

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC and
ECOBEE TECHNOLOGIES ULC,
Petitioners,

v.

ECOFACITOR, INC.,
Patent Owner.

IPR2022-00473
Patent 8,751,186 B2¹

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

HOWARD, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

¹ Ecobee, Inc. was joined as a party to this proceeding via a Motion for Joinder in IPR2022-01460.

I. INTRODUCTION

A. Background and Summary

Google LLC (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claims 1–13 of U.S. Patent No. 8,751,186 B2 (Ex. 1001, “the ’186 patent”). EcoFactor Inc. (“Patent Owner”) filed a Preliminary Response to the Petition (Paper 6). We instituted an *inter partes* review of claims 1–13 of the ’186 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 14, “PO Sur-reply”).

An oral hearing was held on May 3, 2023, and the record contains a transcript of this hearing. Paper 22 (“473Tr.”). Additionally, with the agreement of the parties, the record also includes the transcripts of the oral hearing in IPR2022-00538 (Paper 20, “538Tr.”) and IPR2022-00475 (Paper 24), 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 1–13 of the ’186 patent are unpatentable.

B. Real Parties in Interest

Petitioner and Patent Owner identify themselves as the real parties in interest. Pet. 5; Paper 4, 1 (Patent Owner’s Mandatory Notices). Joined party ecobee Technologies, ULC identifies ecobee Technologies ULC, ecobee Ltd., and Generac Holdings Inc. as the real parties in interest.

Ecobee Technologies ULC v. EcoFactor, Inc., IPR2022-01466, Paper 1, vii (Petition).

C. Related Matters

The parties identify the following proceedings in which the '186 patent is asserted: *EcoFactor, Inc. v. ecobee, Inc.*, No. 6-21-cv-00428 (W.D. Tex. April 28, 2021) and *Google, LLC v. EcoFactor, Inc.*, 4-21-cv-03220 (N.D. Cal. April 30, 2021).

We also take official notice of two *inter partes* review proceedings that involve similar issues: *Google LLC v. EcoFactor, Inc.*, IPR2022-00475 (PTAB Feb. 2, 2022) and *Google LLC v. EcoFactor, Inc.*, IPR2022-00538 (PTAB Feb. 3, 2022).

D. The '186 Patent

The '186 patent is entitled “System and Method for Calculating the Thermal Mass of a Building” and is directed to “communicating thermostats [that] are combined with a computer network to calculate the thermal mass of a structure.” Ex. 1001, code (54) (first quote), 1:22–26 (second quote). More specifically, the '186 patent describes how a remote server can use measurements of inside temperature, outside temperature, and other factors to predict the building's thermal characteristics and the performance of the HVAC (heating, ventilation, and air conditioning) system. Ex. 1001, 8:63–9:9.

The '186 patent further describes how electric companies are changing from charging residential customers a flat rate regardless of energy demand to a variable rate that depends on overall electricity demand:

Traditionally, residential customers paid the same price regardless of time or the cost to produce. Thus consumers have had little financial incentive to reduce consumption during

periods of high demand and high production cost. Many electric utilities are now seeking to bring various forms of variable rates to the retail energy markets. Under such schemes, consumers can reduce costs by taking into account not just how much energy they use, but when they use it.

Ex. 1001, 3:10–17. The '186 patent further describes how pre-cooling during a lower-cost time period just before the increase can be an effective strategy to reduce cost while maintaining comfort. Ex. 1001, 3:18–36.

E. Illustrative Claims

Claims 1 and 8 are independent. Claim 1, reproduced below as corrected in the Certificate of Correction, is illustrative of the claimed invention.

1. [1a] A system for controlling a heating, ventilation and air conditioning (HVAC) system comprising:

[1b] one or more server computers comprising computer hardware, the one or more server computers configured to receive inside temperature measurements from at least a first location conditioned by at least one HVAC system;

[1c] one or more databases that store the inside temperature measurements over time, the one or more databases accessed by the one or more server computers;

[1d] wherein the one or more server computers are located remotely from the first location, the one or more server computers configured to receive outside temperature measurements from at least one source other than the HVAC system,

[1e] wherein the one or more server computers are configured to calculate one or more predicted rates of change in temperature at the first location based on status of the HVAC system, and based on the outside temperature measurements, wherein the one or more predicted rates of change predict a speed a temperature inside the first location will change in response to changes in outside temperature; and

[1f] wherein the one or more server computers are further configured to determine whether to direct the HVAC control system to pre-cool the first structure based on the one or more predicted rates of change prior to directing the HVAC control system to reduce electricity demand.

Ex. 1001, 13:31–57, Certificate of Correction.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–13 are unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 3–8, 10–13	103(a)	Schurr, ² Ehlers ³
1–13	103(a)	Schurr, Ehlers, Rosen ⁴

Petitioner relies on direct testimony of Rajendra Shah. Ex. 1002; Ex. 1017. Mr. Shah was cross-examined in this proceeding. Ex. 2011. Mr. Shah was not cross-examined after his second declaration. 473Tr. 5:8–11.

Patent Owner relies on the direct testimony of John A. Palmer, Ph.D. Ex. 2009. Dr. Palmer was cross-examined in this proceeding. Ex. 1018.

II. ANALYSIS

A. Legal Standards

In *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966), the Supreme Court set out a framework for assessing obviousness under 35 U.S.C. § 103(a) that requires consideration of four factors: (1) the “level of ordinary skill in the pertinent art,” (2) the “scope and content of the prior art,” (3) the “differences between the prior art and the claims at issue,” and

² US 6,868,293 B1, issued Mar. 15, 2005 (Ex. 1005).

³ US 2004/0117330 A1, published June 17, 2004 (Ex. 1004).

⁴ US 6,789,739 B2, issued Sept. 14, 2004 (Ex. 1006).

(4) if in evidence, “secondary considerations” of non-obviousness such as “commercial success, long-felt but unsolved needs, failure of others, etc.” *Id.* at 17–18. “While the sequence of these questions might be reordered in any particular case,” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 407 (2007), the U.S. Court of Appeals for the Federal Circuit has repeatedly emphasized that “it is error to reach a conclusion of obviousness until all those factors are considered,” *WBIP v. Kohler Co.*, 829 F.3d 1317, 1328 (Fed. Cir. 2016).⁵

B. Level of Ordinary Skill in the Art

In determining whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham*, 383 U.S. at 17. “The importance of resolving the level of ordinary skill in the art lies in the necessity of maintaining objectivity in the obviousness inquiry.” *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991). The “person having ordinary skill in the art” is a hypothetical construct, from whose vantage point obviousness is assessed. *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998).

Factors pertinent to a determination of the level of ordinary skill in the art include “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.” *Envtl. Designs, Ltd. v. Union Oil Co. of Cal.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983) (citing

⁵ Because neither party address objective evidence of non-obviousness, we focus solely on the first three *Graham* factors.

Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc., 707 F.2d 1376, 1381–82 (Fed. Cir. 1983)). “Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case.” *Id.*

Petitioner argues that a person having 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. 26 (citing Ex. 1002 ¶¶ 27–29).

Patent Owner argues that a person having 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. 6 (citing Ex. 2009 ¶ 26). Patent Owner further argues that an Administrative Law Judge adopted that formulation in a proceeding involving a related patent. PO Resp. 6–7 (citing Ex. 2014).

The ’186 patent is directed to a system for controlling an HVAC system. *See* Ex. 1001, 13:31–57 (claim 1). That 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 controls. *Compare* Ex. 2002 ¶ 29, *with* Ex. 1002 ¶¶ 27–29; *see also In re Certain Smart Thermostat Sys., Smart HVAC Sys., Smart*

HVAC Control Sys., and Components Thereof, 337-TA-1258, Order No. 18, 8 (ITC Sept. 1, 2021) (noting with regard to a related patent that “Professional experience in a more specialized area, even if for a shorter time (as Complainant contends), seems more appropriate than a more general area of experience having no direct connection to the relevant technology Therefore, a person of ordinary skill in the art at the time of the invention would have had 2–3 years’ experience in temperature controls, embedded control systems, electronic thermostats, or HVAC controls, or similarly relevant industry experience”) (Ex. 2014). 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

We apply the same claim construction standard used in the federal courts, in other words, the claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), which is articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). See 37 C.F.R. § 42.100(b) (2021). Under the *Phillips* standard, the “words of a claim ‘are generally given their ordinary and customary meaning,’” which is “the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application.” *Phillips*, 415 F.3d at 1312–13.

Petitioner argues 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 ’186 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.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). 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.” Pet. Reply 7–8 (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 ¶ 29; Ex. 1003 (CV of Mr. Shah); Ex. 2009 ¶ 26; Ex. 2010 (CV of Dr. Palmer). 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 Pet. 8), 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, provides opinions that are consistent with the prior art, and the witness’ cross-examination testimony.

E. Obviousness over Schurr and Ehlers (Claims 1, 3–8, and 10–13)

Petitioner challenges claims 1, 3–8 and 10–13 as unpatentable over Schurr in view of Ehlers. Pet. 28–64.

1. Summary of Schurr

Schurr is entitled “System and Method for Energy Usage Curtailment” and is directed “to a system and method for managing the use of energy.” Ex. 1005, code (54) (first quote), 1:4–5 (second quote); see also Ex. 1005, code (57) (“A system and method are disclosed for performing energy usage management within a network.”). The system includes an energy management system, such as a thermostat, that is associated with a

residence. Ex. 1005, code (57). A server may be located outside of the house and “may perform one or more energy curtailment management operations within the network . . . for remotely controlling the energy management system.” Ex. 1005, code (57). This can include reducing the load during a peak energy demand period. Ex. 1005, 6:7–12. “Additionally, a database may be associated with the server for storing curtailment event information relating to the network.” Ex. 1005, code (57). “A signal may be transmitted by the server to the thermostat device to alter an offset temperature setting of the thermostat device thereby remotely controlling the operation of the thermostat device.” Ex. 1005, code (57).

Schurr Figure 1 is reproduced below.

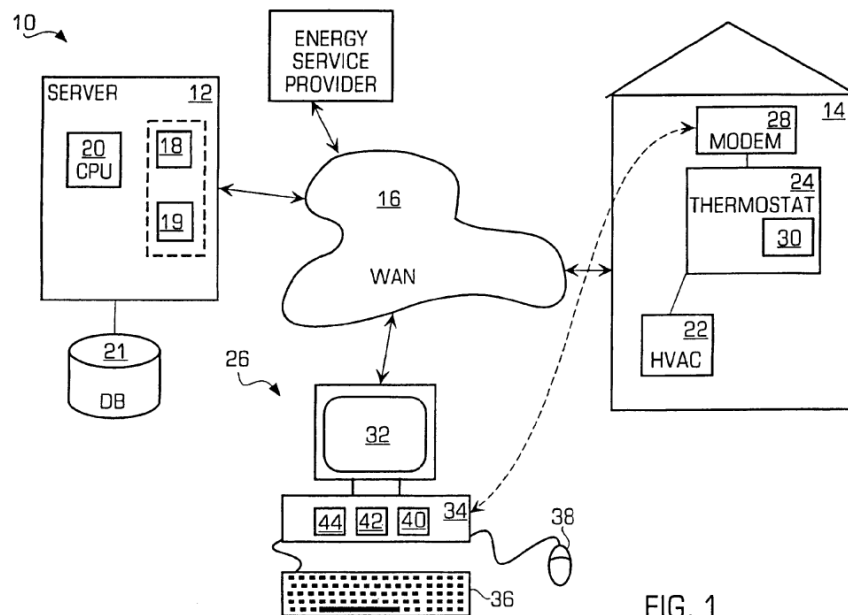


FIG. 1

Schurr Figure 1 “is a diagram illustrating a load curtailment system.”

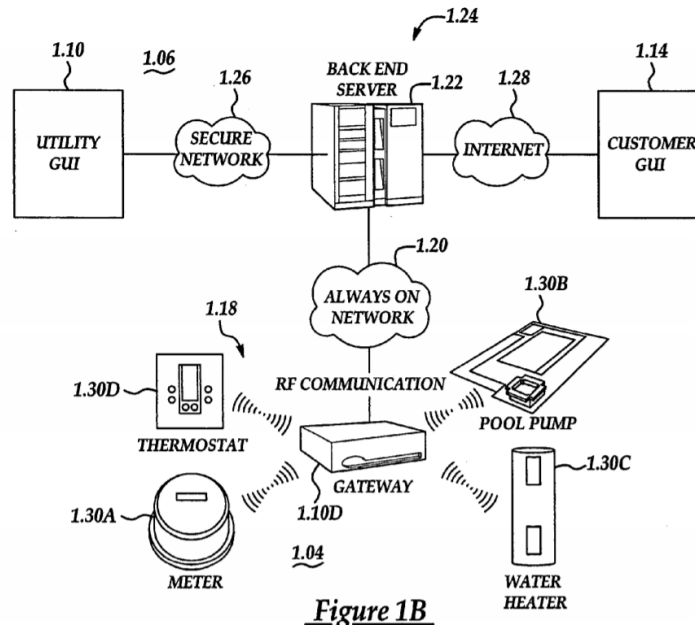
Ex. 1005, 3:18–19. “[T]he load curtailment system 10 may include a server 12 connected with one or more client nodes 14 across a data network 16, such as a wide area network (WAN) 16.” Ex. 1005, 3:55–59. “The server 12 may include a first software application 18 for performing energy

management functions within the network” and “[a] database 21 may be associated with the server 12 for storing curtailment event and other information relating to different client nodes 14 within the system 10.” Ex. 1005, 3:65–4:6.

