ 95.

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

- b) *Claim limitation 1b.1: a thermostatic controller having at least two settings for a delay enforced by said thermostatic controller after said thermostatic controller turns said ventilation system off prior to allowing said thermostatic controller to signal said ventilation system to turn on again,*

Petitioner asserts that the combined teachings of Ehlers and McLellan render claim limitation 1b.1 obvious. Pet. 29–40. According to Petitioner, Ehlers’ system contains a thermostatic controller in the form of thermostat device 1.30D. *Id.* at 30 (citing Ex. 1004 ¶ 224 (“thermostat 1.30D is an advanced thermostatic control device”); Ex. 1002 ¶ 98).

Petitioner further asserts that McLellan, in turn, teaches that a thermostatic controller (i.e., “intelligent thermostat (IT) device 100”) controls one or more HVAC systems and can enforce delay settings. Pet. 30–31 (citing Ex. 1005, 4:55, 4:53–6:34, 8:9–11, 9:41–54, Fig. 3; Ex. 1002 ¶ 101). According to Petitioner, McLellan’s IT device has at least three different delay settings (i.e., safety delay, random delay, and cycling feature) for a delay enforced by the thermostatic controller after the thermostatic controller turns the ventilation system off prior to allowing the thermostatic controller to signal the ventilation system to turn on again. *Id.* at 31 (citing Ex. 1002 ¶ 103). Petitioner explains that McLellan’s “safety delay,” is the claimed delay setting because the IT device (the thermostatic controller) prevents the compressor from turning on again too soon after it has been turned off, and then signals the compressor to start after the expiration of the

safety delay. *Id.* at 32 (citing Ex. 1002 ¶ 105). McLellan’s “random delay” is also the claimed delay setting because a person of ordinary skill in the art would have understood that “the ‘random delay’ is on top of the ‘safety delay’ — meaning that the system will enforce an additional delay after the expiration of the ‘safety delay.’” *Id.* at 33 (citing Ex. 1002 ¶ 107). Finally, Petitioner asserts that McLellan also discloses a “cycling feature” which “enforce[s] a period of time during which the operation of the HVAC system 305 will be restricted.” *Id.* (citing Ex. 1002 ¶ 108; Ex. 1005, 12:20–32, 18:4–44, Figs. 7, 9) (emphasis omitted).

Petitioner contends there are several reasons that it would have been obvious to implement the three different delays taught by McLellan in Ehlers’ system. Pet. 35–40. First, Petitioner states it would have been obvious to employ a minimum compressor “safety delay” as taught by McLellan to “protect the compressor” as such “delays were common in the relevant timeframe and served a known mechanical purpose.” *Id.* at 35 (citing Ex. 1005, 9:41–48, 18:32–34; Ex. 1002 ¶ 111); *see also* Ex. 1001, 2:1–40).

Second, Petitioner asserts it would have been obvious to employ a “random delay” in environments having multiple HVAC systems like Ehlers because, “at the end of a setback period, the system might signal all of the HVAC systems to come on at the same time in order to cool the structure to the new, lower setpoint” (Pet. 35–36 (citing Ex. 1004 ¶¶ 192, 204, 229, 319, Fig. 2E; Ex. 1002 ¶ 112)) and it “was known that randomization of start times of HVAC systems could ‘reduce[] power spiking in HVAC systems that have multiple equipment installations’” (*id.* (citing Ex. 1006, 7:20–27, 2:13–20 (teaching the use of randomization of start times); *see also*

Ex. 1005, 19:1–8). Petitioner explains that a person of ordinary skill in the art would have been motivated to implement a “random delay” like McLellan’s “to protect against situations in which the system would signal all HVAC systems in a multi-HVAC system installation to start at the same time, thus potentially resulting in a power spike.” *Id.* at 36 (citing Ex. 1002 ¶ 112).

Third, Petitioner asserts that a person of ordinary skill in the art would have been motivated to implement McLellan’s “cycling feature” in Ehlers’ system because, for example, (1) “[d]oing so would have assisted the system in performing energy management functions, including reducing energy demand” (Pet. 36 (citing Ex. 1002 ¶ 114)); (2) it allows the system to enforce a specific percentage of the cycle during which the system will be permitted to turn “on” (*id.* at 37 (Ex. 1002 ¶ 115)); and (3) it permits control of the duty cycle in addition to the use of control based on temperature setpoints (*id.* at 38 (Ex. 1002 ¶ 116)).

