

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC and ECOBEE, INC.,
Petitioners,

v.

ECOFACITOR, INC.,
Patent Owner.

IPR2020-01504¹
Patent 8,498,753 B2

Before JEFFREY W. ABRAHAM, CHRISTOPHER L. OGDEN, and
SCOTT B. HOWARD, *Administrative Patent Judges*.

HOWARD, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision on Remand
Determining All Challenged Claims Unpatentable
Denying Petitioner's Motion to Exclude Evidence
35 U.S.C. §§ 144, 318(a)

¹ ecobee, Inc. was joined as a party to this proceeding via a Motion for Joinder in IPR2021-00792.

INTRODUCTION

A. Background and Summary

Google LLC (“Petitioner”) filed a Petition requesting that we institute an *inter partes* review of claims 1–20 of U.S. Patent No. 8,498,753 B2 (Ex. 1001, “the ’753 patent”). Paper 2 (“Pet.”). EcoFactor, Inc. (“Patent Owner”) did not file a Patent Owner Preliminary Response. We instituted an *inter partes* review of claims 1–20 of the ’753 patent on the ground of unpatentability alleged in the Petition. Paper 6.

After institution of trial, Patent Owner filed a Response (Paper 13, “PO Resp.”), Petitioner filed a Reply (Paper 20, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 22, “PO Sur-reply”).

Prior to the Sur-reply, we joined ecobee, Inc. (“Petitioner,” collectively with Google LLC) as a party to the proceeding. Paper 21.

After the end of regular briefing but before the oral hearing, we issued an Order with a proposed construction of the preambles of the challenged claims and ordered the parties to address that proposed claim construction. Paper 28. Petitioner and Patent Owner each submitted a supplemental claim construction brief agreeing with our proposed construction. Paper 31 (“PO Claim Constr. Br.”); Paper 32 (Pet. Claim Constr. Br.”).

An oral hearing was held on December 7, 2021, and the record contains a transcript of this hearing. Paper 41 (“Tr.”).

Following the hearing, we issued an order requesting additional briefing from the parties in light of *Kyocera Senco Industrial Tools Inc. v. ITC*, 22 F.4th 1369 (Fed. Cir. 2022). Paper 43, 2. Petitioner filed Supplemental Briefing Regarding Dr. Palmer’s Testimony. Paper 44 (“Pet. Supp. Br.”). Patent Owner responded. Paper 45 (“PO Supp. Br.”).

B. The Final Written Decision, the Federal Circuit Remand, and the Remand Proceeding

We issued a Final Written Decision holding that none of the challenged claims were unpatentable. Paper 46 (“Final Decision” or “Fin. Dec.”). In particular, we determined that Petitioner did not show by a preponderance of the evidence that the combination of Wedekind² and Ehlers³ teaches limitation 1m:

[1m] determining a first time prior to said target time at which said climate control system should turn on to reach the target temperature by the target time based at least in part on [i] said one or more thermal performance values of said structure, [ii] said performance characteristic of said climate control system, said [iii] first internal temperature, [iv] said first external temperature, and [v] the forecasted temperature.

See id. at 22–27 (alteration in original). Specifically, because Petitioner relied on the thermal performance values of said structure (which is based in part on internal temperature measurements) for both inputs [i] and [iii], we determined that Petitioner “effectively ignore[d] a claim limitation by double counting the ‘one or more thermal performance values of said structure.’ That is, Petitioner uses the ‘one or more thermal performance values of said structure’ to satisfy both inputs [i] and [iii].” *Id.* at 26.

Petitioner filed a Notice of Appeal of the Final Decision with the United States Court of Appeals for the Federal Circuit. Paper 47; *see also* Paper 48 (Notice of Appeal of ecobee, Inc.).

On February 7, 2024, the Federal Circuit issued a decision vacating the Final Decision and remanding for further proceedings. *Google LLC v.*

² US 5,197,666, issued Mar. 30, 1993 (Ex. 1006).

³ US 6,216,956 B1, issued Apr. 17, 2001 (Ex. 1008).

EcoFactor, Inc., 92 F.4th 1049 (Fed. Cir. 2024). Specifically, the Federal Circuit held that we erred in construing limitation 1m. According to the Federal Circuit,

In sum, both the claim language and the specification support a broader construction than the Board accorded the [1m] limitation. The proper construction of the term must allow for any of the five claimed inputs to potentially be used to calculate another claimed input. We agree, then, with Google’s proposed construction, which simply “require[s] that each of the five inputs be used at some point during the determination of the first time prior to said target time.” Appellant Br. 52 (emphasis and quotation marks omitted).

Id. at 1059 (alteration in original). The Federal Circuit further ordered that we “apply this construction on remand.” *Id.*

Following the issuance of the mandate, we held a conference call with the parties. *See* Paper 51, 2 (Order on Conduct of Proceedings on Remand). As noted in the previous paragraph, the Federal Circuit instructed us to apply Petitioner’s construction for limitation 1m on remand. *Google*, 92 F.4th at 1059. Because the construction was implicitly argued in the Petition, the parties had notice and opportunity to be heard. Paper 51, 5. Therefore, in accordance with PTAB Standard Operating Procedure 3,⁴ we “determine[d] that additional briefing [was] not warranted in this proceeding.” *Id.* at 4.⁵

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision on Remand is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has shown by a

⁴ Available at https://www.uspto.gov/sites/default/files/documents/ptab_sop_3-2023-oct.pdf.

⁵ Neither party requested to submit additional evidence or have an oral hearing on remand. Ex. 3002 (Email from the parties to the Board).

preponderance of the evidence that claims 1–20 of the ’753 patent are unpatentable.

C. Real Parties in Interest

Petitioner identifies Google LLC as the real party in interest. Pet. 5.

Ecobee, Inc. identifies ecobee, Inc. and ecobee Ltd. as the real parties in interest. *Ecobee, Inc. v. EcoFactor, Inc.*, IPR2021-00792, Paper 1, 1 (Petition).

Patent Owner identifies EcoFactor, Inc. as the real party in interest. Paper 3, 1.

D. Related Matters

The parties identify the following proceedings in which the ’753 patent has been asserted: *EcoFactor, Inc. v. Google LLC*, 1-19-cv-12322 (D. Mass. Nov. 12, 2019); *EcoFactor, Inc. v. Alarm.com Inc.*, 1-19-cv-12323 (D. Mass. Nov. 12, 2019); *EcoFactor, Inc. v. Daikin Industries, Ltd.*, 1-19-cv-12324 (D. Mass. Nov. 12, 2019); *EcoFactor, Inc. v. Ecobee, Inc.*, 1-19-cv-12325 (D. Mass. Nov. 12, 2019); *EcoFactor, Inc. v. Schneider Electric USA, Inc.*, 1-19-cv-12326 (D. Mass. Nov. 12, 2019); *EcoFactor, Inc. v. Vivint, Inc.*, 1-19-cv-12327 (D. Mass. Nov. 12, 2019); *In re Smart HVAC Systems, and Components Thereof*, 337-TA-1185 (ITC), *EcoFactor, Inc. v. ecobee, Inc.*, 6-22-cv-00033 (W.D. Tex. Jan. 10, 2022), *ecobee Technologies ULC v. EcoFactor, Inc.*, 1-22-cv-10049 (D. Mass. Jan. 13, 2022), *EcoFactor, Inc. v. Google LLC*, 5-22-cv-07661 (N.D. Cal. Dec. 5, 2022), *EcoFactor, Inc. v. Google LLC*, 6-22-cv-00032 (W.D. Tex. Jan. 10, 2022), and *Google LLC v. EcoFactor, Inc.*, 5-22-cv-00162 (N.D. Cal. Jan. 10, 2022). Paper 52, 2–3 (Petitioner’s Updated Mandatory Notices); Paper 3, 2.

E. The '753 Patent

The '753 patent is entitled “System, Method and Apparatus for Just-In-Time Conditioning Using a Thermostat” and is directed to “reducing the cycling time of a climate control system.” Ex. 1001, codes (54), (57).

The '753 patent describes a prior art thermostat in which the user can set the thermostat to change the setpoint—the temperature one has set the thermostat to maintain—at different times. *See* Ex. 1001, 1:18–44. “[F]or example, if the homeowner gets out of bed at 7 AM, setting the thermostat to change from the overnight setpoint of 64 degrees to 70 at 6 AM can make the house comfortable when the consumer gets up.” *Id.* at 1:38–41.

However, the '753 patent describes problems with this approach: “First, the amount of preconditioning required will vary with outside temperature. . . . Second, the amount of preconditioning required will vary depending on the relationship between the capacity of the HVAC [heating, ventilation, and air conditioning] system and the thermal characteristics of the structure.” Ex. 1001, 1:45–55. According to the '753 patent, it would therefore “be advantageous to have a means for controlling the HVAC system that is capable of taking into account both outside weather conditions and the thermal characteristics of individual homes in order to improve the ability to dynamically achieve the best possible balance between comfort and energy savings.” *Id.* at 2:1–6.

Figure 7 of the '753 patent, not reproduced, “shows a flow chart for a high-level version of the process of calculating the appropriate turn-on time in a given home.” Ex. 1001, 2:25–27. The steps shown in Figure 7 are as follows:

In step 1002, the server determines whether a specific thermostat 108 is scheduled to run the preconditioning program.

If, not, the program terminates. If it so scheduled, then in step 1004 the server retrieves the predetermined target time when the preconditioning is intended to have been completed (TT). Using TT as an input, in step 1006 the server then determines the time at which the computational steps required to program the preconditioning event will be performed (ST). In step 1008, performed at start time ST, the server begins the process of actually calculating the required parameters, as discussed in greater detail below. Then in 1010 specific setpoint changes are transmitted to the thermostat so that the temperature inside the home may be appropriately changed as intended.

Id. at 5:37–51.

Figure 8, not reproduced, shows “a more detailed flowchart of the process.” Ex. 1001, 5:52. As shown in Figure 8, in step 1102, the server retrieves input parameters—such as “the maximum time allowed for a [just-in-time] event for thermostat 108 (MTI); the target time the system is intended to hit the desired temperature (TT); and the desired inside temperature at TT (TempTT)” —used to create a just-in-time event. *Id.* at 5:52–57.

In step 1104, the server retrieves a set of algorithmic learning data (ALD), including “historic readings from the thermostat, together with associated weather data, such as outside temperature, solar radiation, humidity, wind speed and direction, etc[.]; together with weather forecast data [(WFD)] for the subject location for the period when the algorithm is scheduled to run,” which is used to calculate the appropriate start time. Ex. 1001, 5:62–6:3.

“In step 1106, the server uses the ALD and the WFD to create prediction tables that determine the expected rate of change or slope of inside temperature for each minute of HVAC cycle time (ΔT) for the

relevant range of possible pre-existing inside temperatures and outside climatic conditions.” Ex. 1001, 6:10–15.

In step 1108, the servers use the prediction table, TT, and Temp (TT) “to determine the time at which slope ΔT intersects with predicted initial temperature PT. The time between PT and TT is the key calculated parameter: the preconditioning time interval, or PTI.” Ex. 1001, 6:17–22.

“In step 1110, the server checks to confirm that the time required to execute the pre-conditioning event PTI does not exceed the maximum parameter MTI. If PTI exceeds MTI, the scheduling routine concludes and no ramping setpoints are transmitted to the thermostat.” Ex. 1001, 6:23–27.⁶ However, “if MTI is greater than PTI, then in step 1112 the server calculates the schedule of intermediate setpoints and time intervals to be transmitted to the thermostat.” *Id.* at 6:56–58.

Finally, “[i]n step 1114, the server schedules setpoint changes calculated in step 1112 for execution by the thermostat.” Ex. 1001, 7:13–14.

Figures 9A through 9D of the ’753 patent “show[] the steps shown in the flowchart in FIG. 8 in the form of a graph of temperature and time.” Ex. 1001, 2:31–32. Figure 9A is reproduced below.

⁶ Ramping involves making large temperature changes by changing the setpoints gradually to avoid using expensive heating or cooling stages. Ex. 1002 ¶ 122

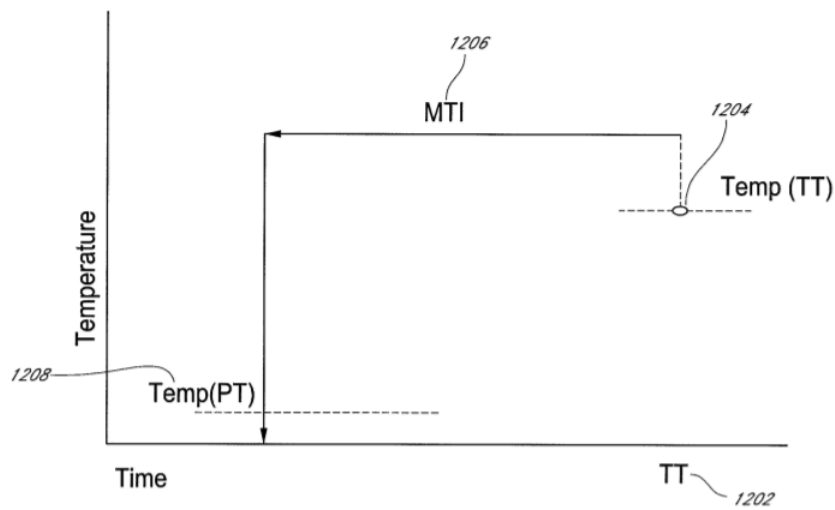


FIG. 9A

Figure 9A “shows step 1102, in which inputs target time TT 1202, target temperature Temp(TT) 1204, maximum conditioning interval MTI 1206 and the predicted inside temperature during the period of time the preconditioning event is likely to begin Temp(TT) 1204 are retrieved.” *Id.* at 7:26–31.