2. Summary of Ehlers

Ehlers is entitled “System and Method for Controlling Usage of a Commodity” and is directed to “a system and method for managing the delivery and usage of a commodity such as electricity, natural gas, steam, water, chilled or heated water, or potable or recycled water.” Ex. 1010, code (54) (first quote), ¶ 2 (second quote).

Ehlers Figure 1B is reproduced below.



Ehlers Figure 1B “is a diagrammatic illustration of one implementation of the energy management system.” Ex. 1010 ¶ 20. As shown in Ehlers Figure 1B,

the gateway node 1.10D communicates to the utility control system 1.12 via an “always on”, secured wired or wireless

network 1.20 through a cable modem, DSL modem, or other suitable means (not shown). The utility control system 1.12 may be implemented in software which is stored and executed on a back-end server 1.22.

Id. ¶ 72.

Amongst other features, Ehlers recites how the system obtains both internal and external temperature:

The system 1.02 may have the ability *to sense the current indoor temperature and could be enhanced to include* at a minimum, humidity sensing, *outside temperature*, UV intensity, wind direction and speed, relative humidity, wet bulb thermometer, dew point and local weather forecast data or encoded signals as well as other analog or digital inputs used in the calculation of and maintenance of occupant comfort.

Ex. 1004 ¶ 88 (emphases added). Ehlers also teaches using pre-cooling or pre-heating based on the price or expected demand for energy: “By varying the operational parameter for the control of the system, the load control node 2.20B, 2.20C may choose, but not be limited to, . . . perform[ing] pre-cooling or pre-heating prior to higher pricing or demand periods being in effect.” *Id.* ¶ 204; *see also id.* ¶ 247 (“Forward projection of pricing enables the system 3.08 to determine the optimal humidity and temperature settings that can be achieved for the site 1.04 and perform humidity level increases in the case of heating or humidity level decreases in the case of cooling so that the effective set point can be either lowered in the case of heating or raised in the case of cooling, permitting the heating or cooling system to run less during periods of higher prices. This ability to precondition the site in anticipation of increased pricing on average will reduce the total energy bill for the site 1.04.”).

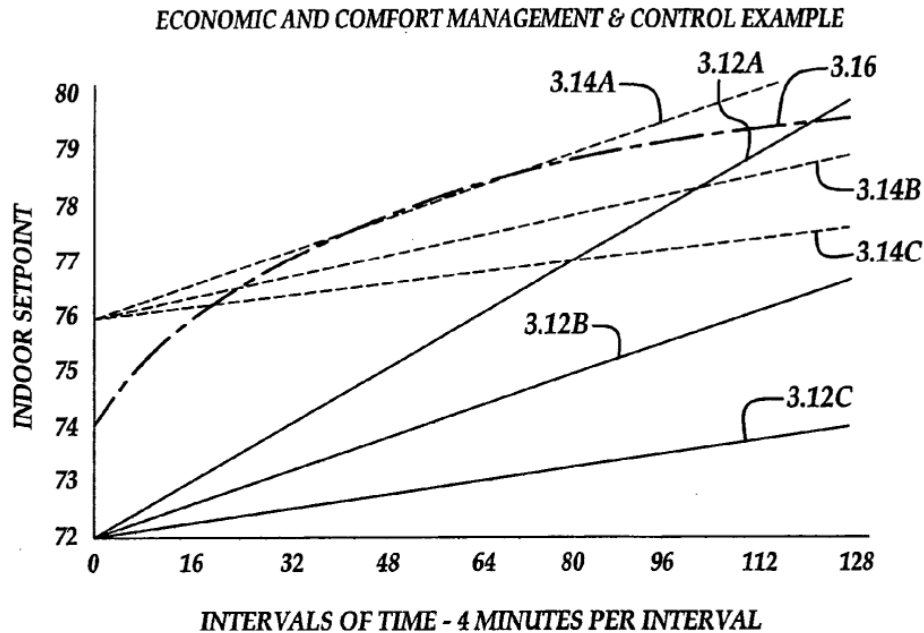
3. Ehlers and “Thermal Gain Rate”

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. 12–23; Pet. Reply 8–14; 538Tr. 8:5–22:16 (Petitioner), 30:14–41:20 (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. 40–46; Pet. Reply 8–14; 538Tr. 9:6–12. According to Petitioner, it is measured when the HVAC is off. *See* Pet. 41–42 (“It 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)); Pet. Reply 9 (“*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 their 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. 12–23; PO Sur-reply 4–14; 538Tr. 30:14–15. Instead, Patent Owner argues that it is the rate that energy is absorbed. *See* PO Resp. 14 (citing Ex. 2009 ¶ 38); 538Tr. 30:16–17. Patent Owner relies on the same portions of Ehlers as Petitioner does.

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 2.18.” Ex. 1004 ¶ 253. In the scenario illustrated in Figure 3D, the HVAC system is off. Ex. 1002 ¶ 112; Ex. 2009 ¶ 78.

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 ¶ 39; *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 ¶ 113. And a person having ordinary skill in the art would recognize that “that the thermal gain rate is *related to* the slope of the line (which would be rate of change of temperature).” Ex. 2009 ¶ 39 (emphasis in original); *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 ¶ 113. “[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 ¶ 82; *see also* Ex. 1002 ¶¶ 112–113; 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 ¶ 39)—is the thermal gain rate. *See* Ex. 1002 ¶¶ 112–113. 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, that means that the HVAC is cycled off at that time. *See* Ex. 1017 ¶ 16.

However, 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 ¶ 113.

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 find 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. 2009 ¶ 38). But the only evidence Patent Owner cites is the conclusory statement of Dr. Palmer repeating the Response without any citation. *See* Ex. 2009 ¶ 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 (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 5–7. We agree that there is some support of 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 operation.” PO Resp. 21 (citing Ex. 2009 ¶ 44); *see also* PO Resp. 17–18 (arguing thermal gain rate in Figure 3E cannot be a change of internal temperature because the temperature does not change); PO Resp. 18–21 (making a similar argument with regard to Figure 3G); PO Sur-reply 6–10. According to Patent Owner, that is “directly contrary to Ehelers['] own usage.” PO Resp. 21.

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.” Ex. 1017 ¶ 16. 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. Ex. 1017 ¶ 16. 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. Ex. 1017 ¶¶ 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.” Ex. 1017 ¶ 17; *see also* Ex. 1017 ¶¶ 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.'" ⁶ PO Sur-reply 5 (quoting Ex. 2011, 27:13–14) (alteration in original); *see also* PO Resp. 13–14 (quoting Ex. 2011, ⁷ 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.

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 choose not to include

⁶ Here and elsewhere, the parties refer to "Ehlers" as "Ehlers '330." We have modified all quotes to change "Ehlers '330" to "Ehlers."