Patent Owner does not separately address this limitation. *See* PO Resp.

We agree with Petitioner. McLellan discloses the claimed delay settings recited in limitation 1b.1: (1) the safety delay, (2) the random delay, and (3) the cycling delay. *See* Ex. 1055, 9:45–54; Ex. 1002 ¶¶ 101–108.

We determine that Petitioner has proven, by a preponderance of the evidence, that Ehlers and McLellan teach or suggest claim limitation 1b.1.

- c) *Claim limitation 1b.2: one setting being for a first interval, and at least a second setting for a second interval that is longer than said first interval;*

Petitioner asserts that McLellan teaches this limitation by its disclosure that McLellan teaches three different settings for a delay — the “safety delay,” the “random delay,” and the “cycling feature” — and the use of these three different settings meets the claim language in at least two different ways. Pet. 40 (citing Ex. 1002 ¶ 119). Petitioner presents two theories — the first is based on McLellan’s safety delay and random delay and the second is based on McLellan’s safety delay and cycling delay. *Id.*; *see also* Reply 21–28.

Petitioner explains that McLellan’s “system will always obey the ‘safety delay’ which prescribes a minimum time period before compressor activation” and this “safety delay is a setting for a **first interval** — the interval being the amount of time of the delay.” Pet. 40 (citing Ex. 1005, 9:41–48, 18:32–34; Ex. 1002 ¶ 120).

As to its first theory, Petitioner explains that the claimed second interval is the safety delay and the random delay. Pet. 40. Although McLellan does not specify the precise length of the safety delay, Petitioner states a person of ordinary skill in the art would have recognized that “the safety delay used is shorter than the random delay — i.e., the minimum length of the random delay will be greater than the safety delay because the compressor cannot be started before the expiration of the safety delay.” *Id.* (citing Ex. 1002 ¶ 121; Ex. 1005, 9:41–48, 18:32–34). According to Petitioner, a person of ordinary skill in the art would have understood that “the ‘random delay’ is on top of the ‘safety delay’ — meaning that the system will enforce an additional delay after the expiration of the ‘safety

delay.’” *Id.* at 40–41. Accordingly, “the length of the **second interval** is the sum of the interval of the minimum ‘safety delay’ plus the amount of the ‘random delay’ and the length of the **second interval** is longer than said first interval (*i.e.*, the length of the safety delay).” *Id.* at 41 (citing Ex. 1002 ¶ 121).

As to the second theory, Petitioner states that the claimed second interval is the safety delay and the “cycling feature,” which also restricts the operation of the system for a second interval that is longer than said first interval. Pet. 41 (citing Ex. 1002 ¶ 122).

Patent Owner does not separately address this limitation. *See* PO Resp.

We determine that Petitioner has proven, by a preponderance of the evidence, that McLellan teaches or suggests claim limitation 1b.2.

d) Claim limitation 1c: a computer processor in communication with said thermostatic controller

Petitioner asserts that Ehlers renders this claim limitation obvious. Pet. 42–43. Patent Owner does not separately address this limitation. *See* PO Resp.

We agree with Petitioner. Ehlers’ thermostat 1.30D is a thermostatic controller and Ehlers’ “system includes various ‘nodes 1.10’, including a gateway node that ‘can . . . include a **processor** and an Ethernet connection.’” Pet. 42 (citing Ex. 1004 ¶ 84); *see also* Ex. 1004 ¶¶ 171 (“[E]ach node 1.10 includes a node processor 2.02. In one embodiment, the node processor 2.02 is a microprocessor.”), 171, 179, 198; Ex. 1002 ¶ 123. “Each of the nodes of Ehlers’ 330’s system, including the gateway node, is in communication with the thermostat 1.30D.” Ex. 1002 ¶ 124.