Figure 9B is reproduced below.

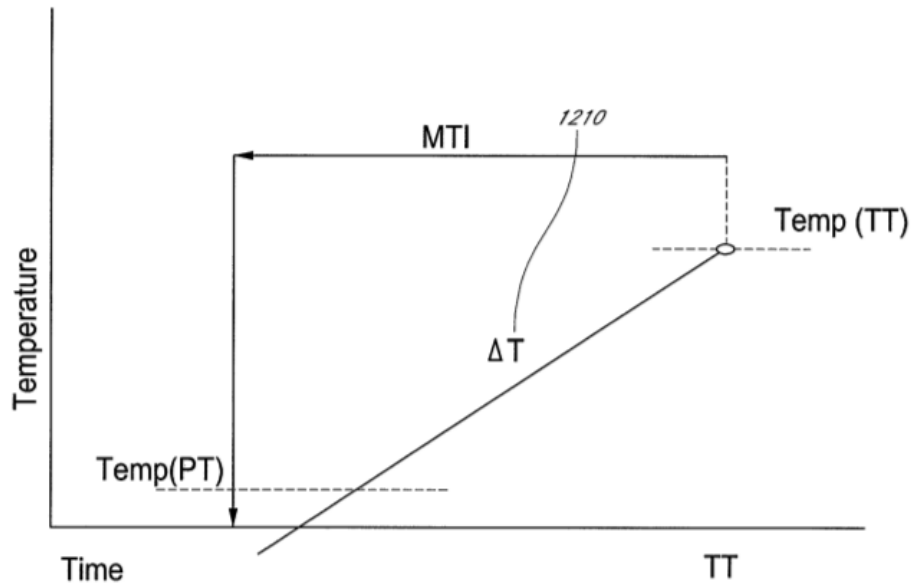


FIG. 9B

Figure 9B “shows the initial calculations performed in step 1108, in which expected rate of change in temperature ΔT 1210 inside the home is generated from the ALD and WFD using Temp(TT) 1204 at time TT 1202 as the endpoint.” Ex. 1001, 7:32–35.

Figure 9C is reproduced below.

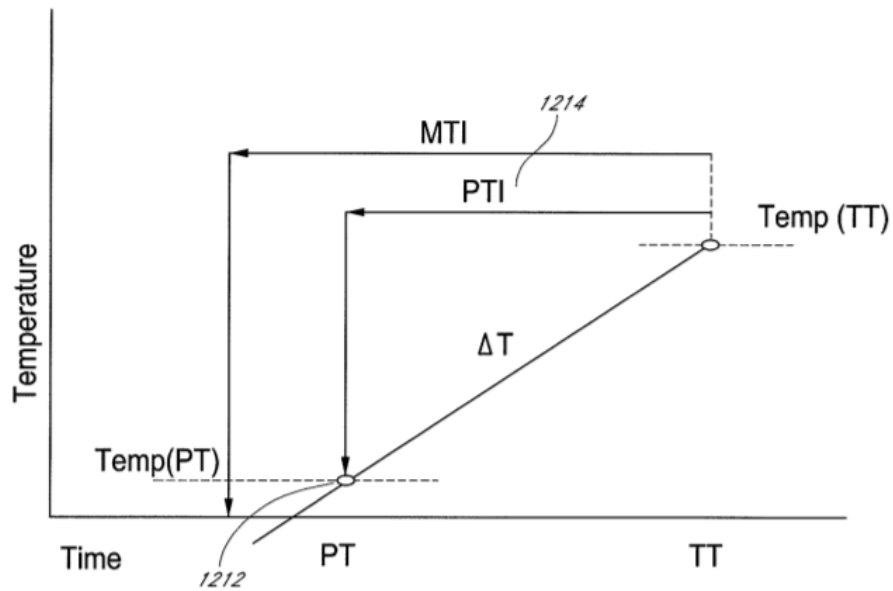


FIG. 9C

Figure 9C “shows how in step 1108 ΔT 1210 is used to determine start time PT 1212 and preconditioning time interval PTI 1214. It also shows how in step 1110 the server can compare PTI with MTI to determine whether or not to instantiate the pre-conditioning program for the thermostat.” Ex. 1001, 7:36–40.

Figure 9D is reproduced below.

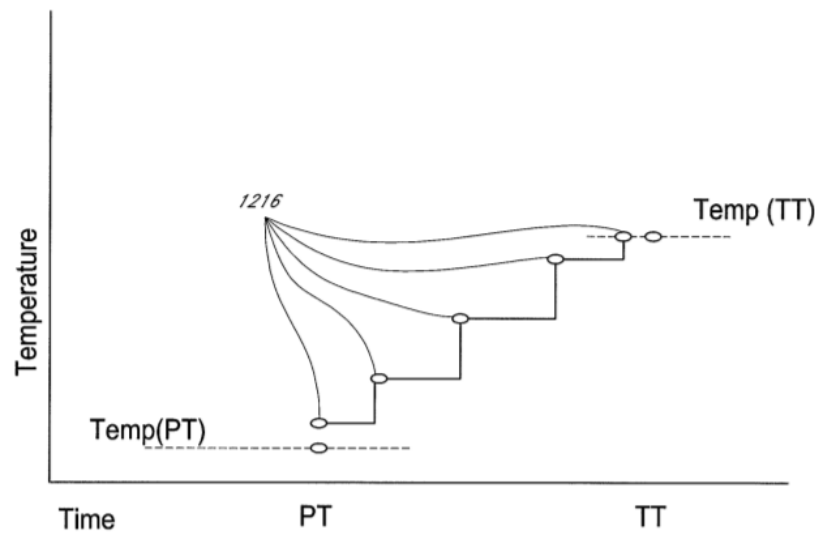


FIG. 9D

Figure 9D “shows step 1112, in which specific ramped setpoints 1216 are generated.” Ex. 1001, 7:41–42; *see also* Ex. 1002 ¶ 39 (“Ramping involved changing the temperature of a space by automatically changing the thermostat setpoint in small increments, for example, by one degree Fahrenheit at a time.”).

F. Illustrative Claim

Claim 1, 9, and 15 are independent claims. Claim 1 is illustrative and reads as follows:

1. [1a] A method for reducing the cycling time of a climate control system, said method comprising:

[1b] accessing stored data comprising a plurality of historic internal temperature readings taken within a structure and a plurality of measurements relating to a plurality of historic external temperatures outside said structure during at least one selected time period;

[1c] determining one or more thermal performance values of said structure [1d] by correlating at least one of the plurality of historic internal temperatures with at least one of the plurality

of historic external temperatures that both occur at a first time during the at least one selected time period, and by correlating at least one of the plurality of historic internal temperatures with at least one of the plurality of historic external temperatures that both occur at a second time during the at least one selected time period, [1e] wherein said one or more thermal performance values indicate a rate of change of temperature in said structure in response to changes in outside temperatures;

[1f] storing said one or more thermal performance values of said structure;

[1g] retrieving a target time at which said structure is desired to reach a target temperature;

[1h] acquiring at least a first internal temperature inside said structure at a third time prior to said target time;

[1i] acquiring at least a first external temperature relating to a temperature outside said structure at the third time prior to said target time;

[1j] obtaining at least one forecasted temperature forecasted to occur outside the structure at the target time;

[1k] retrieving at least said one or more thermal performance values of said structure that indicate said rate of change of temperature in said structure in response to changes in outside temperatures;

[1L⁷] retrieving at least one performance characteristic of said climate control system;

[1m] determining a first time prior to said target time at which said climate control system should turn on to reach the target temperature by the target time based at least in part on [i] said one or more thermal performance values of said structure, [ii] said performance characteristic of said climate control system, said [iii] first internal temperature, [iv] said first external temperature, and [v] the forecasted temperature;

⁷ Because the number 1 and lower case l appear nearly identical, we use the upper case L. We have modified all quotations to reflect that change.

[1n] calculating a plurality of intermediate setpoints and a plurality of setpoint target times that occur between the first time and the target time based at least in part on [i] said one or more thermal performance values of said structure, [ii] said performance characteristic of said climate control system, [iii] said first internal temperature, [iv] said first external temperature, and [v] the forecasted temperature,

[1o] wherein the plurality of intermediate setpoints direct a thermostatic controller to change the actual temperature inside the structure to the target temperature in a series of intermediate steps;

[1p] transmitting the plurality of intermediate setpoints to the thermostatic controller; and

[1q] setting the thermostatic controller with the plurality of intermediate setpoints to control said climate control system.

Ex. 1001, 9:9–10:3.

G. Prior Art and Asserted Ground

Petitioner asserts that claims 1–20 are unpatentable on the following ground:

Claim(s) Challenged	35 U.S.C. § ⁸	Reference(s)/Basis
1–20	103(a)	Wedekind, Ehlers

Petitioner also relies on the Declaration of Rajendra Shah. Ex. 1002. Mr. Shah was cross-examined. Ex. 2004. Patent Owner relies on the Declaration of John A. Palmer, Ph.D. Ex. 2002. Dr. Palmer was cross-examined. Ex. 1014.

⁸ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. §§ 102, 103 that became effective on March 16, 2013. Because the ’753 patent issued from an application filed before March 16, 2013, we apply the pre-AIA versions of the statutory bases for unpatentability. *See* Ex. 1001, code (22) (non-provisional application filed April 10, 2009).

ANALYSIS

A. Legal Standard

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 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 (4) if in evidence, objective evidence 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, LLC v. Kohler Co.*, 829 F.3d 1317, 1328 (Fed. Cir. 2016).

We note that, with respect to the fourth *Graham* factor, neither party has presented argument or evidence directed to objective evidence of obviousness or nonobviousness. *See* Pet.; PO Resp. Therefore, the analysis below addresses the first three *Graham* factors.

B. Level of Ordinary Skill in the Art

The level of ordinary skill in the pertinent art at the time of the invention is a factor in how we construe patent claims. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). It is also one of the factors we consider when determining whether a patent claim is obvious over the prior art. *See Graham*, 383 U.S. at 17–18.

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, 696–697 (Fed. Cir. 1983) (citing *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 ¶¶ 26–27).

Patent Owner argues that a person of ordinary skill in the art at the time of the invention would have had “(a) [a] bachelor’s degree in engineering, computer science, or a comparable field of study, and (b) at least 2 years of professional experience in electronic thermostats, HVAC controls, building energy management and controls or other similarly relevant industry experience.” PO Resp. 5–6. Patent Owner further argues that “[a]dditional relevant industry experience may compensate for lack of formal education or vice versa.” *Id.* at 6.

On the one hand, Patent Owner’s formulation is attorney argument without any supporting evidence. See PO Resp. 5–6. Although not cited in the Response, when Dr. Palmer testifies to the level of skill in the art, he

simply states what Patent Owner’s contention is without offering his own opinion:

EcoFactor contends that a person of ordinary skill in the arts at the time of the invention would have had a (a) bachelor’s degree in engineering, computer science, or a comparable field of study, and (b) at least 2 years of professional experience in electronic thermostats, HVAC controls, building energy management and controls or other similarly relevant industry experience. Additional relevant industry experience may compensate for lack of formal education or vice versa.

Ex. 2002 ¶ 22 (emphasis added). It is well settled that mere attorney arguments and conclusory statements that are unsupported by factual evidence are generally entitled to no probative value. *See Johnston v. IVAC Corp.*, 885 F.2d 1574, 1581 (Fed. Cir. 1989) (“Attorney’s argument is no substitute for evidence.”).

On the other hand, Petitioner’s proposal is supported by Mr. Shah’s testimony. *See* Pet. 26 (citing Ex. 1002 ¶¶ 26–27). Because Mr. Shah’s testimony is based on his years of experience, we give it some weight. *See* Ex. 1002 ¶¶ 2–10.