⁷ Patent Owner incorrectly identifies Exhibit 1007 in the Patent Owner Response.

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. 2011, 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.” PO Sur-reply 10 (quoting Ex. 2011, 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. 2011, 28:7–11. But at no time did Mr. Shah equate the heat being absorbed with the thermal gain rate. *See* Ex. 2011, 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. 2011, 27:14–20.⁸

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.

4. Analysis of Claim 1

a) Undisputed Elements

The preamble of claim 1 recites “[1a] [a] system for controlling a heating, ventilation and air conditioning (HVAC) system comprising.”

Ex. 1001, 13:31–32. Petitioner argues Schurr teaches the preamble.⁹ Pet.

⁸ Patent Owner also challenges the testimony of Mr. Shah relating to the prosecution of the ’186 patent. PO Resp. 22–23. Because we do not rely on this testimony, Patent Owner’s arguments rebutting it are moot.

⁹ 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.

28–30. Patent Owner does not separately address this limitation. *See* PO Resp.

We agree with Petitioner. Specifically, Schurr teaches a system and method for performing energy use management within a network including HVAC unit 22. Ex. 1005 code (57), 2:13–14, 4:15–21; Ex. 1002 ¶ 84.

Claim 1 further recites “[1b] one or more server computers comprising computer hardware, the one or more server computers configured to receive inside temperature measurements from at least a first location conditioned by at least one HVAC system.” Ex. 1001, 13:33–36. Petitioner argues Schurr¹⁰ teaches this limitation. Pet. 30–34. Patent Owner does not separately address this limitation. *See* PO Resp.

We agree with Petitioner. Specifically, Schurr teaches a system that includes one or more server computers. Ex. 1005, code (57), 2:13–27, 3:65–4:2, 4:21–26, 4:34–40, 4:56–64, 5:24–29, 8:1–9, claims 1, 4–5, 11; Ex. 1002 ¶ 89. Schurr’s server computer includes computer hardware such as a CPU. Ex. 1005, Fig. 1, 3:65–4:2; Ex. 1002 ¶ 91. Schurr also teaches using a system that includes a thermostat which takes inside temperature measurements from at least a first location that is either heated or cooled by the HVAC system. Ex. 1002 ¶ 92; Ex. 1005, Fig. 1, 4:30–34, 4:56–58. Schurr’s system thermostat indicates the indoor temperature at that first location and it would have been obvious to have the server receive the indoor temperature measurement from the thermostat. Ex. 1002 ¶¶ 93–97; Ex. 1005, code (57), 2:35–45, 4:15–26, 5:41–57, 8:9–14, Fig. 10 (step 122c).

¹⁰ Although the Petitioner indicates that this limitation is taught by Schurr in combination with Ehlers, the argument focuses solely on Schurr. *See* Pet. 30–34.

Claim 1 further recites “[1d] wherein the one or more server computers are located remotely from the first location, the one or more server computers configured to receive outside temperature measurements from at least one source other than the HVAC system.” Ex. 1001, 13:40–44. Petitioner argues Schurr in combination with Ehlers teaches this limitation. Pet. 36–39. Patent Owner does not separately address this limitation.¹¹ See PO Resp.

We agree with Petitioner. Specifically, Schurr teaches one or more server computers location remote from the first location. Ex. 1002 ¶¶ 102; Ex. 1005, code (57), 2:15–20, 4:20–29, 4:58–64. Additionally, Ehlers teaches that it can receive “local weather forecast data,” which a person having ordinary skill in the art would understand to include both projected and current weather conditions, such as the outside temperature. Ex. 1004 ¶¶ 88, 230; Ex. 1002 ¶¶ 105–106; Ex. 1013, 10:30–31, 11:4–5, 11:17–18¹² (WO 2007/128783 A1, published Nov. 15, 2007). A person having ordinary skill in the art would have combined Ehlers’ use of outside temperature measurements from a source other than the HVAC system with Schurr’s remote server in order to improve Schurr’s energy management functions with a reasonable expectation of success. Ex. 1002 ¶¶ 108–110.

Claim 1 further recites “[1f] wherein the one or more server computers are further configured to determine whether to direct the HVAC

¹¹ Although Patent Owner does not expressly discuss the combination of these two features, Patent Owner presents generalized arguments as to why a person having ordinary skill in the art would not have combined Schurr and Ehlers. We address those arguments below in Section II.E.4.(d).

¹² Citation is to native pagination.

control system to pre-cool the first structure based on the one or more predicted rates of change prior to directing the HVAC control system to reduce electricity demand.” Ex. 1001, 13:53–57. Petitioner argues the combination of Schurr and Ehlers teach this limitation. Pet. 51–57. Patent Owner does not separately address this limitation.¹³ See PO Resp.

We agree with Petitioner. Specifically, Schurr teaches directing the thermostat to increase the set point in order to reduce electricity demand and Ehlers’ teaching pre-cooling prior to higher pricing or demand periods. Ex. 1002 ¶¶ 130–135 (citing Ehlers and Schurr). Pre-cooling was well known and it would have been obvious to a person having ordinary skill in the art to have used it with Schurr prior to increasing the set point in order to maximize occupant comfort during a curtailment period and that a person having ordinary skill in the art would have had a reasonable expectation of success. Ex. 1002 ¶¶ 136–140.

b) Limitation [1c]: One or More Databases That Store the Inside Temperature Measurements over Time, the One or More Databases Accessee[d] by the One or More Server Computers

Claim 1 further recites “one or more databases that store the inside temperature measurements over time, the one or more databases accessee[d] by the one or more server computers.” Ex. 1001, 13:37–39, Certificate of Correction. Petitioner argues that the combination of Schurr and Ehlers teaches this limitation. Pet. 34–36. For the reasons given below, we agree with Petitioner.

¹³ Although Patent Owner does not expressly discuss the combination of these two features, Patent Owner presents generalized arguments as to why a person having ordinary skill in the art would not have combined Schurr and Ehlers. We address those arguments below in Section II.E.4.(d).

Schurr teaches a database that is associated with the server. Ex. 1005, code (57) (“Additionally, a database may be associated with the server for storing curtailment event information relating to the network.”), 2:25–27, 4:4–6; Ex. 1002 ¶ 98. A person having ordinary skill in the art would have recognized that the server must be able to access the database. Ex. 1002 ¶ 98.

Schurr does not expressly teach that the database is used to store inside temperature measurements over time as recited in claim 1. Ex. 1002 ¶ 99. However, a person having ordinary skill in the art would have modified Schurr to store the inside temperature measurements over time with a reasonable expectation of success. Ex. 1002 ¶¶ 99–101. “[D]oing so would have allowed the server to track, organize, maintain, and then later use the inside temperatures in calculations relating to energy efficiency and curtailment management.” Ex. 1002 ¶ 99. This is necessary in order to have a reasonable expectation of success in using Ehlers’ thermal gain rate computations as discussed previously and in the following section. *See* Ex. 1002 ¶ 99.