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

- e) *Claim limitation 1d: the processor configured to: access stored data 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 asserts that Ehlers teaches this claim limitation by disclosing that “various data elements are stored within the system 1.02.” Pet. 43 (citing Ex. 1004 ¶ 268 (“[E]ach node 1.10 in the system 1.02 includes a node processor 2.02 and **memory 2.04**. Therefore, 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** in the event the gateway node 1.10D becomes disabled.”); *see also* Ex. 1004 ¶¶ 85, 244, 253, 268, 295; Ex. 1002 ¶ 125). Petitioner explains that Ehlers’ data elements include internal temperature measurements (*id.* at 44–46) and outside temperature measurements (*id.* at 46–48).

Patent Owner argues that Ehlers teaches storing “average temperatures” and “temperature setpoints” but does not disclose “storing inside temperature measurements.” PO Resp. 21 (citing Ex. 1004 ¶¶ 278 (temperature setpoints), 283 (average temperatures); Ex. 2009 ¶¶ 54–55). Patent Owner argues that an “average temperature is not an actual temperature measurement” and “a temperature setpoint is not a temperature measurement.” *Id.*

We do not agree with Patent Owner. Ehlers teaches or suggests storing internal temperatures by disclosing that its system can generate “[d]aily temperature reports displaying temperature and setpoints in, e.g., 15-minute intervals.” Ex. 1004 ¶ 124; *see also* Ex. 1004, Fig. 4L (showing a daily temperature report). Ehlers could not generate such a report if inside temperatures were not stored over time. *See* Ex. 1018, 30:20–31:1 (Dr. Palmer stating that Ehlers “would not be able to display temperature measurements without storing those temperature measurements”). As to Patent Owner’s argument that the stored average temperatures are not actual temperatures (PO Resp. 21), the actual temperatures must be stored for at least some time in order to calculate and store the average temperatures.

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

f) Claim limitation 1e: use the stored data to predict a rate of change of temperatures inside the structure in response to at last changes in outside temperatures

Petitioner argues that these elements of claim 1 are suggested by Ehlers. Pet. 48–55. Petitioner argues that Ehlers teaches a system that “tracks and learns about the thermal gain characteristics of the home.” *Id.* at 48 (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 III.E.2 above; *see also* Ex. 1002 ¶¶ 134–139; Pet. 48–55. 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 at a first location. Ex. 1002 ¶¶ 138–139.

Petitioner argues that Ehlers uses the “computed thermal gain rate” to “compute[] the required effective set point offset needed to keep the HVAC cycle run time at [a] specified trigger level,” for example, at or below 33%. Pet. 52 (quoting Ex. 1004 ¶ 256). In this way, Ehlers predicts the thermal gain or the speed that the temperature inside the first location will change in response to changes in outside temperature at the current time or at a time in the future. Ex. 1002 ¶ 139. This thermal gain rate can be used to determine whether to pre-cool the structure prior to implementing a demand reduction request and/or reducing demand in response to a change in energy pricing. Ex. 1002 ¶ 139; *see also* Ex. 1004 ¶¶ 204, 247, 265 (all discussing pre-cooling).

Some of Patent Owner arguments focus on Petitioner’s alleged misunderstandings of the meaning of thermal gain rate as used in Ehlers. *See* PO Resp. 22–29; PO Sur-reply 4–19. For the reasons discussed above in Section III.E.2, we do not agree with those 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. 22–24. Patent Owner further argues that Mr. Shah stated during cross-examination “that the

HVAC system being turned ON and functioning will alter the thermal gain rate of a building.” *Id.* at 24 (citing Ex. 2014, 29:3–23).⁶

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. Claim 1 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, and neither Petitioner nor Mr. Shah identify one, of predicting changes in inside temperatures based on changes in outdoor temperatures.” PO Resp. 24 (citing Ex. 2009 ¶ 61). Specifically, Patent Owner first argues that “calculating a setpoint is not a prediction, it is developing an instruction for the control system.” *Id.* at 25 (citing Ex. 2009 ¶ 62). Similarly, Patent Owner argues that Ehlers balances the future setpoint which results in a thermal gain rate which would not increase HVAC run time over the future period of time. *Id.* at 25. Second, Patent Owner argues that, at best, Ehlers teaches “the changes in inside temperature from a specific starting temperature and for a single, specific outside temperature when the HVAC system is OFF.” *Id.* at 26. 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. 2009 ¶ 64).