Accordingly, we are persuaded that Petitioner’s formulation, except for the qualifier “at least,” is correct.⁹

C. Claim Construction

We apply the same claim construction standard used to construe the claim in a civil action under 35 U.S.C. § 282(b), which is articulated in *Phillips*, 415 F.3d 1303. *See* 37 C.F.R. § 42.100(b). Under the *Phillips* standard, the “words of a claim ‘are generally given their ordinary and

⁹ We eliminate the qualifier because it expands the range indefinitely without an upper bound, and thus precludes a meaningful indication of the level of ordinary skill in the art.

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 proposes a construction for the term “heating, ventilation, and air conditioning system.” Pet. 15.

Patent Owner’s Response incorporates by reference constructions contained in other documents: “Proposed claim constructions relevant to the ’753 patent are shown in Ex. 1007; Ex. 2002 at ¶ 25.” PO Resp. 6.

However, we do not consider arguments that are incorporated by reference from other documents. 37 C.F.R. § 42.6(a)(3) (“Arguments must not be incorporated by reference from one document into another document.”).

After briefing, we issued an order inviting supplemental briefing regarding the preambles of the challenged claims. Paper 28. In the Order, we proposed that the preamble of each of the challenged claims was not limiting. *Id.* at 2–3. In supplemental briefing, both Petitioner and Patent Owner agreed with that construction. PO Claim Constr. Br. 1; Pet. Claim Constr. Br. 5. We adopt the parties undisputed construction that the preamble of each of the claims is not limiting. In doing so, we conclude that the preamble is not limiting because it is “only a statement of purpose and intended result” and “[t]he expression does not result in a manipulative difference in the steps of the claim.” *Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1375–76 (Fed. Cir. 2001).

The Federal Circuit concluded that limitation 1m “must allow for any of the five claimed inputs to potentially be used to calculate another claimed input.” *Google*, 92 F.4th at 1059. The Federal Circuit also concluded that the limitation “simply ‘require[s] that each of the five inputs be used at some

point during the determination of the first time prior to said target time.”
Id. (alteration in original).

Besides the construction of the preamble and limitation 1m above, no express construction is needed for our decision. Therefore, we do not construe any of the remaining claim limitations. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” (alteration in original) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. The Qualifications of Dr. Palmer

1. Motion to Exclude Dr. Palmer’s Testimony

Petitioner moves¹⁰ to exclude Dr. Palmer’s testimony, arguing that he does not have at least ordinary skill in the art. Pet. Supp. Br. 5. However, we are not persuaded by Petitioner’s argument that Dr. Palmer is not a person having ordinary skill in the art.

Having reviewed Dr. Palmer’s direct and cross-examination testimony, we conclude that he is at least as skilled as a person having ordinary skill in the art. *See Kyocera*, 22 F.4th at 1377 (holding that to be qualified to offer expert testimony on issues from the vantage point of an ordinarily skilled artisan in a patent case, an expert must, at a minimum, possess ordinary skill in the art). Specifically, Dr. Palmer “began working as an electrical forensic engineer at Knott Laboratory, LLC, which evolved into a full-time position in January 2000.” Ex. 2002 ¶ 7. As a forensic

¹⁰ Although not styled as a motion to exclude, we treat Petitioner’s request as a motion. *See* 37 C.F.R. §§ 42.20(a) (“Relief, other than a petition requesting the institution of a trial, must be requested in the form of a motion.”), 42.64(c) (motion to exclude).

engineer, Dr. Palmer “investigated and became familiar with a wide range of electrical failures and accidents, including many control system failures related to industrial, commercial, and residential HVAC systems.” *Id.*; *see also* Ex. 1014, 10:20–11:9. That work as a forensic engineer involved “a wide variety of HVAC systems, generally those that have been involved in failures. [Dr. Palmer] looked at both the control and the operation and the energy management elements of HVAC systems in that role as a forensic engineer.” Ex. 1014, 10:20–11:9. In order to perform that work, Dr. Palmer had “to dig into HVAC systems and understand how they work, understand how their thermostats work and so forth.” *Id.* at 12:16–13:6. Dr. Palmer worked on between “10 and 30” such matters over “a couple of decades.” *Id.* at 13:7–16.

Further, Dr. Palmer is an associate professor in the Department of Electrical and Computer Engineering at the University of Utah. Ex. 2002 ¶ 8. In that position, he taught a variety of topics related to energy management and controls including “Power System Analysis, Power System Protection, Power Electronics, and Electrical Forensic Engineering and Failure Analysis.” *Id.* Dr. Palmer has also taught classes with subject matter related to temperature control systems that include HVAC systems. Ex. 1014, 15:12–17:13.

In light of this experience in building energy management controls and other relevant industry experience over nearly two decades, Dr. Palmer is a person having at least ordinary skill in the art.

Petitioner argues that Patent Owner, as the proponent of the testimony, “has the burden to demonstrate the admissibility of its proffered expert testimony.” Pet. Supp. Br. 3 (citing Fed. R. Evid. 702, Advisory Committee Notes). We disagree. As the movant, Petitioner bears the

“burden of proof.” *See* 37 C.F.R. § 42.20(c) (“The moving party has the burden of proof to establish that it is entitled to the requested relief.”).

Regardless, as Patent Owner has sufficiently demonstrated that Dr. Palmer is a person having at least ordinary skill in the art, our determination would be the same regardless of which party has the burden of proof.

Petitioner raises three arguments on Dr. Palmer’s lack of expertise. First, Petitioner argues that Dr. Palmer lacks the five years of relevant experience required of the person having ordinary skill in the art. Pet. Supp. Br. 1–2. Specifically, Petitioner argues that Dr. Palmer does not have any specific recollection of how many hours he has spent in consulting engagements that required him to delve into how HVAC systems work. *Id.* at 2 (citing Ex. 1014, 10:20–13:21).

We are not persuaded by that argument. Given the number of engagements (10 to 30) and the amount of time over which they occurred over (approximately two decades), it is not surprising that Dr. Palmer was not able to give an exact answer. We also note that Petitioner asked only a single question and did not follow up with any questions that might have given an approximate amount of time, such as asking if it was over 100 hours. *See* Ex. 1014, 13:17–21. Moreover, Petitioner’s question was limited to “HVAC systems and HVAC control systems” (*id.*); however, the level of skill refers to the broader use of “building energy management and controls.” Because Petitioner’s questions focused on too narrow a field, Petitioner has not shown that Dr. Palmer does not have the correct amount of experience.

Second, Petitioner points to Dr. Palmer’s lack of experience in building or designing HVAC control systems and relevant publications or patents. Pet. Supp. Br. 2 (citing Ex. 1014, 13:22–14:5, 15:8–11; Ex. 2003,

3–4). Again, we are not persuaded by Petitioner’s argument. As discussed above, the focus on HVAC systems is too narrow given the broader statement of the level of skill in the art. Although the level of skill is broad enough to encompass design and building of HVAC systems, it is not so limited.

Third, Patent Owner argues that Dr. Palmer’s academic background does not make up for the lack of practical experience as “his studies related to electrical power engineering generally, not HVAC systems in particular.” Pet. Supp. Br. 2 (citing Ex. 1014, 10:9–12:8; Ex. 1002 ¶ 26). However, as discussed with the previous arguments, there is nothing in the definition of the level of ordinary skill in the art that limits experience to HVAC systems. As such, studies on electrical power engineering generally are sufficient.

2. Relative Credibility of the Experts

Petitioner also argues that because Mr. Shah has significantly more experience than Dr. Palmer, we should find Dr. Palmer’s testimony less credible. Pet. Reply 4–5. 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 1–2.

As a general matter and not limited to any specific testimony or topic, we decline to find Dr. Palmer less credible based solely on his relative amount of experience when compared to Mr. Shah. 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’s cross-examination testimony. Thus, we do not determine that for every point of the testimony, including describing what is in the prior art, that Mr. Shah’s greater experience means that we should give his testimony more weight.

However, as appropriate, if an expert witness's background does not demonstrate that they have specific experience on a topic to give reliable testimony on that topic and the witness's testimony is not corroborated by other evidence, we may decline to give it any weight or limit the weight we do give it. For example, given Dr. Palmer's lack of experience "designing or building HVAC control systems" (*see* Ex. 1014, 13:22–14:5), we do not give his testimony regarding the design or building of HVAC control systems any weight. *See, e.g.,* Section II.E.m.2, *infra*.

E. Obviousness in View of Wedekind and Ehlers

Petitioner argues that claims 1–20 would have been obvious over Wedekind and Ehlers. Pet. 15–75. For the reasons that follow, we are persuaded that Petitioner has shown by a preponderance of the evidence that claims 1–20 are unpatentable.

1. Summary of Wedekind

Wedekind is entitled "Method and Apparatus for Estimation of Thermal Parameter for Climate Control" and is directed to "adaptive electronic energy management thermostats having the ability to measure the parameters of a building, its climate control system and its surrounding environment and to optimize the efficiency of energy consumption as a function of these parameters." Ex. 1006, code (54), 1:13–18. Wedekind describes a methodology for how measured values such as temperatures, times, and flowrates "are used by enclosure parameter and the climate control system parameter estimating means 66 and 69, respectively, to determine the various thermal and thermodynamic parameters." *Id.* at 12:43–53. Those parameters are used "by the non-linear efficiency model to correctly determine the most efficient way to maintain the occupancy

comfort schedule 39 which was input by the operator.” *Id.*; *see also id.* at 12:54–21:12 (providing details of the model).

Wedekind Figure 2, not reproduced, “is a graph representing temperature of the air in a conditioned space as a function of time and average energy as a function of time during a typical thermostat setback.”¹¹ Ex. 1006, 3:6–9 (footnote added). More specifically, Wedekind Figure 2 shows a comfort temperature of T_f' (72° F) and a setback temperature of T_i' (65° F). *Id.* at Fig. 2, 6:1–7:18.

[O]ccupancy comfort time domains, t_0 – t_1 and t_4 – t_5 , represent the times in which the occupants of the enclosure 30 are using the enclosure 30 and want it comfortable. The thermostat setback time domain, t_1 – t_4 , represents the time in which the occupants of the enclosure 30 are not present in the case of commercial or residential enclosures 30, or asleep in the case of residential enclosures 30.

Id. at 5:58–65. Wedekind Figure 2 shows that it takes some time (the interval t_1 – t_2) for the temperature to reach the setback temperature.

Wedekind Figure 2 further shows that at time t_3 the thermostat turns on so that the temperature returns to the original temperature T_f' by the end of the

¹¹ A thermostat is set to a setpoint or target temperatures. Ex. 1001, 1:18–44; Ex. 1002 ¶ 30. Setback refers to a setpoint that is an uncomfortable, but less costly, temperature when the user is away from the premises or asleep. Ex. 1002 ¶ 35. For example, “a home user in winter might want the temperature at 70° F between 7 and 9 AM and between 5 PM and 11 PM, but 58° F otherwise.” *Id.* “The uncomfortable temperature (the ‘setback temperature’—in this case, 58° F), saves energy by preventing the furnace from cycling ‘on.’” *Id.*

setback period at time t_4 .¹² *Id.* at 6:31–7:18. The length of the recovery period (t_4-t_3) is t_r . *Id.* at Fig. 2, 7:19–23.

2. *Summary of Ehlers*

Ehlers is entitled “Environmental Condition Control and Energy Management System and Method” and is directed “to a system that controls internal environmental conditions to optimize comfort and minimize energy consumption and/or energy cost, based on user-defined parameters.”

Ex. 1008, code (54), 1:11–14. Ehlers teaches, *inter alia*, receiving and using weather information to predict heating and cooling times for a building. *Id.* at 2:52–65, 9:49–63, 35:13–28. Ehlers further teaches minimizing energy consumption—and thus energy costs—by using energy ramping when setpoints changes are made that would require operating the HVAC system. *Id.* at 19:27–20:3.

3. *Analysis of Claim 1*

a) *Limitation 1a – The Preamble*

Claim 1 recites “[a] method for reducing the cycling time of a climate control system.” Ex. 1001, 9:9–10. Petitioner argues that Wedekind teaches the preamble. *See* Pet. 27–29. Specifically, Petitioner argues “Wedekind expresses energy use by the HVAC system in terms of cycle time” and “Wedekind teaches reducing or minimizing the cycle time by reducing the input energy rate (E_g).” *Id.* at 27–28 (emphasis omitted).¹³

¹² The period t_3-t_4 is sometimes called a recovery period. Ex. 1002 ¶¶ 60–61. The recovery period refers to a period of time in which the setback is reversed. *Id.* ¶ 35.

¹³ For this and other limitations, Petitioner also states Ehlers teaches the limitation. *See* Pet. 29. The entirety of Petitioner’s statement consists of a conclusory statement followed by a string citation with no explanation:

At one point, Patent Owner disputed Petitioner’s argument. PO Resp. 19–21; PO Sur-reply 7–8. However, Patent Owner later agreed that the preamble is not limiting. PO Claim Constr. Br.

