

PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of

**CERTAIN SMART THERMOSTAT
SYSTEMS, SMART HVAC SYSTEMS,
SMART HVAC CONTROL SYSTEMS,
AND COMPONENTS THEREOF**

Investigation No. 337-TA-1258

COMMISSION OPINION

The Commission has determined to review in part the final initial determination (“FID”) issued by the presiding administrative law judge (“ALJ”) on April 4, 2022. On review, the Commission has determined that there has been no violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337 (“section 337”) with respect to U.S. Patent Nos. 8,596,550 (“the ’550 patent”) and 8,886,488 (“the ’488 patent”) (collectively, “the Asserted Patents”).

This opinion sets forth the Commission’s reasoning in support of its determinations. The Commission affirms all findings in the FID that are not inconsistent with this opinion.

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I. BACKGROUND

A. Procedural Background

On April 2, 2021, the Commission instituted this investigation under section 337 based on a complaint filed by EcoFactor, Inc. of Palo Alto, California (“Complainant” or “EcoFactor”). *See* 86 Fed. Reg. 17402-03 (Apr. 2, 2021). The complaint, as amended and supplemented, alleges a violation of section 337 based upon the importation into the United States, the sale for importation, and the sale within the United States after importation of certain smart thermostat systems, smart HVAC systems, smart HVAC control systems, and components thereof by reason of infringement of certain claims of the U.S. Patent Nos. 8,423,322 (“the ’322 patent”), 8,019,567 (“the ’567 patent”), and 10,612,983 (“the ’983 patent”) as well as the ’550 patent, and the ’488 patent. *See id.*

The notice of investigation names the following respondents: ecobee Ltd. and ecobee, Inc., both of Toronto, Canada (collectively, “ecobee”); Google LLC of Mountain View, California (“Google”); Carrier Global Corporation of Palm Beach Gardens, Florida (“Carrier Global”); Emerson Electric Co. of St. Louis, Missouri (“Emerson”); Honeywell International Inc. of Charlotte, North Carolina (“Honeywell”); Resideo Technologies, Inc. of Austin, Texas (“Resideo”); Johnson Controls International, PLC of Cork, Ireland (“JCP”); and Siemens Industry, Inc. of Buffalo Grove, Illinois and Siemens AG of Munich, Germany (collectively, “Siemens”). *See id.* The Office of Unfair Import Investigations is not a party to the investigation. *See id.*

On May 11, 2021, the Commission amended the complaint and notice of investigation to add Johnson Controls Inc. (“JCI”) and to terminate respondent JCP. *See* Order No. 4 (Apr. 20, 2021), *unreviewed by* Comm’n Notice (May 11, 2021).

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The Commission later terminated the investigation as to respondents Emerson, Siemens, Honeywell, Resideo, and Carrier Global based on the withdrawal of the allegations in the complaint as to those respondents. *See* Order No. 3 (Apr. 12, 2021), *unreviewed by* Comm’n Notice (Apr. 29, 2021); Order No. 7 (May 13, 2021), *unreviewed by* Comm’n Notice (May 24, 2021); Order No. 13 (July 16, 2021), *unreviewed by* Comm’n Notice (July 30, 2021). On August 6, 2021, the Commission terminated the investigation as to JCI based on settlement. *See* Order No. 17 (Aug. 6, 2021), *unreviewed by* Comm’n Notice (Aug. 18, 2021). Respondents ecobee and Google (hereinafter, “Respondents”) remain in the investigation.

The Commission also later terminated the investigation as to the ’322, ’567, and ’983 patents based on the withdrawal of the complaint as to those patents. *See* Order No. 16 (Aug. 5, 2021), *unreviewed by* Comm’n Notice (Aug. 18, 2021); Order No. 26 (Nov. 8, 2021), *unreviewed by* Comm’n Notice (Dec. 8, 2021). Accordingly, only the ’550 and ’488 patents, *i.e.*, the Asserted Patents, remain in the investigation.

On September 1, 2021, the ALJ issued a claim construction order construing certain terms disputed by the parties. *See* Order No. 18 (Sept. 1, 2021). In addition, the ALJ determined that the asserted claims of the since-terminated ’567 patent were invalid as indefinite. *See id.*; *see also* Order No. 21 (Sept. 15, 2021).

On April 4, 2022, the ALJ issued the FID, finding no violation of section 337 based on Complainant’s failure to establish infringement of the asserted claims of the ’550 and ’488 patents. In addition, the FID finds all of the asserted claims to be invalid as follows: (1) claims 9 and 17 of the ’550 patent and claims 1 and 2 of the ’488 patent are invalid for lack written description under 35 U.S.C. § 112, ¶ 1 (section 112, ¶ 1); and (2) claim 9 (but not claim 17) of the ’550 patent and claims 1 and 2 of the ’488 patent are patent ineligible under 35 U.S.C. § 101

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(section 101).¹ The FID also finds that claims 9 and 17 of the '550 patent and claims 1 and 2 of the '488 patent are not invalid as anticipated or obvious under 35 U.S.C. §§ 102 or 103 (section 102 or 103). Furthermore, the FID finds that Complainant has not satisfied the technical prong of the domestic industry requirement with respect to any of the asserted claims. The FID also finds that Complainant has satisfied the economic prong of the domestic industry requirement with respect to both Asserted Patents.

The ALJ's recommended determination ("RD") recommends, should the Commission affirm and find a violation of section 337, that the Commission issue a limited exclusion order against infringing smart thermostat systems, smart HVAC systems, smart HVAC control systems, and components thereof imported by or on behalf of the Respondents. The RD does not recommend issuance of a cease and desist order against any respondent. In addition, the RD recommends that the Commission decline to set a bond during the period of Presidential review.