We do not agree with Patent Owner’s arguments. Ehlers calculates the thermal gain rate so that it can make predictions about future inside

⁶ The Response directs us to page 28. This appears to be a typographical error. However, our discussion of this argument applies to the testimony cited on either page.

temperatures, including predictions based on changes in outside temperatures. *See* Ex. 1002 ¶¶ 138–139; Ex. 1017 ¶ 26. 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 ¶¶ 27–36 (providing a detailed explanation). Additionally, as discussed above, Ehlers uses the thermal gain rate to make predictions when determining whether to pre-cool before implementing a reduction in demand. Ex. 1002 ¶ 139; 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 1d.

- g) *Claim limitation 1f: evaluate one or more parameters including at least the outside temperature measurements and the predicted rate of change, and to determine whether to adopt said first interval or said second interval based upon the values of said parameters*

Petitioner asserts that the combined teachings of Ehlers and McLellan teach or suggest this claim limitation. Pet. 55–60. Petitioner contends it would have been obvious to use McLellan’s three delay settings (i.e., safety delay, random delay, and cycling delay) in Ehlers’ system. *Id.* at 56 (citing Ex. 1002 ¶¶ 143–144). Petitioner presents two theories — the first is based

on McLellan's safety delay and random delay and the second is based on McLellan's safety delay and cycling delay. *Id.*; *see also* Reply 21–28.

Safety Delay and Random Delay

In its first theory, Petitioner explains it would have been obvious “to employ the ‘safety delay’ at all times as a minimum time period after compressor deactivation and before compressor activation” and this “‘safety delay’ is a **first interval**.” Pet. 56 (citing Ex. 1002 ¶ 146). Petitioner also asserts “the amount of time of McLellan's ‘random delay’ (1–4 minutes) plus the amount of the ‘safety delay’ is a **second interval**.” *Id.*

According to Petitioner, it would have been obvious “to evaluate the thermal gain rate (*i.e.*, the **predicted rate of change**) to determine whether to implement the random delay or to implement the ‘default’ minimum safety delay in configurations having multiple controlled spaces and thus multiple HVAC systems.” Pet. 57 (Ex. 1002 ¶ 147). Petitioner explains:

For example, in configurations having multiple HVAC systems, different controlled areas may have different thermal gain rates—*i.e.*, their inside temperatures may change in different ways in response to the same outside temperature. After a curtailment period, in some controlled spaces, the inside temperatures may be higher than the new setpoint (for the new desired indoor temperature) and in other controlled spaces, this may not be the case. (Ex. 1002, ¶147). Thermal gain rates for the different controlled spaces may thus predict that after a curtailment period the inside temperature will need to be reduced for some portion of the controlled spaces. The difference between a new setpoint (for the new desired indoor temperature) and the actual indoor temperature would ordinarily trigger the HVAC system to begin cooling upon a return to unrestricted operation of the system. Where the thermal gain rates predict that the inside temperatures of all or some significant portion of controlled spaces will be above the

new setpoint(s), it would be obvious to direct the system to employ McLellan’s “random delay” to prevent all or a significant number of the HVAC systems from activating at once, potentially resulting in a power spike. (Ex. 1002, ¶147). See analysis for claim element [1b.1]. In this manner, **evaluation(s)** of the claimed **parameters** are used to **determine** whether the random delay should be adopted. (Ex. 1002, ¶147).

Id. at 57–58. Finally, because Ehlers’ thermal gain rates are calculated for particular outside temperatures, Petitioner contends that, in selecting which thermal gain rate to evaluate, it also would have been obvious “to evaluate the **outside temperature measurements** to determine which thermal gain rate most closely represents an accurate **predicted rate of change** given the actual outside temperatures during the relevant time period so as to use the most accurate and representative thermal model available.” *Id.* at 58 (citing Ex. 1002 ¶ 148; Ex. 1004 ¶ 253, Fig. 3D).

Patent Owner argues that Petitioner’s contentions are erroneous for several reasons. First, Patent Owner argues that because McLellan’s minimum safety delay (i.e., the first interval) would always be implemented to protect the compressor, the safety delay/first interval is not adopted based on the claimed “parameters” recited in limitation 1f. PO Resp. 30, 33; PO Sur-Reply 19–20. We do not agree because Patent Owner’s position contradicts the claim language, which requires that the system “evaluate one or more parameters . . . , and to determine whether to adopt said first interval **or** said second interval based upon the values of said parameters.” Ex. 1001, 10:13–17 (emphasis added). Under Petitioner’s first theory, the system determines whether to adopt the safety delay or **also** implement the “random

delay” based on the claimed parameters.⁷ The claims do not require that the claimed parameters be used in determining whether to adopt safety delay/first interval *alone*.