Patent Owner argues that Schurr does not teach this limitation. *See* PO Resp. 28–30; PO Sur-reply 19–21. For the reasons set forth below, we do not agree with Patent Owner’s arguments.

Patent Owner argues “that Schurr does not disclose storing inside temperature over time” and “there is no need to store inside temperatures over time for the implementation of Schurr’s system.” PO Resp. 28–29 (citing Ex. 2009 ¶ 71). Although Patent Owner is factually correct, Patent Owner’s argument does not address Petitioner’s theory. Petitioner’s theory is not that Schurr recites the limitation, but that a person having ordinary

skill in the art would have modified Schurr to allow for the use of Ehlers' thermal gain rates. *See* Pet. 34–35. And our findings are based on Petitioner's theory as to why a person having ordinary skill in the art would have modified Schurr.

Patent Owner further argues that Ehlers teaches “storing temperature setpoints” and not “storing temperature measurements.” PO Resp. 29 (citing Ex. 2009 ¶ 73; Ex. 1004 ¶ 278); *see also* PO Sur-reply 20 (“Schurr does not disclose storing inside temperature over time.” (citing Ex. 2009 ¶ 71)). Specifically, Patent Owner argues that “a temperature setpoint is not a temperature measurement” and that temperature measurements are not one of the “41 specific data points [listed in Ehlers] that may be recorded in the database.” PO Resp. 29 (citing Ex. 2009 ¶ 73; Ex. 1004 ¶ 278). Patent Owner also argues that because “Petitioner cites to arguments made regarding other claim elements, [specifically element [1e],] and not made previously with respect to claim element [1c],” we should not consider those new arguments. PO Sur-reply 20–21 (citing Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019)¹⁴ (“CPTG”) 73).

We do not agree with Patent Owner. Although internal temperature measurements are not one of the 41 listed data points that “may be maintained or stored by the system” in the section cited by Patent Owner (*see* Ex. 1004 ¶¶ 268–309), elsewhere, Ehlers teaches or suggests storing internal temperature measurements. For example, Ehlers states that the system can generate “[d]aily temperature reports displaying temperature and setpoints in, e.g. 15-minute intervals.” Ex. 1004 ¶ 124; *see also* Ex. 1004,

¹⁴ *Available at* <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

Fig. 4L (showing a daily temperature report). As Dr. Palmer admitted under cross-examination, Ehlers “would not be able to display temperature measurements without storing those temperature measurements.” Ex. 1018, 30:20–31:1. Although Dr. Palmer further states—and Patent Owner argues—that those are average temperatures (Ex. 1018 31:1–10; PO Resp. 29), the actual temperatures must also be stored, for at least some time, in order to calculate the average temperatures. Ex. 1022, 164:8–13 (Dr. Palmer’s deposition, *EcoFactor, Inc. v. ecobee, Inc.*, Case No. 6:21-v-00428).

We also do not agree with Patent Owner that Petitioner made an improper new argument in the Reply. First, our rules simply prohibit Petitioner from “submit[ting] new evidence or argument in reply that it could have presented earlier, e.g. to make out a prima facie case of unpatentability.” CPTG 73. But, as Patent Owner concedes, the evidence and arguments were made in the Petition, just for another limitation. Our rules do not require a party to repeat the same arguments in multiple limitations of the same claim.

Second, our rules do not prohibit Petitioner from citing new evidence in response to Patent Owner’s arguments. CPTG 73 (“A party also may submit rebuttal evidence in support of its reply.”); *see also Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1077–78 (Fed. Cir. 2015). In this case, Patent Owner argued in its Response that Ehlers does not teach storing indoor temperatures. *See* PO Resp. 29. Petitioner’s arguments and evidence contradict that argument. *See* Pet. Reply 20–21. Accordingly, such evidence and argument is proper in a reply.

Patent Owner also argues that Petitioner's reliance on claim 11 of Schurr (Pet. Reply 19–20) is a new argument that should be disregarded. PO Sur-reply 19. We disagree. In its Reply, Petitioner argues as follows:

As the Petition explains in detail under claim element [1b] (which EcoFactor does not challenge), Schurr's server remotely monitors inside temperature. (Pet., 30-34) (Ex. 1005, claim 11) (*see also* Ex. 1005, 2:23-29) (Ex. 1002, ¶96). Schurr specifically teaches that inside temperatures can be accessed and viewed via the remote server. (Ex. 1005, 8:1-16) (*see also* Ex. 1005, 7:51-54, 3:2-4, 5:29-57, claim 5, Fig. 3, Fig. 8C) (Ex. 1002, ¶97).

Pet. Reply 19–20. That is no different than the argument made in the Petition that “Schurr teaches that software at the server remotely monitors the temperature in the structure.” Pet. 33–34 (citing Ex. 1005, claim 11). Because the argument was previously raised in the Petition, it is appropriate to repeat it in the Reply.¹⁵

Patent Owner also argues that even if Schurr teaches that inside temperature measurements can be accessed and viewed by the remote server, “[b]eing accessed and viewed does not require saving on a database.” PO Sur-reply 19–20. Similarly, Patent Owner argues that because “Schurr implements curtailment based on factors outside the home, not inside,” “indoor temperatures are not useful in Schurr's system.” PO Sur-reply 20.

Because Patent Owner's arguments do not address Petitioner's argument, the arguments are inapposite. Petitioner does not argue that Schurr recites that the internal temperature measurements are stored in a database. Indeed, Petitioner agrees with Patent Owner that “Schurr does not expressly disclose that the **one or more databases store the inside**

¹⁵ We note that we do not rely on Schurr claim 11 in our analysis.

temperature measurements over time.” Pet. 34–35 (emphasis in original). Instead, Petitioner argues that a person having ordinary skill in the art would have modified Schurr, in light of the teachings of Ehlers, to store the data in a database. *See* Pet. 34–35. Patent Owner’s argument does not address that combination and modification.¹⁶

c) Limitation [1e]: Wherein the One or More Server Computers Are Configured to Calculate One or More Predicted Rates of Change in Temperature at the First Location Based on Status of the HVAC System, and Based on the Outside Temperature Measurements, Wherein the One or More Predicted Rates of Change Predict a Speed a Temperature inside the First Location Will Change in Response to Changes in Outside Temperature;

Claim 1 further recites

wherein the one or more server computers are configured to calculate one or more predicted rates of change in temperature at the first location based on status of the HVAC system, and based on the outside temperature measurements, wherein the one or more predicted rates of change predict a speed a temperature inside the first location will change in response to changes in outside temperature.

Ex. 1001, 13:45–52. Petitioner argues the combination of Schurr and Ehlers teaches that limitation. Pet. 39–51. For the reasons given below we agree with Petitioner.