Because the preamble is not limiting (Section II.C), we need not address the parties’ arguments.

b) Limitation 1b – Accessing Stored Data

Claim 1 further recites “accessing stored data comprising a plurality of historic internal temperature readings taken within a structure and a plurality of measurements relating to a plurality of historic external temperatures outside said structure during at least one selected time period.” Ex. 1001, 9:11–15. Petitioner argues that Wedekind teaches that limitation. *See* Pet. 29–31. Patent Owner does not separately address this limitation. *See* PO Resp.

We are persuaded by Petitioner’s argument. Specifically, Wedekind teaches a computer with “sufficient memory capabilities to store all the data retrieved by the data acquisition system.” Ex. 1006, 4:56–59; *see also* Ex. 1002 ¶ 82. This capability includes storing historical interior (internal) and outside (external) temperature measurements. Ex. 1006, 12:57–61, 13:22–25, 14:60–62, 16:38–40; Ex. 1002 ¶ 82. Wedekind further teaches

“Ehlers also teaches this limitation. (Ex. 1008, 4:43–46, 19:27–51, 29:1–35, 1:18–25).” *Id.* For limitations such as this where Petitioner simply states Ehlers teaches the limitation and supplies a string citation without any explanation or supporting testimony, we do not consider such statements and deem the arguments forfeited. *See United States v. Dunkel*, 927 F.2d 955, 956 (7th Cir. 1991) (“Judges are not like pigs, hunting for truffles buried in briefs.”); *DeSilva v. DiLeonardi*, 181 F.3d 865, 866–67 (7th Cir. 1999) (“A brief must make all arguments accessible to the judges, rather than ask them to play archaeologist with the record.”); 37 C.F.R. § 42.104(b)(4) (The Petitioner must show “[h]ow the construed claim is unpatentable.”).

accessing that stored data as part of the calculation of its non-linear efficiency model. Ex. 1006, 12:57–59 (using internal temperature measurements), 14:60–62 (using outside temperature measurements), 14:57–15:22 (using both internal and outside temperature measurements); Ex. 1002 ¶ 83.

c) Limitation 1c – Determining Thermal Performance Values

Claim 1 further recites “determining one or more thermal performance values of said structure.” Ex. 1001, 9:17–18. Petitioner argues that Wedekind teaches this limitation. See Pet. 32–33. Patent Owner does not separately address this limitation. See PO Resp.

We are persuaded by Petitioner’s argument. Specifically, Wedekind determines several performance values of the structure that indicate a rate of change of temperature in the structure in response to changes in external temperature, including the Mc_v (Effective Thermal Capacitance), hA (Effective Internal Heat Transfer Conductance), and U_0A_0 (Effective External Heat Conductance Between Conditioned Space and Outside Air). See Ex. 1006, code (57), 14:57–17:50; Ex. 1002 ¶¶ 84–85.

d) Limitation 1d – Correlating Internal and External Temperatures

Claim 1 further recites

by correlating at least one of the plurality of historic internal temperatures with at least one of the plurality of historic external temperatures that both occur at a first time during the at least one selected time period, and by correlating at least one of the plurality of historic internal temperatures with at least one of the plurality of historic external temperatures that both occur at a second time during the at least one selected time period.

Ex. 1001, 9:18–26. Petitioner argues that Wedekind teaches this limitation. *See* Pet. 33–34. Patent Owner does not separately address this limitation. *See* PO Resp.

We are persuaded by Petitioner’s argument. Specifically, Wedekind teaches that U_0A_0 , the effective external heat transfer conductance, is computed using a plurality of internal and external temperature measurements taken at different times. Ex. 1006, 15:12–22; Ex. 1002 ¶ 86. The plurality of temperature measurements includes at least the two historical internal and external temperature measurements. Ex. 1002 ¶ 86. It also includes other internal and external temperature measurements that are stored (limitations 1i and 1j). *Id.* ¶¶ 82–83, 97–100.

Similarly, because hA and Mc_v are also calculated using U_0A_0 , the same temperature correlations discussed above are also indirectly used in their computation. *See* Ex. 1002 ¶ 87; Ex. 1006, 17:28–43 (equations 19 and 20).

e) Limitation 1e – Thermal Performance Values Indicating a Rate of Change of Temperature in the Structure

Claim 1 further recites “wherein said one or more thermal performance values indicate a rate of change of temperature in said structure in response to changes in outside temperatures.” Ex. 1001, 9:26–29. Petitioner argues that Wedekind teaches this limitation. *See* Pet. 34–39. Patent Owner does not separately address this limitation. *See* PO Resp.

We are persuaded by Petitioner’s argument. Wedekind teaches using the thermal performance values U_0A_0 , hA , and Mc_v , in its non-linear efficiency model, which are defined by a set of differential equations that depend on outside temperature measurements. Ex. 1002 ¶ 89, Ex. 1006, 17:52–18:64. Those differential equations used to calculate U_0A_0 , hA , and

Mc_v indicate a rate of change of temperature in the structure in response to changes in outside temperatures. Ex. 1002 ¶ 90; Ex. 1006, 18:5–64.

f) Limitation 1f – Storing the Thermal Performance Values

Claim 1 further recites “storing said one or more thermal performance values of said structure.” Ex. 1001, 9:30–31. Petitioner argues that Wedekind teaches this limitation. See Pet. 39. Patent Owner does not separately address this limitation. See PO Resp.

We are persuaded by Petitioner’s argument. Specifically, Wedekind teaches using the one or more thermal performance values of said structure in its method. See, e.g., Ex. 1006, code (57), 12:43–53, 14:57–15:42, 17:23–50; Ex. 1002 ¶ 93. Wedekind further teaches that those thermal and thermodynamic values are “stored in the registers 45 or database 45.” Ex. 1006, 17:53–63; Ex. 1002 ¶ 93.

g) Limitation 1g – Retrieving a Target Time

Claim 1 further recites “retrieving a target time at which said structure is desired to reach a target temperature.” Ex. 1001, 9:32–33. Petitioner argues that Wedekind teaches this limitation. See Pet. 40–42. Patent Owner does not separately address this limitation. See PO Resp.

We are persuaded by Petitioner’s argument. Specifically, Wedekind teaches that its thermostat will “predict in advance the time period, t_r , necessary for temperature recovery from the setback temperature, T_i , to the occupancy set-point or comfort temperature, T_f .” Ex. 1006, 7:19–23; see also *id.* at Fig. 2, 4:7–21; Ex. 1002 ¶¶ 94–95. That time period t_r corresponds to the time period at which the HVAC is turned on to reach a target temperature, T_f , at a specific time, t_4 , *i.e.*, the recovery time. See Ex. 1006, Fig. 2, 4:7–21, 7:19–23; Ex. 1002 ¶¶ 94–95. Wedekind further

teaches that a schedule, which includes time period t_r , is received by the climate control system. Ex. 1006, Fig. 6, 11:22–30; Ex. 1002 ¶ 96.

h) Limitation 1h – Acquiring a First Internal Temperature

Claim 1 further recites “acquiring at least a first internal temperature inside said structure at a third time prior to said target time.” Ex. 1001, 9:34–35. Petitioner argues that Wedekind teaches this limitation. See Pet. 42. Patent Owner does not separately address this limitation. See PO Resp.

We are persuaded by Petitioner’s argument. Specifically, Wedekind teaches “continuous measurement of various air temperatures” including internal temperatures. Ex. 1006, code (57); see also Ex. 1002 ¶ 97; Ex. 1006, 3:59–62, 4:38–5:1, 7:41–68, 17:53–63, Fig. 3. This includes the historic internal temperatures that are discussed above for limitation 1b and used with limitation 1d. Ex. 1002 ¶¶ 97, 100. Because there is a continuous measurement of the internal temperature, this includes measuring at least a first internal temperature inside said structure at or before time t_3 in Fig. 2, which is the third time prior to said target time.” See *id.* ¶ 98.

i) Limitation 1i – Acquiring a First External Temperature

Claim 1 further recites “acquiring at least a first external temperature relating to a temperature outside said structure at the third time prior to said target time.” Ex. 1001, 9:36–38. Petitioner argues that Wedekind teaches that limitation. Pet. 43. Patent Owner does not separately address this limitation. See PO Resp.

We are persuaded by Petitioner’s argument. Specifically, as discussed above, Wedekind teaches “continuous measurement of various air temperatures” including external temperatures. Ex. 1006, code (57); see also Ex. 1002 ¶ 99; Ex. 1006, 3:59–62, 4:38–5:1, 7:41–68, 17:53–63, Fig. 3.

This includes the historic external temperatures that are discussed above for limitation 1b and used with limitation 1d. Ex. 1002 ¶¶ 99, 100. And because there is a continuous measurement of the external temperature, this includes measuring at least a first external temperature outside said structure at or before time t_3 in Fig. 2, which is the third time prior to said target time. *Id.* ¶ 100.

j) Limitation 1j – Obtaining a Forecasted Temperature

Claim 1 further recites “obtaining at least one forecasted temperature forecasted to occur outside the structure at the target time.” Ex. 1001, 9:39–40. Petitioner argues that Ehlers teaches this limitation and that a person having ordinary skill in the art would have combined Ehlers and Wedekind. Pet. 43–48. Patent Owner does not separately address this limitation. *See* PO Resp.¹⁴

We are persuaded by Petitioner’s argument. Specifically, Ehlers teaches obtaining local weather information that can come from a weather service provider. Ex. 1008, 9:50–54. “The data can be in the form of discrete parameters representing temperature” *Id.* at 9:54–58. This weather information can also include forecasted temperature data:

In one embodiment, the system of the invention would have the ability to sense an indoor temperature. In an enhanced embodiment, the system could sense at least humidity, outside temperature, UV intensity, wind direction and speed, relative humidity, wet bulb thermometer measurements, and dew point.

¹⁴ Patent Owner does not raise any specific arguments relating to the reason to combine the references as it relates to this limitation. *See* PO Resp. However, Patent Owner raises issues to relating to the combination of the Ehler’s forecasted temperature with Wedekind’s system with regard to limitation 1m. *See* PO Resp. 37–44; PO Sur-reply 12–17. We address those arguments below in Section II.E.3.m.

The system also can accept and process inputs such as local weather forecast data, energy supply company pricing schemes, and user-entered parameters such as desired comfort levels and energy price cutoff points. Such sensed conditions and inputs are processed by a processor of the system, with software operating on the processor, to maintain environmental conditions and energy consumption level and cost within the user-defined levels.

Id. at 2:52–65 (emphasis added); *see also id.* at 11:35–63 (describing how the system will use “weather patterns or forecasts”); Ex. 1002 ¶ 103.

Moreover, for the reasons discussed below in Section II.E.3.m.(2), Petitioner has sufficiently shown why a person having ordinary skill in the art would have combined Ehlers’ use of a forecasted temperature with Wedekind’s system.

k) Limitation 1k – Retrieving the Thermal Performance Values

Claim 1 further recites “retrieving at least said one or more thermal performance values of said structure that indicate said rate of change of temperature in said structure in response to changes in outside temperatures.” Ex. 1001, 9:41–44. Petitioner argues that Wedekind teaches that limitation. Pet. 48–50. Patent Owner does not separately address this limitation. *See* PO Resp.

We are persuaded by Petitioner’s argument. Specifically, as discussed above in sections II.E.3.c and II.E.3.d, Wedekind teaches using the stored thermal performance values. *See also* Ex. 1006, 17:53–63. A person having ordinary skill in the art would have understood that the stored values must have been retrieved in order to be used. Ex. 1002 ¶ 109. “Because these parameters are used to optimize the comfort schedule and compute recovery time, and because the values are stored in memory . . . the parameters are obviously retrieved.” *Id.* ¶ 111 (emphasis omitted); *see also id.* ¶¶ 109–110

(describing how the factors are used to create an optimized comfort schedule).

l) Limitation 1L – Retrieving a Performance Characteristic

Claim 1 further recites “retrieving at least one performance characteristic of said climate control system.” Ex. 1001, 9:45–46. Petitioner argues Wedekind teaches that limitation. *See* Pet. 50–52. Patent Owner does not separately address this limitation. *See* PO Resp.

We are persuaded by Petitioner’s argument. Specifically, “Wedekind teaches determining and storing several performance characteristics of the climate control system in using its non-linear efficiency model.” Ex. 1002 ¶ 112; *see also* Ex. 1006, code (57). This includes various performance characteristics including E_s (“Average energy rate . . . delivered to the conditioned space during a typical climate control system cycle”), η_s (“Non-linear climate control efficiency”), and E_g (Input energy rate of the climate control system), which are stored in memory or a database. Ex. 1002 ¶¶ 113–114; Ex. 1006, 7:41–67, 12:14–20, 13:31–43, 17:53–63. Those factors are used in Wedekind’s non-linear efficiency model to optimize the comfort schedule and for recovery time analysis. Ex. 1002 ¶¶ 115–116; Ex. 1006, 17:53–63, 18:3–40, 19:50–20:2. And, because the values are stored in memory prior to their use, a person having ordinary skill in the art would have understood that they are retrieved. Ex. 1002 ¶ 117.

m) Limitation 1m – Determining a First Time Prior to Said Target Time

Claim 1 further recites:

[1m] *determining a first time prior to said target time at which said climate control system should turn on to reach the target temperature by the target time based at least in part on [i] said one or more thermal performance values of said structure,*

[ii] said performance characteristic of said climate control system, [iii] *said first internal temperature*, [iv] said first external temperature, and [v] *the forecasted temperature*.