Second, Patent Owner argues that Petitioner is “inconsistent” regarding the “random delay” because “[s]electing either the safety delay or the ‘random delay’ is not having the ‘random delay’ on top of or in addition to the safety delay.” PO Resp. 31 (citing Ex. 2009 ¶ 76); *see also* PO Sur-reply 20–22. We do not agree because Petitioner’s position is that the system is deciding between whether to adopt the default safety delay (the claimed “first interval”) or whether to *also* adopt the random delay “on top of the safety delay” (the claimed “second interval that is longer than said first interval”). *See* Pet. 40–41, 56–57; Reply 23. We note that Dr. Palmer agrees that “[a] POSITA would recognize that the ‘safety delay’ would always be implemented” and does not dispute that a random delay, if implemented, would be implemented “on top of” any minimum safety delay. *See* Ex. 2009 ¶ 74.

Third, Patent Owner argues that McLellan “teaches away” from implementing the random delay based on the claimed parameters because McLellan’s “random delay” is implemented based on energy price levels and not based on the outside temperature measurements and the predicted rate of change. PO Resp. 32. We do not agree. Patent Owner’s argument is an improper individual attack on McLellan, not the combined teachings of Ehlers and McLellan, which does not rebut the obviousness of Petitioner’s

⁷ Similarly, under Petitioner’s second theory, the system determines whether to adopt the safety delay or *also* implement the “cycling feature” based on the claimed parameters.

proposed combination. *Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1050 (Fed. Cir. 2019). (“A finding of obviousness, however, cannot be overcome ‘by attacking references individually where the rejection is based upon the teachings of a combination of references.’”). Patent Owner’s argument also does not identify any teaching in McLellan which criticizes, discredits, or otherwise discourages performing an analysis or calculation based on outside temperatures and predicted rate of temperature changes to apply the random delay. *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (“A reference does not teach away, however, if it merely expresses a general preference for an alternative invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the invention claimed.”).

Fourth, Patent Owner argues that, in a situation where the “random delay” would be implemented, the decision “would only be based on . . . whether the two or more HVAC systems were to be turned ON at the same time” and “not based on evaluating outside temperature and a predicted rate of change.” PO Resp. 34. We do not agree because Petitioner’s proposed system would know whether two or more HVAC systems would turn on at a future time via the use of Ehlers’ predictive modeling — and thus, the decision to use the random delay would be based on a predicted rate of change. Pet. 56–58; Reply 24–25.

Finally, Patent Owner argues that Petitioner does not identify any teachings of using different thermal gain rates for different controlled spaces within the same structure. PO Resp. 34–35. We do not agree because Petitioner’s theory is not limited to instances in which both “controlled spaces” and both HVAC systems are in the same structure. Pet. 57. Ehlers

discloses installations having multiple “sites” and thus multiple structures. Ex. 1004 ¶¶ 181 (multiple sites), 342 (multiple sites in Phoenix, Richmond, Philadelphia), 172 (multiple sites), 173 (multiple sites), 218 (home and other sites); Ex. 1002 ¶ 147.

Safety Delay and Cycling Feature

In its second theory, Petitioner contends that it would have been obvious “to evaluate one or more parameters including at least the [i] outside temperature measurements and [ii] the predicted rate of change, and to determine whether to employ the cycling feature (thus implementing a restricted period) or instead to merely employ the ‘safety delay’ based upon the values of said parameters.” Pet. 58 (emphasis omitted). According to Petitioner, under this scenario, the amount of time of a restricted period when McLellan’s “cycling feature” is in use is a second interval. *Id.* (citing Ex. 1002 ¶ 149).