Ehlers teaches a system that “tracks and learns about the thermal gain characteristics of the home.” Ex. 1004 ¶ 253. As discussed above, Ehlers

¹⁶ Patent Owner does not expressly discuss the combination of these two references when discussing this limitation. *See* PO Resp. 28–30. However, Patent Owner presents generalized arguments as to why a person having ordinary skill in the art would not have combined Schurr and Ehlers. *See* PO Resp. 23–28. We address those arguments below in Section II.E.4.(d).

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; Section II.E.3; *see also* Ex. 1002 ¶¶ 111–115. 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 ¶¶ 116–117.

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.” Ex. 1004 ¶ 256. In that way, Ehlers predicts the thermal gain to predict 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 ¶ 118. This thermal gain rate is then 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 ¶ 119; *see also* Ex. 1004 ¶¶ 204, 247, 265 (all discussing pre-cooling). Because the thermal gain rate is based on the HVAC being off, the calculations are based on the status of the HVAC system.

Additionally, a person having ordinary skill in the art would have used Ehlers’ thermal gain computations on Schurr’s servers with a reasonable expectation of success. *See* Ex. 1002 ¶¶ 120–128. First, performing Ehlers thermal gain rate computation on Schurr’s servers would allow Schurr to incorporate Ehlers’ temperature predictions into its calculations relating to energy efficiency and curtailment management. Ex. 1002 ¶¶ 121–123. A person having ordinary skill in the art would have recognized that using

Ehlers' projections would improve Schurr by allowing offsets to be calculated for each particular building. Ex. 1002 ¶ 124. Second, a person having ordinary skill in the art would have incorporated Ehlers into Schurr to allow for the calculation of accurate recovery times.¹⁷ Ex. 1002 ¶¶ 125–126; *see also* Ex. 1004 ¶ 295 (“This computed factor is used to more accurately compute the recovery time for thermal gain or loss when combined with the average normalized thermal gain or loss for the site 1.04.”). Third, the substitution involves using a known technique (Ehlers) that would have been predictably carried out by any conventional system, such as Schurr. *See KSR*, 550 U.S. at 416–21; Ex. 1002 ¶ 127.

Some of Patent Owner arguments focus on Patent Owner's argument that the Petition misunderstands the meaning of thermal gain rate as used in Ehlers. *See* PO Resp. 30–36; PO Sur-reply 21–24. For the reasons discussed above in Section II.E.3, 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. 31–32. Patent Owner further argues that Mr. Shah stated during cross-examination in a different proceeding (IPR2022-00538) “that the HVAC system being turned ON and

¹⁷ A recovery time is the amount of time it takes a system to change from a first setpoint to a second setpoint. Ex. 1002 ¶ 125.

functioning will alter the thermal gain rate of a building.” PO Resp. 32 (citing Ex. 2015, 29:3–23).¹⁸

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 simply requires that the predicted rate of change be based upon that “status of the HVAC system.” As discussed in Section II.E.3, the thermal gain rate in Ehlers applies when the HVAC is off, which is a status of the HVAC system. Nothing in claim 1 requires it to calculate a predicted rate of change for all statuses 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. 33 (citing Ex. 2009 ¶ 80). Specifically, Patent Owner first argues that “calculating a setpoint is not a prediction, it is developing an instruction for the control system.” PO Resp. 33 (citing Ex. 2009 ¶ 81). 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.” PO Resp. 34. 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.” PO Resp. 34 (citing Ex. 2009 ¶ 82).

¹⁸ The Response directs us to page 28. That appears to be a typographical error. However, our discussion of this argument applies to the testimony cited on either page.

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 ¶¶ 117–118; Ex. 1017 ¶ 26. For example, Ehlers describes how that 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 ¶¶ 118, 147–148; Ex. 1004 ¶ 256) and when computing the recovery time (Ex. 1002 ¶¶ 125–126). 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.

d) Reason to Combine

Petitioner argues that a person having ordinary skill in the art would have combined the relevant teachings of Schurr and Ehlers with a reasonable expectation of success. Pet. 23–27, 35–36, 38–39, 46–51, 54–57; Pet. Reply 14–19. We agree.

Schurr teaches a system and method for managing energy use relating to HVAC system. Ex. 1005, code (57), 1:4–24. During peak energy events, it initiates a load curtailment event which can “alter an offset temperature

setting of the thermostat” to reduce the use of electricity. Ex. 1005, code (57), 6:7–12, Fig. 7.

Ehlers teaches a system that controls the thermostat of an individual house. Ex. 1004, code (57), ¶ 247. Specifically, Ehlers teaches preconditioning a house—such as by pre-cooling¹⁹—during periods of time when electricity is cheaper to reduce the use of electricity during higher cost periods. Ex. 1004 ¶ 247. Ehlers teaches using thermal gain calculations to compute the required amount of pre-cooling to keep the HVAC cycle run time at a specific level during a curtailment or demand reduction event. Ex. 1004 ¶¶ 253–256.

A person having ordinary skill in the art would have combined this teaching from Ehlers with Schurr’s system to improve the efficiency and comfort of the HVAC system. *See* Ex. 1002 ¶ 74. For example, although Schurr discusses transmitting a temperature “offset,” Schurr is silent on how that offset is determined. *See* Ex. 1005, 2:28–63, 4:15–28, 6:35–61, 8:62–64; Ex. 1002 ¶ 75. Instead, Schurr uses the same offset for each house. *See* Ex. 1005, Fig. 7. A person having ordinary skill in the art would recognize that Ehlers’ teaching would improve Schurr by allowing the use of custom offsets that are appropriate for each individual building and allow for an appropriate amount of precooling. *See* Ex. 1002 ¶¶ 76–78.

We do not agree with Patent Owner’s contrary arguments.

Patent Owner argues that Petitioner’s “comparison ignores fundamental differences in Schurr and Ehlers ‘330 that would *teach away* from a [person having ordinary skill in the art] combining these two

¹⁹ For ease, we only discuss pre-cooling. However, the system equally applies to preheating.

teachings.” PO Resp. 23 (citing Ex. 2009 ¶ 58) (emphasis added). On one hand, Patent Owner argues that “Schurr is a system for a utility or other service provider to manage energy usage.” PO Resp. 23 (citing Ex. 2009 ¶ 59); *see also* PO Resp. 23–25 (describing Schurr in more detail); PO Sur-reply 15–16. On the other hand, Patent Owner argues Ehlers “is directed toward energy usage at a single customer site.” PO Resp. 25 (citing Ex. 1004 ¶ 60); *see also* PO Sur-reply 16. According to Patent Owner, it will take a significant amount of time at varying temperatures for each house to obtain the information for Ehlers to work. PO Resp. 25–27 (citing Ex. 2009 ¶¶ 64–67, Ex. 2011, 29:17–22). This “would require those customers to endure extremely hot temperatures (90+) for more than two hours at a time with the HVAC system OFF.” PO Resp. 27 (citing Ex. 2009 ¶ 68); PO Sur-reply 16–18. Because of this, Patent Owner argues that “[i]n view of the time and difficulties associated with gathering the data necessary for an individualized analysis of a consumer’s home in Ehlers, a [person having ordinary skill in the art] would have been dissuaded from combining the teachings of Ehlers with the system of Schurr.” PO Resp. 27.