Ex. 1001, 9:47–54 (emphases added). We have emphasized the portions of the limitation that are in dispute. Petitioner argues that Wedekind teaches limitation 1m except for input [v], which it argues would have been obvious in light of Ehlers. *See* Pet. 52–54; Pet. Reply 19–27. For the reasons discussed below, we agree.

Wedekind teaches solving equations to predict time t_3 , which is the time to begin the recovery period. Ex. 1006, 19:50–20:2; Ex. 1002 ¶ 118; *see also* Ex. 1006, 7:19–30. That recovery period is designed for the system to achieve target temperature T_f at the time t_4 , the beginning of the comfort period. *See* Ex. 1006, 7:19–30; Ex. 1002 ¶ 118. With regard to inputs [i] and [ii], in order to predict the time to begin the recovery period, t_3 , Wedekind uses, *inter alia*, the thermal performance values of said structure (as explained above for limitation 1k) and characteristics of said climate control system (as explained above for limitation 1L). Ex. 1002 ¶ 120; *see also* Ex. 1006, 17:51–19:10, 19:50–20:2. Because the thermal performance values of the structure (as explained above for limitations 1d, 1h, and 1i) are based on the first internal temperature and the first external temperature measurements, Wedekind also teaches using inputs [iii] and [iv]. *See* Ex. 1002 ¶¶ 109–110, 112–113, 118–120.¹⁵

¹⁵ In its Reply, Petitioner argues that the claim limitation is satisfied even if Wedekind uses the setback/setpoint temperature as a substitute for an actual internal temperature measurement. Pet. Reply 20. That is, Petitioner argues that the setpoint temperature is an acquired first internal temperature. *Id.* Patent Owner argues that because Petitioner’s alternate argument is a new argument raised for the first time in the Reply, it should not be considered.

With regard to input [v], Wedekind does not teach using a forecasted temperature. However, as discussed above in section II.E.3.j, Ehlers teaches obtaining a forecasted temperature. A person having ordinary skill in the art would have combined Ehler's forecasted temperatures to improve Wedekind's non-linear efficiency model when used to predict the recovery time. *See* Ex. 1002 ¶¶ 104–107. Specifically, because it is well-known that the outside temperature affects the time to heat or cool a building, a person having ordinary skill in the art would have realized that using the forecasted temperature would allow for improved predictions of the recovery time, especially during periods when the temperature is predicted to change markedly, such as around sunrise and sunset. *See id.*

Moreover, a person having ordinary skill in the art would have found various methods of implementing the use of the forecast to have been predictable and within the ability of a person having ordinary skill in the art. Ex. 1002 ¶ 108. For example, as Mr. Shah testifies, a person having ordinary skill in the art would have “select[ed] a forecasted temperature that is predicted to occur during the middle of a normal recovery period, or a forecasted temperature that is the average of the current temperature and the forecasted temperature at time t_4 .” *Id.* That forecasted temperature would then “be used to select pre-recorded building and HVAC parameters corresponding to that outside temperature, and using those parameters in solving the non-linear thermal model.” *Id.* Alternatively, Mr. Shah also testifies that a person having ordinary skill in the art would have substituted the forecasted temperature for the measured outside temperature in

PO Sur-reply 9. Because we do not rely on that argument, we need not determine whether it is an improper reply argument.

Wedekind equation 13 “to provide an improved estimate of the external heat transfer conductance.” *Id.*

With respect to input [iii], Patent Owner argues that Wedekind does not teach “determining a first time” based, at least in part, on a “first internal temperature” as recited in claim 1. PO Resp. 22–30; PO Sur-reply 19–22. Specifically, Patent Owner argues that “Wedekind does not acquire a **‘first internal temperature’** at a **‘third time’** that is used to determine the start time of a recovery period, and instead it bases the computation on the setback temperature setpoint T_i .” PO Resp. 23 (citing Ex. 1006, 19:59–64); *see also* PO Sur-reply 8–9. Patent Owner also argues that “the Petition itself never argued that ‘acquiring’ an internal temperature measurement at a third time should be construed to mean obtaining a temperature setpoint that is scheduled to occur instead of acquiring new temperature measurements.” PO Sur-reply 9.

Patent Owner further argues that the claim requires an internal temperature separate from any of the historical internal temperatures used to determine the thermal performance value or performance characteristics. PO Resp. 30–37. According to Patent Owner, a person having ordinary skill in the art “would understand that the **‘first internal temperature’** at a **‘third time’** must be different from one of the **‘historic’ indoor temperatures** from a **‘first and second time’** used to determine thermal performance values for element [1c] and [1d].” *Id.* at 31 (citing Ex. 2002 ¶ 79); *see also id.* at 31–32 (arguing Petitioner improperly “assert[s] that the **‘historic internal temperatures’** used to calculate the **‘thermal performance values’** can also qualify as the **‘first internal temperature’** that is acquired at a **‘third time.’**”). Patent Owner also argues that Petitioner “never assert[ed] or reference[d] a disclosure in Wedekind for calculating

the recovery time t_r or the time to commence the recovery t_3 using a newly acquired indoor air temperature separately from using the thermal performance values of element [1d].” *Id.* at 33–34.

Patent Owner further argues that “Wedekind’s model predicts that the temperature will need to change from the setback temperature setpoint T_i to the occupancy comfort setpoint T_f without acquiring a new indoor air temperature at or immediately before the start of the recovery period at time t_3 .” PO Resp. 23 (citing Ex. 1006, 7:19–30; Ex. 2002 ¶ 63). That is, according to Patent Owner, Wedekind does not teach using a “newly acquired” temperature measurement. *Id.* at 23–26. Patent Owner also argues that it would not have been obvious to modify Wedekind to use a newly acquired internal temperature measurement. *Id.* at 27–30.

We do not agree with Patent Owner’s arguments regarding input [iii]. First, Patent Owner’s arguments are inapposite. Specifically, we agree with Petitioner that there is no requirement that the first internal temperature must be used to directly determine the “first time prior to said target time.” *See* Pet. Reply 20–21. As properly construed, the limitation “must allow for any of the five claimed inputs to potentially be used to calculate another claimed input.” *Google*, 92 F.4th at 1059; *see also* Section II.C (claim construction section).

Second, we do not agree with Patent Owner that the first internal temperature must be newly acquired. Claim 1 recites at least seven distinct times: a first time (for the measurement of historical temperatures), a second time (also for the measurement of historical temperatures), a third time (for the measurement of the first internal and external temperatures), a target time (the time the structure should reach a given temperature), a first time prior to said target time (the time the climate control system should turn on),

and a plurality of intermediate setpoint target times¹⁶ (used for ramping with intermediate setpoints). Ex. 1001, 9:9–10:3. However, the claim imposes very few restrictions on those times. For example, because claim 1 recites using a plurality of historical temperatures, the historical temperatures must be taken at different times. *See id.* at 9:17–29. Similarly, all of the inputs used to determine the first time prior to said target time must be acquired prior to that first time. *See id.* at 9:47–54. Likewise, based on the language of the claims, the plurality of intermediate setpoint target times must fall between the first time prior to the target time and the target time. *See id.* at 9:55–61. But there are no other limitations on the timing, such as one requiring that first internal temperature must be newly acquired. *See id.* at 9:9–10:3.

With respect to input [v], Patent Owner argues that “Ehlers does not teach or disclose using a **forecasted temperature forecasted to occur at the target time** in order to predict a recovery time.” PO Resp. 38 (emphasis omitted); *see also* Ex. 2002 ¶ 95. Specifically, Patent Owner argues that Ehlers mentions using a forecasted temperature and “none of them disclose or render obvious obtaining a **forecasted temperature forecasted to occur at the ‘target time’** (the end of a recovery period).” PO Resp. 38 (citing Ex. 1008, 2:52–65, 11:43–45, 37:22–30, 37:37–50); *see also* Ex. 2002 ¶ 96; PO Resp. 38–41 (discussing citations to Ehlers in detail).

We do not agree with Patent Owner’s argument. “The question in an obviousness inquiry is whether it would have been obvious to a person of

¹⁶ The plurality of intermediate setpoint target times requires at least two times. The analysis does not turn on the number of intermediate setpoint target times.

ordinary skill in the art to combine the relevant disclosures of the two references, not whether each individual reference discloses all of the necessary elements.” *Game & Tech Co. v. Wargaming Grp. Ltd.*, 942 F.3d 1343, 1352 (Fed. Cir. 2019) (citing *Cohesive Techs., Inc. v. Waters Corp.*, 543 F.3d 1351, 1364 (Fed. Cir. 2008)). Because Petitioner relies on the combination of Wedekind and Ehlers to teach limitation 1m—specifically the use of a forecasted temperature as one factor used to predict a recovery time—Patent Owner’s argument that Ehlers alone does not teach the entirety of the claim limitation is inapposite. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“The test for obviousness is not whether . . . the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.”).

Patent Owner further argues that “[e]ven if Ehlers did disclose using a forecasted temperature forecasted to occur at the target time, it would not have been obvious to modify Wedekind to consider a forecasted temperature forecasted to occur at the target time.” PO Resp. 41. According to Patent Owner, “Wedekind already teaches a model that does not require the additional complexity of obtaining and using a forecasted temperature forecasted to occur at the target time.” *Id.* (citing Ex. 2002 ¶ 103).

We do not agree with Patent Owner’s argument. As the Federal Circuit has recognized, just because a prior art reference works, that does not mean that a person having ordinary skill in the art would not desire to improve it by making it better, such as by increasing efficiency. *See Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 797–99 (Fed. Cir. 2021) (reversing PTAB decision finding that improved efficiency was not a sufficient reason to combine references); *Huawei Techs. Co. v. Iancu*, 813 F. App’x 505,

509–10 (Fed. Cir. 2020) (non-precedential) (finding increased efficiency was a sufficient reason to combine references). Thus, even though the primary reference may work, a person having ordinary skill in the art would still try to improve it. *See KSR*, 550 U.S. at 417 (holding that “if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”).

Patent Owner also argues that if a person having ordinary skill in the art used a forecasted temperature, there would be no need to use the actual temperature measurement of input [iv]. PO Resp. 42. We do not agree with Patent Owner’s argument as it does not accurately reflect Petitioner’s argument. Instead, Petitioner persuasively argues the person having ordinary skill in the art would use the forecasted temperature in order to compensate for changing temperatures during the period where a recovery period was likely to occur, such as when the temperature transitions from daytime temperatures to nighttime temperatures or nighttime temperatures to morning temperatures. Ex. 1002 ¶¶ 104–105. This would be important as the recovery rates were known to be slow, which result in greater changes in outside temperatures during the recovery period. *Id.* ¶ 104. Thus, a person having ordinary skill in the art would use both the thermal performance values of said structure (which is based in part on an outside temperature measurement prior to the recovery time) along with the forecasted temperature (as taught by Ehlers). *Id.* ¶¶ 105–108, 118–120.

Patent Owner further argues that the use of the forecasted temperature requires changing Wedekind’s equations, which would require undue experimentation. PO Resp. 42–44; PO Sur-reply 15–17.

We do not agree with Patent Owner’s argument. Patent Owner relies on the testimony of Dr. Palmer. *See* Ex. 2002 ¶¶ 106–107. However, his testimony is entitled to little or no weight. First, although Dr. Palmer is sufficiently skilled to offer expert opinion in this proceeding (*see* Section II.D.1), by his own admission he has never “held a position where [his] primary responsibility was designing or building HVAC control systems” or “worked on the design of an HVAC control” system. Ex. 1014, 13:22–14:5. He thus lacks, based on his experience, the knowledge and experience to adequately support testimony about how hard it would be to make changes to Wedekind’s formulas. *See United States v. Frazier*, 387 F.3d 1244, 1261 (11th Cir. 2004) (“Of course, the unremarkable observation that an expert may be qualified by experience does not mean that experience, standing alone, is a sufficient foundation rendering reliable any conceivable opinion the expert may express.”); Fed. R. Evid. 702 advisory committee’s note (2000 amends) (“If the witness is relying solely or primarily on experience, then the witness must explain how that experience leads to the conclusion reached, why that experience is a sufficient basis for the opinion, and how that experience is reliably applied to the facts.”).

Second, although Dr. Palmer cites Mr. Shah’s cross-examination as support for his testimony, we have reviewed those citations and they do not provide sufficient support for Dr. Palmer’s testimony. At most, the testimony simply acknowledges that modifications would take work and that a person of ordinary skill in the art would only do the work if it was worthwhile. *See* Ex. 2004, 92:7–94:11, 95:24–98:19, 102:19–103:15. Accordingly, we give Dr. Palmer’s testimony on this topic no weight.