Petitioner states that Ehlers’ system computes a “thermal gate rate” which is a predicted rate of change and these thermal gain rates are calculated for particular outside temperatures. Pet. 58–59. Petitioner further states that, in selecting which thermal gain rate to **evaluate**, it would have been obvious “to evaluate the **outside temperature measurements** to determine which thermal gain rate most closely represents an accurate **predicted rate of change** given the actual outside temperatures during the relevant time period so as to use the most accurate and representative thermal model available.” *Id.* at 59 (citing Ex. 1002 ¶ 150). According to Petitioner, for similar reasons, it would have been obvious (1) to use the thermal gain rate to set a customizable cycle in order to maintain a flat or

reduced level of demand and (2) to evaluate the thermal gain rate (*i.e.*, the predicted rate of change) to determine whether to follow the customizable cycle and thus restrict the period of time during which the HVAC system can turn on or to implement the “default” minimum safety. *Id.* (citing Ex. 1002 ¶ 151). In such an implementation, under a customized cycle during which the operation of the HVAC system is restricted, the HVAC system will be delayed from turning on until the expiration of a restricted period. *Id.* (citing Ex. 1002 ¶ 151).

Patent Owner argues that Petitioner’s second theory based on the “cycling feature” is erroneous. First, Patent Owner argues that “the ‘cycling feature’ is not a delay.” PO Resp. 35. We do not agree because McLellan’s cycling feature “**enforce[s]** a period of time during which the operation of the HVAC system 305 will be restricted.” Ex. 1005, 12:20–32 (emphasis added), 12:11–14 (“The cycle length is the amount of time that the heating and air conditioning system is restricted.”), 12:20–21 (“The cycling feature is another way of controlling the energy demand of the HVAC system 305.”); Ex. 1002 ¶ 108; Pet. 33–34. The cycling feature **delays** the restart of the HVAC system until the end of a predetermined time period set as a function of the “Cycle Period” and the “Cycle Rate.” Ex. 1002 ¶¶ 109–110; Ex. 1017 ¶¶ 16–17, 20. Patent Owner does not provide a construction or other reason explaining why McLellan’s cycling feature is not a delay or the claimed second interval.

Second, Patent Owner argues that McLellan does not teach implementing the “cycle feature” based on an evaluation of outside temperature measurements and a predicted gain rate. PO Resp. 37 (citing Ex. 2009 ¶ 89); *see also id.* at 37–39. We do not agree because Patent

Owner's argument is an improper individual attack on McLellan, not the combined teachings of Ehlers and McLellan, which does not rebut the obviousness of Petitioner's proposed combination. *Bradium*, 923 F.3d at 1050.

We determine that Petitioner has proven, by a preponderance of the evidence, that Ehlers and McLellan teach or suggest claim limitation 1f.

h) Conclusion

After our review of all arguments and evidence provided by both Petitioner and Patent Owner, we determine that Petitioner has proven, by a preponderance of the evidence, that Ehlers and McLellan render obvious independent claim 1.

5. Claims 2–16

Claims 2–8 depend directly or indirectly from independent claim 1. Ex. 1001, 10:18–35. Petitioner directs us to where Ehlers and McLellan teach or suggest each of the limitations recited in dependent claims 2–8. Pet. 60–64.

As to independent claim 9, Petitioner relies on essentially the same discussion as that for claim 1, for related aspects of independent claim 9. Pet. 64–67. As to claim 10–16 which depend directly or indirectly from claim 9, Petitioner directs us to where Ehlers and McLellan teach or suggest each of the limitations recited in dependent claims 10–16. *Id.* at 67–68.

Patent Owner relies on its arguments related to claim 1 for the patentability of claims 2–16. PO Resp. 39–40.

We determine that Petitioner has proven, by a preponderance of the evidence, that Ehlers and McLellan render obvious claims 2–16.

IV. CONCLUSION⁸

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
1–16	103(a)	Ehlers, McLellan	1–16	

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–16 of U.S. Patent 8,740,100 B2 have been shown to be unpatentable; and

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.

⁸ 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).

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FOR PETITIONER:

Matthew Smith
Elizabeth Laughton
SMITH BALUCH LLP
smith@smithbaluch.com
laughton@smithbaluch.com

FOR PATENT OWNER:

Philip Wang
Jonathan Link
Reza Mirzaie
Kristopher Davis
RUSS AUGUST & KABAT
pwang@raklaw.com
jlink@raklaw.com
rmirzaie@raklaw.com
kdavis@raklaw.com