However, Patent Owner has not shown that either reference “teaches away” from using the other. References teach away if “a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.” *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). Although Patent Owner has shown differences in how the systems in Ehlers and Schurr work, that “does not teach away. . . [as] it merely expresses a general preference for an alternative invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the

invention claimed.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)). Such a stated preference is insufficient to teach away from the claimed invention. *See id.*; *Fulton*, 391 F.3d at 1201.

Moreover, it is of no import that Schurr is a relatively simple system while Ehlers is more complex. *Compare* PO Resp. 24 (“[Schurr] takes the very simple and basic approach.”), *with* PO Resp. 28 (“Because a typical utility provides thousands of homes with electricity, it would not be interested in the complex data gathering and customized analysis of each customer that would be necessary to incorporating the teachings of Ehlers.”). *KSR* holds such hard and fast rules are improper. *KSR*, 550 U.S. 398; *see also Navico Inc. v. ITC*, No. 2016-1533, slip op. 16 (Fed. Cir. June 13, 2017) (non-precedential) (finding a reason to combine when “Betts was a simple, fixed system and Tucker was a complex, customizable system”). Instead, all that is required is “some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness,” which Petitioner has done. *See In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006), *cited with approval in KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). Moreover, even if more complex, such optimization could lead to improved customer participation in curtailment events. *See* Ex. 1022, 204:10–25.

Additionally, the evidence does not support Patent Owner’s argument that it would not be practical for a utility to obtain data from each of its customer’s home. *See* PO Resp. 25. To the contrary, Ehlers expressly teaches that its system can be performed either at the customer cite or by the utility. *See* Ex. 1004 ¶¶ 59 (“In general, the system 1.02 allows at least one

customer (or user) located *at a customer site (indicated by reference number 1.04) and/or a utility (indicated by reference number 1.06)* to manage delivery or usage of the electricity to the customer's site 1.06.” (emphasis added)), 70, 74.

Patent Owner also overstates the burden of collecting data for the Ehlers system to work. First, Patent Owner has not shown that the method of data collection would be different whether Ehlers is being applied to a single home or a group of homes.

Second, Ehlers does not state that 2 hours is required to collect data for each set point/outside temperature combination. *See* Ex. 1004 ¶ 253 (describing Figures 3D). Although Patent Owner argues that 2 hours is needed based on what is shown in Figure 3D during the oral hearing (473Tr. 27:7–28:10), Patent Owner has not directed us to any evidence in the record to support it. Dr. Palmer simply testifies that Mr. Shah testified that Figure 3D shows data collected over 2 hours (*see* Ex. 2009 ¶¶ 64–67); but, that is different than saying that 2 hours is required.

Third, Patent Owner ignores that Ehlers is continuously collecting and tracking data, such as when the HVAC is off. *See* Ex. 1004 ¶ 256; Ex. 1017 ¶ 10. This data can be used to determine the thermal gain rates without imposing any hardship on the occupant.

Fourth, a person having ordinary skill in the art would have found it “straightforward both to acquire and to interpolate thermal gain rate data for other indoor and outdoor temperatures.” Ex. 1017 ¶ 10. At most, this appears to be an attack on whether Ehlers is practical or what a practical business person or home owner might do. *See* 473Tr. 28:11–31:4 (Patent Owner arguing Ehlers is not practical). But, “[t]hat a given combination

would not be made by businessmen for economic reasons does not mean that persons skilled in the art would not make the combination because of some technological incompatibility.” *In re Farrenkopf*, 713 F.2d 714, 718 (Fed. Cir. 1983); *Velander v. Garner*, 348 F.3d 1359, 1368 (Fed. Cir. 2003) (“expense, time, and effort involved” are distinct from likelihood of success).

Patent Owner also argues that “Petitioner originally argued that Fig. 3D shows measured inside temperature (Pet. at 41–42) but now apparently agrees it does not. [Pet.] Reply 18–19.” PO Sur-reply 19. We have reviewed the pages Patent Owner directs us to, but we do not see anything to support its argument. In the Reply, Petitioner argues that “occupants would not have to endure 90°F *indoor* temperatures to gather data.” Pet. Reply 18–19 (emphasis in original). That is consistent with the description of Ehlers Figure 3D in the Petition in which the lines are described as indoor temperatures that correspond to various outdoor temperatures (such as one for 90°F). *See* Pet. 41–42; Ex. 1004 ¶ 253. In fact, the highest *indoor* temperature shown in Ehlers Figure 3D is 80°F, not 90°F.

e) Conclusion Regarding Claim 1

For the reasons set forth above, Petitioner has demonstrated by a preponderance of the evidence that the subject matter of claim 1 would have been obvious over Schurr and Ehlers.

5. Analysis of Claims 3–8 and 10–13

Petitioner argues that the combination of Schurr and Ehlers teaches the limitations recited in claims 3–8 and 10–13 and that a person having ordinary skill in the art would have combined the teachings with a reasonable expectation of success. Pet. 57–64. Petitioner’s arguments are

supported by citations to the prior art and the testimony of Mr. Shah. *See* Pet. 57–64. We adopt Petitioner’s arguments and evidence as our own.

Patent Owner does not address separately the additional limitations recited in claims 3–8 and 10–13. *See* PO Resp. 36–37.

Accordingly, Petitioner has shown by a preponderance of the evidence that the subject matter of claims 3–8 and 10–13 would have been obvious over Schurr and Ehlers.

F. Obviousness over Schurr, Ehlers and Rosen (Claims 1–13)

Petitioner challenges claims 1–13 as unpatentable over Schurr in view of Ehlers and Rosen. Pet. 64–69. Petitioner states that “Schurr and Ehlers ’330 are applied as in Ground 1,” but adds that “Rosen supports the obviousness of receiving current outside temperatures from the Internet by teaching that such arrangements were common in the relevant timeframe.” Pet. 65 (citing Ex. 1006, 4:4–15, 4:39–59; Ex. 1002 ¶164). Petitioner further explains that “[t]he claim mapping for all claims is otherwise the same as in Ground 1, except dependent claims 2 and 9,” which are not challenged in the prior ground. Pet. 65.