In contrast to Dr. Palmer, Mr. Shah has substantial experience in the design of HVAC control systems. Mr. Shah has over twenty-five years of

experience on the design and development of HVAC systems. Ex. 1002 ¶¶ 2–8. Mr. Shah is “a named inventor on at least 50 patents, with applications still pending. [His] patents primarily relate to the field of HVAC technology.” *Id.* ¶ 9. In light of his experience, we find his testimony that a person having ordinary skill in the art would have been able to combine Wedekind’s system using Ehlers’ forecasted temperatures credible. *See id.* ¶ 108. In this regard, as discussed above, Mr. Shah provided two different ways in which the forecasted temperatures could easily have been used with Wedekind’s equations.¹⁷ *Id.*

We further note that the challenged ’753 patent uses both current and forecasted temperatures in its system. *See* Ex. 1001. However, the ’753 patent provides no formulas or algorithms on how to do so. *See id.* This lack of detail is strong evidence that it is within the ability of a person having ordinary skill in the art without undue experimentation. *See In re Epstein*, 32 F.3d 1559, 1568 (Fed. Cir. 1994) (“[T]he Board’s observation that appellant did not provide the type of detail in his specification that he now argues is necessary in prior art references supports the Board’s finding that one skilled in the art would have known how to implement the features of the references.”).

Patent Owner further argues that Petitioner has engaged in improper hindsight in using Ehlers’ forecasted temperatures. PO Sur-reply 12–13.

We do not agree. First, this is an improper new argument raised for the first time in the Sur-reply. Our rules generally prohibit us from considering arguments raised for the first time in a sur-reply:

¹⁷ Even if we had given Dr. Palmer’s conclusory testimony on this topic some weight, we find Mr. Shah’s detailed testimony more persuasive.

Generally, a reply or sur-reply may only respond to arguments raised in the preceding brief. 37 C.F.R. § 42.23, except as noted above. “Respond,” in the context of 37 C.F.R. § 42.23(b), does not mean proceed in a new direction with a new approach as compared to the positions taken in a prior filing. While replies and sur-replies can help crystalize issues for decision, a reply or sur-reply that raises a new issue or belatedly presents evidence may not be considered.

Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019) (“CTPG”)¹⁸ 74. Although the Response mentions hindsight once, it does so without any explanation or detailed analysis: “The Petition and Mr. Shah also fail to effectively demonstrate the viability of the combination of the prior art references upon which he relies, as well as the reasonable expectation of the result of such a combination absent a significant level of hindsight bias.” PO Resp. 7 (citing Ex. 2002 ¶ 30). Patent Owner cites no relevant case law in the Response and there is no detailed discussion as to how Petitioner is allegedly using hindsight. *See id.* Because any hindsight argument was not fully developed in the Response, Patent Owner is making an improper new argument in the Sur-Reply.

Second, even if we considered the argument, we do not find any evidence of improper hindsight. A determination that a claim is unpatentable as obvious must be supported by “some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006), *cited with approval in KSR*, 550 U.S. at 418. The requirement for a reason to combine the reference acts as a check on the potential for the improper use of hindsight. *See Plantronics, Inc. v. Aliph, Inc.*, 724 F.3d 1343, 1354 (Fed.

¹⁸ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

Cir. 2013) (holding that an articulated reasoning “is especially important to guard against the dangers of hindsight bias”). Because, as discussed above, Petitioner has persuaded us with evidence and articulated reasoning that a person having ordinary skill in the art had a sufficient reason to combine Ehlers’ forecasted temperature with Wedekind’s system, we conclude that Patent Owner’s improper hindsight argument lacks merit.

Patent Owner also argues that “Petitioner ignores that its alleged motivation is contrary to the express teaching of Wedekind and Ehlers, which use actual temperature measurements.” PO Sur-reply 13; *see also id.* at 13–14. According to Patent Owner, “Petitioner wants to replace an actual temperature measurement with a weather forecast.” *Id.* at 13 (citing Pet. Reply 24). Similarly, Patent Owner argues that “Petitioner [does not] mention forecasted temperature or any reasoning why a [person having ordinary skill in the art] would replace actual temperature measurements with those from a weather forecast.” *Id.* at 15.

We do not agree with Patent Owner’s argument as it misrepresents Petitioner’s theory. Contrary to Patent Owner’s argument, Petitioner argues that the outside temperature measurements are used to calculate thermal performance value, U_0A_0 , which would still be used. Pet. Reply 24–25. According to Petitioner, “the original U_0A_0 is calculated using external temperatures, including the first external temperature, while an updated U_0A_0 for the forecasted outside temperature during the recovery period can be calculated using Equation (13), and then used to calculate the start time and intervals.” *Id.* at 25 (citing Ex. 1002 ¶ 108). Thus, contrary to Patent Owner’s argument, Petitioner’s modification involves using both a measured outside temperature and a forecasted temperature.

Patent Owner also argues that the “use of forecasted temperatures is not consistent with the teachings of Wedekind.” PO Sur-reply 17. According to Patent Owner, “[o]nce the model is trained, Wedekind is done and implements the model for use. Wedekind creates the model and assumes that the indoor temperature meets the predicted temperature. Because of this, there is no need to go back and obtain another temperature reading.” *Id.* (citations omitted).

Patent Owner’s argument is inapposite. Although Patent Owner may be accurately describing how Wedekind works, Patent Owner ignores how Petitioner argues that a person having ordinary skill in the art would have modified Wedekind to take advantage of the improved information of using forecasted temperature data. *See* Pet. 43–50; Ex. 1002 ¶¶ 101–111. The issue is not what Wedekind discloses, but whether Petitioner sufficiently explains why a person having ordinary skill in the art would have modified Wedekind in light of Ehlers. *See Orexo AB v. Actavis Elizabeth LLC*, 903 F.3d 1265, 1273 (Fed. Cir. 2018) (“The question is not whether the various references separately taught components of the [] Patent formulation, but whether the prior art suggested the selection and combination achieved by the [] inventors.”); *Kahn*, 441 F.3d at 988 (Arguments on the reason to combine must be supported by “some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.”).¹⁹

n) Limitation 1n – Calculating a Plurality of Intermediate Setpoints

Claim 1 further recites

¹⁹ In addition to the arguments directed to input [v] above, Patent Owner has generalized arguments regarding the combination of Wedekind and Ehlers. We address those below in Section II.E.3.r.

calculating a plurality of intermediate setpoints and a plurality of setpoint target times that occur between the first time and the target time based at least in part on [i] said one or more thermal performance values of said structure, [ii] said performance characteristic of said climate control system, [iii] said first internal temperature, [iv] said first external temperature, and [v] the forecasted temperature.

Ex. 1001, 9:55–61. Petitioner argues that the combination of Ehlers and Wedekind teaches this limitation. *See* Pet. 54–58. For the reasons discussed below, we agree.

Ehlers teaches ramping—making large temperature changes by changing the setpoints gradually—to avoid the possibility of using expensive heating or cooling stages. Ex. 1002 ¶ 122; Ex. 1008, 4:42–45, 12:55–58, 19:27–20:3, 27:9–10, 27:41–48, 28:1–7, 28:65–29:13. At the time of the invention of the challenged claims, ramping was well-known in the prior art. Ex. 1002 ¶ 123; *see also* Ex. 1004, 1:23–28, 6:49–63; Ex. 1005, 4:53–55. Stated differently, Ehlers “teaches that when the temperature of the structure is to change by more than a few degrees, a ramping of the setpoint up or down should take place, in order to avoid switching on more expensive levels of heating or cooling equipment.” Ex. 1002 ¶ 124.

Mr. Shah also provides testimony, consistent with and supported by the teachings of Ehlers and Wedekind, regarding the calculation of intermediate setpoints. For example, according to Mr. Shah, in order to use ramping to change the temperature gradually, a person having ordinary skill in the art would have understood that the HVAC system would need to “determine a plurality of intermediate setpoints and target times during the recovery period of Wedekind.” Ex. 1002 ¶ 125; *see also id.* ¶ 126; *KSR*, 550 U.S. at 421 (“A person of ordinary skill is also a person of ordinary creativity, not an automaton.”). Those intermediate setpoints would occur

between the start of the setback period, t_3 , and the end of the setback period, t_4 , when the temperature reaches the comfort temperature, T_f . *Id.* ¶ 125; *see also* Ex. 1006, Fig. 2. It would have been obvious to a person having ordinary skill in the art to calculate the intermediate set points using the same inputs used to determine t_3 and thus the overall length of the recovery period. Ex. 1002 ¶ 127 (identifying the following factors: “[i] said one or more thermal performance values of said structure, [ii] said performance characteristic of said climate control system, [iii] said first internal temperature, [iv] said first external temperature, and [v] the forecasted temperature”). Because the number of intermediate setpoints and the timing of setpoint changes (i.e., target times) are constrained by the total recovery interval length ($t_4 - t_3$ or t_r) and the total recovery period is based on at least the five recited inputs, the intermediate setpoints and the target times would need to be based “at least in part” on those 5 inputs. *Id.* That is, the total length of the sum of the subintervals must be equal to the recovery interval ($t_4 - t_3$ or t_r) and the sum of the temperature changes must be equal to the desired temperature change. *Id.*

A person having ordinary skill in the art would have also combined Ehler’s use of weather forecasts to improve Wedekind’s system. *See* Ex. 1002 ¶¶ 125–127. Specifically, a person having ordinary skill in the art would have created intermediate setpoints based on the five inputs identified in limitation 1n in order to allow for the gradual ramping of a temperature to change the temperature during the recovery period to avoid using more expensive heating or cooling equipment. *Id.* ¶¶ 122–127. Those intermediate setpoints, which would direct the controller to change the temperature using intermediate steps, would then be transmitted to the controller to set the controller. *Id.* ¶¶ 128–132.

Patent Owner argues that Ehlers “does not disclose calculating intermediate setpoints based on **forecasted temperatures** or newly acquired indoor temperature measurements at a **third time**, for example. Rather, Ehlers teaches optimizing gradual ramping based on reacting to higher or lower energy prices.” PO Resp. 44 (emphasis omitted). “Because,” according to Patent Owner, “Ehlers does not disclose or render obvious calculating intermediate setpoints in the manner of element [1n], it also would not be obvious to modify Wedekind to calculate intermediate setpoints in the manner of element [1n].” *Id.* at 45 (citing Ex. 2002 ¶ 110).

We do not agree with Patent Owner’s argument. “The question in an obviousness inquiry is whether it would have been obvious to a person of ordinary skill in the art to combine the relevant disclosures of the two references, not whether each individual reference discloses all of the necessary elements.” *Game*, 942 F.3d at 1352 (citing *Cohesive*, 543 F.3d at 1364). Because Petitioner relies on the combination of Wedekind and Ehlers to teach limitation 1n, Patent Owner’s argument that Ehlers does not teach the entirety of the claim limitation is inapposite. *See Keller*, 642 F.2d at 425 (“The test for obviousness is not whether . . . the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.”).

Patent Owner further argues that Ehlers teaches away from the claimed invention. PO Resp. 44. According to Patent Owner, “Ehlers teaches away from calculating intermediate setpoints in the manner of element [1n] because its focus is on adapting to higher or lower energy prices, and it discloses a solution to this problem without practicing [1n],

such as by solving the problem without using newly acquired indoor temperatures, for example.” *Id.* (citing Ex. 2002 ¶ 109).

We do not agree with Patent Owner that Ehlers teaches away from the claimed invention. A reference teaches away from the claimed invention 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). However, neither Patent Owner nor Dr. Palmer cites to any specific passage that they argue teaches away. PO Resp. 44; Ex. 2002 ¶ 109. In fact, neither cite to any passages at all. Thus, there is a complete absence of proof.

Regardless, even if the purpose of Ehlers was to adapt to higher or lower energy prices, that “does not teach away” from using intermediate setpoints 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)). Moreover, the claim is silent as to the reason for the intermediate setpoints. Thus, a different purpose of using intermediate setpoints is inapposite.

Patent Owner also argues that “Wedekind’s non-linear model does not incorporate any element that is associated with costs or energy pricing, so it is unclear what context would be used for incorporating Ehlers’ ramping into Wedekind’s non-linear model.” PO Resp. 45 (citing Ex. 2002 ¶ 111). We do not agree. As discussed above, we are persuaded by Petitioner’s evidence as to why a person having ordinary skill in the art would modify Wedekind to include ramping with intermediate setpoints.

Patent Owner also relies on the same arguments as discussed above for limitation 1m. PO Resp. 45. We do not agree with those arguments for the same reasons set forth above in Section II.E.3.m., *supra*.