1. Summary of Rosen

Rosen is titled “Thermostat System with Location Data” and is directed to “a thermostat system incorporating a communication interface for receiving and displaying diverse information from a remote correspondent.” Ex. 1006, code (54), 1:8–11. Relevant to this proceeding, Rosen teaches using the internet to obtain current weather information for a remote location:

At one or more predetermined times of day (and/or on-demand if provided for in the operating program) which have been previously stored in the memory 8 and established by the

clock 13, the CPU 9 starts the process shown in FIG. 5 by issuing signals to the I/O unit 10 to cause the communications interface 14 to establish communications, via link 16, with a remote correspondent 15. The remote correspondent 15 has a known data communications “address” and, in the example, is a source of current information, such as local weather. Such local current weather information sources are widely available and are *routinely accessed by, for example, using the Internet.*

. . . .

As an example, assume that Montreal weather is of interest to an occupant of a conditioned space in the Montreal area which uses the subject thermostat system and that “temperature”, “high” and “low” are the key terms for the subject of local weather stored in the memory 8. Periodically, as determined by times stored in the memory 8, *the CPU 9 issues signals to access the remote correspondent 15 (a site providing local Montreal weather in the example) and download the current weather information as a data stream.*

Id. at 4:4–49 (emphases added).

2. *Claims 1, 3–8, and 10–13*

Because we determine that claims 1, 3–8, and 10–13 would have been obvious under 35 U.S.C. § 103(a) in view of Schurr and Ehlers, we do not address the parties’ arguments regarding the combination of Schurr, Ehlers, and Rosen. *See Boston Scientific Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (“We agree that the Board need not address issues that are not necessary to the resolution of the proceeding.”).

3. *Claims 2 and 9*

a) *The Undisputed Limitations*

Claim 2 depends from claim 1 and recites that “in which the one or more server computers receive outside temperatures for geographic regions based on ZIP codes from sources other than the HVAC system.” Ex. 1001,

14:1–4. Similarly, claim 9 depends from claim 8 and recites “in which outside temperatures are received for geographic regions based on ZIP codes from sources other than the HVAC system.” Ex. 1001, 14:40–42.

Petitioner argues that Rosen teaches the additional limitation recited in claims 2 and 9. Pet. 67–70. Petitioner’s arguments are supported by citations to the prior art and the testimony of Mr. Shah. *See* Pet. 67–70. We adopt Petitioner’s arguments and evidence as our own.

Besides the challenges discussed above with regard to claim 1, Patent Owner does not dispute Petitioner’s argument regarding whether Rosen teaches the additional limitations recited in dependent claims 2 and 9. *See* PO Resp. 39.

b) Reason to Combine

Petitioner argues that a person having ordinary skill in the art would have combined the teachings of Schurr, Ehlers, and Rosen with a reasonable expectation of success. Pet. 66, 68–70. For the reasons discussed below, we agree.

Although Ehlers teaches that the thermostat “may receive external information,” “such as information related to the local weather forecast,” from a gateway node, Ehlers is silent on where that information comes from. Ex. 1004 ¶ 230; *see also* Ex. 1004 ¶ 88 (discussing “local weather forecast data”); Ex. 1002 ¶¶ 170, 172. Therefore, a person having ordinary skill in the art would have needed to look at known ways of retrieving local forecast data, such as Rosen, which allows the thermostat to obtain weather data via the internet based on a ZIP code. *See* Ex. 1002 ¶ 172; 1006, 2:31–38, 6:50–61, 7:19–45, 7:58–8:41. A person having ordinary skill in the art would have understood that using the internet to obtain weather data based on ZIP

codes would “have provided an accurate average temperature, measured using professional equipment, that was representative of true outside temperature in a certain geographic location.” Ex. 1002 ¶ 173. A person having ordinary skill in the art would also have understood that there were disadvantages associated with local external temperature sensors, such as being placed in a location where they do always provide representative temperature measurements. Ex. 1002 ¶ 172.

A person having ordinary skill in the art would also have realized that there would have been a reasonable expectation of success in using such predictable technology. *See* Ex. 1002 ¶ 167.

Patent Owner argues that “Rosen represents an application which utilizes a modem or other communication technology to retrieve weather forecast information for purposes of displaying it on a household thermostat.” PO Resp. 38 (citing Ex. 2009 ¶ 93); *see also* PO Sur-reply. 24–25 (citing Ex. 1006,²⁰ Fig. 5, 4:4–15; Ex. 2009 ¶ 54). According to Patent Owner, “[t]he utility-based application of Schurr would not be motivated to provide each individual household with outside temperature to display based on zip code.” PO Resp. 38 (citing Ex. 2009 ¶ 93).

We disagree with Patent Owner, as it reads the teaching of Rosen too narrowly. Although the specific application discussed in Rosen was to display the outside temperature on the thermostat, that is not the full scope of its teaching. Instead, as discussed above, Rosen teaches using the internet to obtain a weather forecast based on a ZIP code. Patent Owner’s argument does not address that broad teaching.

²⁰ Patent Owner incorrectly cites Exhibit 1009. We believe Patent Owner meant to cite Exhibit 1006. Regardless, we considered both references.

Patent Owner also argues that “to the extent that the utility may be forecasting their need to reduce demand by their customers . . . , those power forecasts utilize much broader and complex models which a [person having ordinary skill in the art] would not be motivated to integrate into Schurr.” PO Resp. 38 (citing Ex. 2009 ¶ 93). This is substantially the same as the simple-complex combination argument Patent Owner made regarding Schurr and Ehlers. We disagree with that argument for the same reason. *See* Section II.E.4.(d).

Patent Owner also argues that “if Ehlers provides outside temperature information as alleged by Petitioner, there would be no need to provide outside temperature measurements localized by ZIP code.” PO Sur-reply 25. First, Patent Owner forfeited this argument by not raising it in the Patent Owner Response. *See* Paper 8, 8 (Scheduling Order) (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.”). Second, as Petitioner explained in the Petition and we find above, Ehlers teaches obtaining the weather forecast from an external source without providing details on how to do so. Accordingly, a person having ordinary skill in the art would have had to turn to a reference such as Rosen for such a teaching.

c) Conclusion Regarding Claims 2 and 9

For the reasons set forth above, Petitioner has demonstrated by a preponderance of the evidence that the subject matter of claims 2 and 9 would have been obvious over Schurr, Ehlers, and Rosen.

III. CONCLUSION²¹

For the foregoing reasons, we conclude that Petitioner has demonstrated by a preponderance of the evidence the unpatentability of claims 1–13 of the '186 patent.

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1, 3–8, 10–13	103(a)	Schurr, Ehlers	1, 3–8, 10–13	
1–13	103(a)	Schurr, Ehlers, Rosen ²²	2, 9	
Overall Outcome			1–13	

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, Petitioner has shown by a preponderance of the evidence that claims 1–13 of the '186 patent are unpatentable;

²¹ 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).

²² As explained above, we do not address claims 1, 3–8, and 10–13 based on this ground.

IPR2022-00473
Patent 8,751,186 B2

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.

IPR2022-00473
Patent 8,751,186 B2

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