Patent Owner further argues that Petitioner incorrectly argues that the limitation is met by a system that “calculates the start time for a recovery period and then determines a plurality of intermediate setpoints based only on (1) the duration of the recovery period, and (2) the amount of temperature change between the setback temperature and the occupancy comfort temperature.” PO Resp. 45. According to Patent Owner, “[t]his misapplies the language of element [1n], which requires calculating the plurality of intermediate setpoints based on each of subparts [i] – [v], not merely based on the duration of the recovery period and the amount of temperature change between the setback temperature and the occupancy comfort temperature.” *Id.* at 45–46; *see also* Ex. 2002 ¶¶ 113–114; PO Reps. 46.

We do not agree. Limitation 1n requires that the intermediate setpoints be “based at least in part on.” That is similar to the language in limitation 1m that the Federal Circuit construed in *Google*, 92 F.4th 1029. We apply that same construction here and find that the limitation is met so long as “each of the five inputs[are] used at some point during the determination of the” intermediate setpoints. *Id.* at 1059. Petitioner satisfied its burden with regard to this limitation when it showed how the five inputs were used to calculate transition time which is used in determining the intermediate setpoints. *See* Ex. 1002 ¶¶ 118–120, 125–127.

o) Limitation 1o – Intermediate Setpoints Direct a Controller to Change Temperatures

Claim 1 further recites “wherein the plurality of intermediate setpoints direct a thermostatic controller to change the actual temperature inside the

structure to the target temperature in a series of intermediate steps.”

Ex. 1001, 9:62–65. Petitioner argues that Wedekind and Ehlers teach this limitation. *See* Pet. 58–59. Besides the arguments on the reason to combine Wedekind and Ehlers, which are discussed in detail below in Section II.E.3.r., Patent Owner does not separately address this limitation. *See* PO Resp.

We are persuaded by Petitioner’s argument. Specifically, both Wedekind and Ehlers teach that setpoints are directions given to a thermostat to achieve or hold a specific temperature at a specific time. *See* Ex. 1006, 7:19–40; Ex. 1008, 12:44–54; Ex. 1002 ¶ 128. A person having ordinary skill in the art would have appreciated that once intermediate setpoints are calculated, there would need to be “instructions directing a thermostatic controller to change the actual temperature inside the structure to the target temperature in a series of intermediate steps.” Ex. 1002 ¶ 128 (emphasis omitted); *see also* Ex. 1008, 19:27–20:3 (explaining the use of intermediate setpoints); Ex. 1002 ¶¶ 129–130.

p) Limitation 1p – Transmitting the Intermediate Setpoints to the Controller

Claim 1 further recites “transmitting the plurality of intermediate setpoints to the thermostatic controller.” Ex. 1001, 9:66–67. Petitioner argues that limitation would have been obvious. *See* Pet. 59–60. Besides the arguments on the reason to combine Wedekind and Ehlers, which are discussed in detail below in Section II.E.3.r., Patent Owner does not separately address this limitation. *See* PO Resp.

We are persuaded by Petitioner’s argument. Because a person having ordinary skill in the art would have used a processor to determine the intermediate set points, it would have been obvious to then transmit those

calculated intermediate setpoints to the thermostatic controller to implement. Ex. 1002 ¶ 131. This would have been consistent with the teachings of Wedekind, which teaches using a predictor system to calculate the recovery time t_r and then send it to the programmable thermostat. Ex. 1006, 7:19–30; Ex. 1002 ¶ 131.

q) Limitation 1q – Setting the Thermostatic Controller

Claim 1 further recites “setting the thermostatic controller with the plurality of intermediate setpoints to control said climate control system.” Ex. 1001, 10:1–3. Petitioner argues that this limitation would have been obvious in light of Ehlers’ ramping function. *See* Pet. 60–61. Besides the arguments on the reason to combine Wedekind and Ehlers, which are discussed in detail below in Section II.E.3.r., Patent Owner does not separately address this limitation. *See* PO Resp.

We are persuaded by Petitioner’s argument. Because setpoints are used to control the climate control system, it would have been obvious to set the thermostatic controller (the thermostat) with the intermediate setpoints. Ex. 1002 ¶ 132.

r) Reason to Combine Wedekind and Ehlers with a Reasonable Expectation of Success

(1) Reason to Combine the References

As discussed above for limitations 1m and 1n, Patent Owner argues that a person having ordinary skill in the art would not have combined Ehlers’ use of a forecasted temperature and intermediate setpoints with Wedekind’s system. *See* Sections II.E.3.m, n, *supra*. As discussed in those sections, we found that Petitioner has sufficiently explained why a person having ordinary skill in the art would have combined the relevant features of

Ehlers into Wedekind's system. *Id.* We also explained why we did not agree with Patent Owner's arguments focused on the specific limitations. *Id.*

In addition to the specific arguments that were discussed previously, Patent Owner makes general arguments regarding the reason to combine and expectation of success. *See* PO Resp. 6–19; PO Sur-reply 3–7. For the reasons discussed below, we do not agree with Patent Owner's arguments.

Patent Owner argues that because Wedekind and Ehlers use different types of systems, a person having ordinary skill in the art would not have considered combining the references. PO Resp. 10–14; PO Sur-reply 4–7.

According to Patent Owner, Wedekind focuses on a non-linear computational model for an HVAC system with a single heating or cooling capacity applicable to simple systems, such as in a single-family home. PO Resp. 10; PO Sur-reply 3. Patent Owner further argues that Wedekind focuses not on energy costs, but on maximizing energy savings by minimizing the amount of time the system is on. PO Resp. 11, 12, 13–14; PO Sur-reply 3–4.

In contrast, Patent Owner argues that Ehlers focuses on “methods to evaluate the system operation with consideration of energy costs, particularly with input from energy providers that have time varying rate structures in complex building management systems such as would be expected in large commercial buildings or multi-building complexes with multi-stage climate control systems.” PO Resp. 10; *see also* PO Sur-reply 4. Patent Owner further argues that Ehlers focuses on a gradual ramping or recovery period, thus increasing the amount of time the system is on. PO Resp. 11–12, 13.

It is unclear exactly what Patent Owner is arguing in this section. Patent Owner focuses on the general differences of the references, but does

not give particularized arguments focusing on the specific modifications Petitioner has proposed. Such generalized argument is unhelpful, as it does not help us decide the question before us: whether a person having ordinary skill in the art would have made specific modifications to Wedekind in view of Ehlers.

Moreover, although Patent Owner focuses on the differences between the systems described in the references, Patent Owner ignores the substantial similarities. There is no dispute that both Wedekind and Ehlers each describe HVAC control systems. *See* Ex. 2002 ¶¶ 33, 36; Ex. 1002 ¶¶ 56–58, 62–63. Moreover, both Wedekind and Ehlers are directed to costs and efficiency, which are related. Tr. 42:11–43:22; Ex. 1006, 1:13–18, 4:38–45, 11:22–25; Ex. 1008, 2:42–45. But even if the primary purposes of the references are different, a person having ordinary skill in the art would still have a reason to combine them. *See KSR*, 550 U.S. at 420.

Additionally, Patent Owner reads too much into the references and, at times, misdescribes the references. For example, although Patent Owner argues that Ehlers works with “large commercial buildings or multi-building complexes with multi-stage climate control systems” (PO Resp. 10), Ehlers expressly states that it is directed to both commercial and residential buildings. Ex. 1008, 1:9–14 (“The present invention relates generally to a residential or commercial environmental condition control system . . .”). Similarly, Wedekind is also directed to “commercial or residential enclosures.” Ex. 1006, 5:61–67. Thus, contrary to Patent Owner’s arguments, the two references are directed to the same environments.

Nor does Patent Owner point to anything in Wedekind stating that it is limited to a single-stage system. Although Wedekind Figure 2 shows a temperature versus time graph for a single-stage system (*see* Ex. 2004,

120:5–121:1), there is no persuasive evidence saying that Wedekind could not be used with multi-stage systems. To the contrary, the evidence shows that at the relevant times, “many HVAC systems had multiple systems to heat and cool.” Ex. 1002 ¶ 38. Thus, in the absence of any statement in Wedekind saying that it is limited to a single-stage system, we see no reason to limit it in that way.

Alternatively, although not identified as such, it appears that Patent Owner is making an argument that Wedekind and Ehlers are not analogous art. We do not agree with Patent Owner’s argument.

Prior art is analogous and may be used in combination to prove that a claimed invention would have been obvious when the different references are: (1) from the same field of endeavor as the claimed invention; or (2) reasonably pertinent to the particular problem faced by the inventor, if the art is not from the same field of endeavor. *In re Bigio*, 381 F.3d 1320, 1325–26 (Fed. Cir. 2004). “The Supreme Court’s decision in *KSR* . . . directs us to construe the scope of analogous art broadly.” *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1238 (Fed. Cir. 2010). “The field of endeavor of a patent is not limited to the specific point of novelty, the narrowest possible conception of the field, or the particular focus within a given field.” *Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1001 (Fed. Cir. 2016).

Although Patent Owner’s argument focuses on the specific point of novelty of each of the references, that is not the proper analysis. Instead, we must broadly consider the field of endeavor. *See Unwired*, 841 F.3d at 1001. The ’753 patent, Wedekind, and Ehlers are each generally directed to smart HVAC management systems that determine a time to turn the system on based on a variety of factors. *See, e.g.*, Ex. 1002 ¶¶ 30–39, 41; Ex. 1001, code (57), 2:1–6; Ex. 1006, code (57), 1:12–18, 2:37–63; Ex. 1008,

code (57), 1:9–14, 2:35–39. Accordingly, even though there are differences between the references, the references are sufficiently analogous that a person having ordinary skill in the art would have combined Wedekind and Ehlers.

(2) The Reasonable Expectation of Success

Patent Owner argues that a person having ordinary skill in the art at the time of the invention would not have had a reasonable expectation of success.²⁰ PO Resp. 14–18; PO Sur-reply 4–7. For the reasons discussed below, along with the reasons discussed above when discussing the relevant limitations, we are persuaded by Petitioner’s arguments, and do not agree with Patent Owner’s arguments.

Specifically, Patent Owner argues that “Wedekind’s already highly complex non-linear computational model would require extensive modifications and increases in sophistication to account for a system with more than a single stage energy output level.” PO Resp. 15. Patent Owner further argues that besides there being no reason to modify the single-stage Wedekind to include a gradual ramping, a person having ordinary skill in the art “would not have a reasonable expectation of succeeding in this modification because the gradual ramping is not compatible with minimizing runtime.” *Id.* at 15–16. According to Patent Owner, “[i]t would also require extensive revisions to the entire non-linear computational model including the equations from which Wedekind computes the start time t_3 to account for

²⁰ Some of Patent Owner’s arguments seem to be directed more to a reason to combine than a reasonable expectation of success. Our findings and conclusions are the same regardless of the basis of Patent Owner’s arguments.

the varying energy input levels of Ehlers' multi-stage heating or cooling system." *Id.* at 16 (citing Ex. 2002 ¶ 50).

As discussed above in Section II.E.3.m., Dr. Palmer does not have any experience in the design of HVAC systems, including HVAC controls. Accordingly, we give little or no weight to that testimony.

Moreover, even if we did consider Dr. Palmer's testimony, we would not agree with it. On the one hand, Dr. Palmer's testimony regarding the use of a weather forecast is conclusory and gives no reason why the modification would be difficult or beyond the ability of a person having ordinary skill in the art. *See* Ex. 2002 ¶ 49. Additionally, Dr. Palmer does not describe any attempt he made to perform the modification proposed by the Petitioner and does not provide evidence of the difficulty he had in achieving it. *See id.* Instead, Dr. Palmer's testimony is simply *ipse dixit*.

On the other hand, Mr. Shah, who has significant experience designing and building HVAC control systems (*see* Section II.E.3.m.), described in detail how a forecasted temperature can be used with Wedekind. *See* Ex. 1002 ¶¶ 107–108. We are not apprised of anything "uniquely challenging or difficult for one of ordinary skill in the art" with the proposed uses of the forecasted temperature that would make it difficult for a person having ordinary skill in the art. *See Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007). And, we note, that although Dr. Palmer testified generally about the complexity of the Wedekind system, he never directly addressed the specific modifications Mr. Shah proposed (*see* Ex. 1002 ¶ 108) and never testified that there was not a reasonable expectation of success if those specific modifications were made. *See* Ex. 2002 ¶ 49.

With regard to ramping, we again are not apprised of evidence regarding difficulty in adding ramping. Ramping was a widespread technique in the prior art. *See* Ex. 1002 ¶ 123; Ex. 1008, 19:45–20:3; Ex. 1004, 6:49–63; Ex. 1005, 4:53–55. In light of its common use, we do not find that it would have been “uniquely challenging or difficult for one of ordinary skill in the art.” *Leapfrog*, 485 F.3d at 1162.

In addition, the weight of the evidence does not demonstrate or suggest anything incompatible between Wedekind’s desire for reduced runtime and the use of ramping. *See* PO Resp. 15–16. Although Patent Owner cites to Dr. Palmer’s testimony, Dr. Palmer simply provides conclusory evidence without any evidentiary support. *See* Ex. 2002 ¶ 49 (“A [person having ordinary skill in the art] would not have a reasonable expectation of succeeding in this modification because the gradual ramping is not compatible with minimizing runtime.”). There is no explanation as to why gradual ramping and minimizing runtime are not compatible. Although the initial start time might change to accommodate the ramping, there is no evidence in the record that the overall time the HVAC system is operating will substantially change.

Furthermore, Patent Owner’s description of Wedekind’s focus is too narrow. Wedekind is focused not on reducing the time the system is on for the sake of itself; rather, Wedekind is interested in reducing on-time “to optimize the efficiency of energy consumption.” Ex. 1006, 1:13–18; *see also id.* at 2:27–33 (“minimize energy consumption”), 2:48–63 (“optimizing energy consumption”), 4:38–45 (“optimize the energy consumption”), 11:22–25 (“The method of optimizing 76 the energy consumption . . .”), 11:40–45 (“require the least amount of energy consumption”). Patent Owner has not shown how the addition of ramping to Wedekind is

inconsistent with that purpose as ramping, which, as discussed below, reduces (or optimizes) energy consumption in a multi-stage HVAC system.

Instead, Petitioner has persuasively shown how the addition of ramping in a multi-stage system optimizes the efficiency of energy consumption. In a multistage system, the additional units are supplemental and are only engaged when the primary unit is insufficient. Ex. 1008, 19:60–66; Ex. 1014, 24:25–26:12. Because those additional stages are less efficient than the first stage (Ex. 2004, 26:25–28:1, 31:8–32:8), as Ehlers explains, “[b]y maintaining the systems operation in the first stage cycle, maximum energy consumption efficiency is achieved.” Ex. 1008, 19:60–62. Because ramping is designed to allow the system to stay in the more energy efficient (and cheaper) primary stage, adding ramping is consistent with Wedekind’s broad purpose. *See* Ex. 2004, 116:11–120:3; Ex. 1002 ¶ 39. Thus, both Wedekind and gradual ramping are designed to minimize energy consumption. *Compare id.* at 2:27–33, *with* Ex. 1002 ¶ 39.

Patent Owner further argues that “neither Wedekind nor Ehlers is concerned with solving the need [to prevent overshooting] that was finally resolved by the ’753 patent, and a [person having ordinary skill in the art] would not have a reasonable expectation of succeeding in addressing this need by combining the references.” PO Resp. 17. However, Patent Owner’s argument is inapposite.

First, there is nothing in the claims that requires an elimination of overshooting. Although the preamble recites “reducing the cycling time of a climate control system,” it is not clear that the recited purpose relates to overshooting. Moreover, even if it did, the preambles of the challenged claims are not limiting. *See* Section II.C. Thus, there is no need for the prior art to teach preventing overshooting.

Second, Patent Owner cites no evidence that overshooting was a problem that the '753 patent fixed. *See* PO Resp. 17–18. For example, the background of the '753 patent does not refer to overshooting as a problem. *See* Ex. 1001, 1:18–2:6. Similarly, Patent Owner's description of the '753 patent does not describe it as solving the problem of overshooting. *See* PO Resp. 2–5.

Third, it is not necessary for the prior art to serve the same purpose as that disclosed in the specification in order to support the conclusion that the claimed subject matter would have been obvious. *See KSR*, 550 U.S. at 419 (“[N]either the particular motivation nor the avowed purpose of the patentee controls” in an obviousness analysis.); *In re Linter*, 458 F.2d 1013, 1016 (CCPA 1972) (holding that “[d]ifferences between a patent applicant’s and the prior art’s motivation for adding an element” is inapposite when “there is no departure from the prior art in terms of the result achieved.”). “[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining” references. *KSR*, 550 U.S. at 420.

Patent Owner also argues that because Wedekind is directed to a single-stage system, all of the equations would need to be rewritten for a multi-stage system. *See* PO Sur-reply 3–7. As discussed above, although the embodiment described in Figure 2 is a single-stage system, Wedekind is not limited a single-stage system. *See, e.g.*, Tr. 45:6–15. Moreover, because, as discussed above, the goal of Ehlers’ ramping with intermediate setpoints is to keep the system in the primary stage, we do not see—and Patent Owner has not shown—that the formulas would need to be modified. That is, so long as the temperature difference between one intermediate setpoint and the other is sufficiently low that it does not trigger the need for

additional stages, the system will remain in the primary stage. *See* Ex. 1008, 19:52–20:3. In that case, because the multi-stage system is only using a single stage, the multi-stage system is effectively acting as a single-stage system. Given the fact that the operation of multi-stage HVAC systems with ramping were well-known, a person having ordinary skill in the art would have had no difficulty in making sure the system stays in the primary stage, thus eliminating the need to rework the equations. *See* Ex. 1002 ¶¶ 38–41, 123–127; Ex. 1008, 19:52–20:3.

s) 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 Wedekind and Ehlers.

4. Analysis of Claims 2–4, 6–20

Petitioner argues that the combination of Wedekind and Ehlers teaches the limitations recited in claims 2–4 and 6–20 and that a person having ordinary skill in the art would have combined the teachings with a reasonable expectation of success. Pet. 61–62, 64–75. Petitioner’s arguments are supported by citations to the prior art and the testimony of Mr. Shah. *See id.* We have reviewed Petitioner’s arguments and evidence, agree with them, and, therefore, adopt Petitioner’s arguments and evidence as our own.

Patent Owner does not separately address claims 2–4 and 6–20. *See* PO Resp. 46–47, 48–49.

Accordingly, Petitioner has shown by a preponderance of the evidence that the subject matter of claims 2–4 and 6–20 would have been obvious over Wedekind and Ehlers.

5. *Analysis of Claim 5*

Claim 5 depends from claim 1 and further recites “in which at least one remote processor is in communication with said thermostatic controller.” Ex. 1001, 10:12–14. Petitioner argues that the combination of Wedekind and Ehlers teaches that limitation. Pet. 62–64.

We agree with Petitioner. Specifically, Wedekind teaches that “[t]he parameter estimation assembly 16 may operate independent of the thermostat assembly 10.” Ex. 1006, 9:14–15. That means that “the thermostat assembly 10 can be divided into two separate and distinct parts; they being the thermostat assembly 10 which includes the programmable thermostat 12 and the predictor system 14 which includes the non-linear efficiency model, and the parameter estimation assembly 16.” *Id.* at 9:25–31. To do this, “[t]hree distinct microprocessors may be designed; one for the complete thermostat assembly 10; and one each for the parameter estimation assembly 16 and thermostat assembly 10 without the parameter estimation assembly 16.” *Id.* at 9:31–35. Stated differently, Wedekind teaches that the main processing functions (programmable thermostat 12, the predictor system 14, and the parameter estimation system 16) can be implemented separately on different microprocessors. Ex. 1002 ¶ 136.

Ehlers teaches that a person having ordinary skill in the art could use a distributed system in which a remote processor can communicate with the thermostatic controller. *See* Ex. 1008, 34:59–67 (“As a distributed system, the functions are divided between the two unit types. The computer will have functions 11 through 15, 21, 22, 31 through 37, 41, 42, 43 and 45 while the thermostat-like unit will have functions 14, 15, 36 and 44.”), 11:15–18 (“As such, a process can be performed by a remote computer system or by a service provider and sent back to the local system to output functions.”);

Ex. 1002 ¶ 137. Specifically, Ehlers teaches using “a central processor, coupled to the local processor over a communications channel, for monitoring energy consumption at a plurality of premises.” Ex. 1008, 4:31–34. As Ehlers explains, “FIG. 6 is a block diagram of a system including a central processor (main computer) and numerous local processors, each monitoring and controlling a different set of load devices. Each local processor may be located on a different premise.” *Id.* at 36:66–37:3. Stated differently, Ehlers teaches that the central processor can be remote from the thermostatic controller while still being in communication with the thermostatic controller. *See* Ex. 1002 ¶ 138.

Based on the teachings above, a person having ordinary skill in the art would have understood that various parts of the system can be implemented on a remote processor which is in communication with the thermostatic controller. Ex. 1002 ¶ 139. That would include placing some of the separate processors of Wedekind in a remote location and having them communicate with the thermostatic controller. *See id.* ¶¶ 136–139. Further, because doing so would provide the ability to centrally control and administer multiple thermostats, a person having ordinary skill in the art would have seen this as an advantage. *Id.* ¶ 139.

Patent Owner argues that Wedekind simply discusses “us[ing] distinct microprocessors to implement the distinct functions to be used independently – teaching away from the use of the separate processors being in communication with the thermostatic controller.” PO Resp. 47–48 (citing Ex. 1006, 9:14–37).

We do not agree with Patent Owner’s argument. First, “[t]he question in an obviousness inquiry is whether it would have been obvious to a person of ordinary skill in the art to combine the relevant disclosures of the two

references, not whether each individual reference discloses all of the necessary elements.” *Game*, 942 F.3d at 1352 (citing *Cohesive*, 543 F.3d at 1364). Because Petitioner relies on the combination of Wedekind and Ehlers to teach claim 5, Patent Owner’s argument that Wedekind does not teach the entirety of the claim limitation is inapposite. *See Keller*, 642 F.2d at 425 (“The test for obviousness is not whether . . . the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.”).

Second, Patent Owner has not shown any statement in Wedekind that teaches away from the claimed invention. A reference teaches away when “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.” *Gurley*, 27 F.3d at 553. A passage, which discusses a preferred embodiment, “does not teach away. . . [if] it merely expresses a general preference for an alternative invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the invention claimed.” *DePuy*, 567 F.3d at 1327 (quoting *Fulton*, 391 F.3d at 1201). Here, Patent Owner simply points to a description of a non-remote set of processors. *See* Ex. 1006, 19:14–37; Ex. 2002 ¶ 117. However, neither Patent Owner nor Dr. Palmer identifies any passage in Wedekind that discredits or discourages using a remote processor, rather, the cited statement does no more than articulate a preference for processors located with the thermostatic controller. That stated preference is insufficient to teach away from the claimed invention. *See DePuy*, 567 F.3d at 1327; *Fulton*, 391 F.3d at 1201.

Patent Owner also argues that “the Petition and Mr. Shah failed to opine on how the Ehlers system would be implemented within Wedekind’s system to render Claim 5 obvious under Wedekind in view of Ehlers.” PO Resp. 48. According to Patent Owner, Petitioner simply used hindsight based on the challenged patent. PO Sur-reply 17. We do not agree.

In determining whether there would have been a motivation to combine prior art references to arrive at the claimed invention, it is insufficient to simply conclude the combination would have been obvious without identifying any reason why a person of skill in the art would have made the combination. *Metalcraft of Mayville, Inc. v. The Toro Co.*, 848 F.3d 1358, 1366 (Fed. Cir. 2017). “The question is not whether the various references separately taught components of the [patented method], but whether the prior art suggested the selection and combination achieved by the [] inventors.” *Orexo*, 903 F.3d at 1273 (Fed. Cir. 2018). Arguments on the reason to combine must be supported by “some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *Kahn*, 441 F.3d at 988, *cited with approval in KSR*, 550 U.S. at 418. The requirement for a reason to combine the reference acts as a check on the potential for the improper use of hindsight. *See Plantronics*, 724 F.3d at 1354 (holding that an articulated reasoning “is especially important to guard against the dangers of hindsight bias”).

Here, Petitioner and Mr. Shah have done exactly that. *See* Pet. 63–64; Ex. 1002 ¶ 139. That is, Mr. Shah testifies that Ehlers teaches using a remote processor in communication with the thermostatic controller and that a person having ordinary skill in the art would have done so to obtain the advantages of Ehlers, namely “the ability to centrally control and administer multiple thermostats.” Ex. 1002 ¶ 139. Such a modification is consistent

with *KSR*, in which the Supreme Court recognized that “if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.” 550 U.S. at 417.

Accordingly, Petitioner has shown by a preponderance of the evidence that claim 5 would have been obvious to a person having ordinary skill in the art in view of Wedekind and Ehlers.

CONCLUSION²¹

For the foregoing reasons, we conclude that Petitioner has demonstrated by a preponderance of the evidence the unpatentability of claims 1–20 of the ’753 patent. Specifically, Petitioner has demonstrated by a preponderance of the evidence that claims 1–20 would have been obvious under 35 U.S.C. § 103(a) in view of Wedekind and Ehlers. We further deny Petitioner’s motion to exclude the testimony of Dr. Palmer.

In summary,

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–20	103(a)	Wedekind, Ehlers	1–20	

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).

ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1–20 of the '753 patent are unpatentable;

FURTHER ORDERED that Petitioner's motion to exclude the testimony of Dr. Palmer is *denied*; 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.

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