On April 18, 2022, both Complainant and Respondents filed petitions for Commission review of the FID.² Complainant petitions for Commission review of certain findings regarding: (1) certain claim constructions; (2) non-infringement; (3) invalidity of claims 9 and 17 of the '550 patent and claims 1 and 2 of the '488 patent for lack of written description; and

¹ The applications that matured into the '550 and '488 patents were filed before the effective date of the America Invents Act ("AIA"). Thus, the pre-AIA patent law applies to the Asserted Patents.

² See Complainant EcoFactor Inc.'s Petition for Commission Review of Initial Determination on Violation of Section 337 (Apr. 18, 2022) ("Complainant's Pet."); Respondents ecobee Ltd., ecobee, Inc., and Google LLC's Joint Contingent Petition for Review of Final Initial Determination (Apr. 18, 2022) ("Respondents' Pet.").

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(4) patent ineligibility of claim 9 of the '550 patent and claims 1 and 2 of the '488 patent.³

Respondents contingently petition for Commission review of the FID's findings regarding:

(1) certain non-infringement findings; (2) validity of claims 1 and 2 of the '488 patent under section 102 and/or 103; (3) patent eligibility of claim 17 of the '550 patent under section 101; and (4) the economic prong of the domestic industry requirement. On April 26, 2022, the parties filed responses to each other's petition.⁴

On May 4, 2022, Respondents filed statements on the public interest pursuant to Commission Rule 210.50(a)(4), 19 C.F.R. § 210.50(a)(4).⁵ No other submissions on the public interest were received. Nor did the Commission receive any submission in response to its post-RD *Federal Register* notice. See 87 Fed. Reg. 28036-37 (May 10, 2022).

B. Respondents' Accused Products

The notice of investigation defines the scope of the investigation and the accused products as follows:

smart thermostat systems, smart HVAC systems, smart HVAC control systems, and components thereof.

³ Complainant also petitions for review of the ALJ's finding in the claim construction order (Order No. 18) that the asserted claims of the '567 patent are indefinite. See Complainant's Pet. at 88-93. The Commission, however, has previously terminated that patent from the investigation at Complainant's own request. See Order No. 26 (Nov. 8, 2021), *unreviewed by* Comm'n Notice (Dec. 8, 2021). Thus, the '567 patent is no longer before the Commission in this investigation.

⁴ See Complainant Ecofactor Inc.'s Response to Respondents' Joint Contingent Petition for Review of Initial Determination (Apr. 26, 2022) ("Complainant's Resp."); Respondents ecobee, Ltd., ecobee, Inc. and Google LLC's Response to Complainant EcoFactor Inc.'s Petition for Commission Review of Initial Determination on Violation of Section 337 (Apr. 26, 2022) ("Respondents' Resp.") (as corrected on May 3, 2022).

⁵ See Respondents ecobee Ltd. and ecobee, Inc.'s Public Interest Statement Pursuant to 19 C.F.R. § 210.50(a)(4) (May 4, 2022); Respondent Google LLC's Public Interest Statement Pursuant to 19 C.F.R. § 210.50(a)(4) (May 4, 2022).

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See 86 Fed. Reg. at 17403. The FID notes that the accused products are Google’s “Nest Learning Thermostat Third Generation” (“NLT”) and “Nest Thermostat” (“NT”) (collectively, “the Google Accused Products”) and ecobee’s “ecobee3 lite” and “the ecobee SmartThermostat with Voice Control” (collectively, “the ecobee Accused Products”). *See* FID at 6.

C. Complainant’s Domestic Industry Products

The FID notes that “[t]he domestic industry [(“DI”)] product in this investigation is the EcoFactor Platform, both on its own and when used as a cloud platform that provides features for a compatible thermostat, including EcoFactor’s Simple Wi-Fi Thermostat (S100) or the CT-218 thermostat.” *See id.* at 6.

II. COMMISSION REVIEW OF THE FID

The Commission may review an ID either upon petition by one of the parties or on its own motion. *See* 19 C.F.R. §§ 210.43, 210.44. The Commission will grant a petition for review, in whole or in part, if it appears:

- (i) that a finding or conclusion of material fact is clearly erroneous;
- (ii) that a legal conclusion is erroneous, without governing precedent, rule or law, or constitutes an abuse of discretion; or
- (iii) that the determination is one affecting Commission policy.

See 19 C.F.R. § 210.43(b)(1), (d)(2).

In addition, the Commission will “grant a petition for review and order review of an initial determination or certain issues therein when at least one of the participating Commissioners votes for ordering review.” *See* 19 C.F.R. § 210.43(d)(3). “Any issue not raised in a petition for review will be deemed to have been abandoned by the petitioning party and may be disregarded by the Commission in reviewing the initial determination (unless the

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Commission chooses to review the issue on its own initiative under § 210.44).” 19 C.F.R. § 210.43(b)(2).

When the Commission reviews an initial determination, in whole or in part, it reviews the determination *de novo*. *Certain Soft-Edged Trampolines and Components Thereof*, Inv. No. 337-TA-908, Comm’n Op. at 4 (May 1, 2015). Upon review, the “Commission has ‘all the powers which it would have in making the initial determination,’ except where the issues are limited on notice or by rule.” *Certain Flash Memory Circuits & Prods. Containing Same*, Inv. No. 337-TA-382, USITC Pub. No. 3046, Comm’n Op. at 9–10 (July 1997) (quoting *Certain Acid-Washed Denim Garments & Accessories*, Inv. No. 337-TA-324, Comm’n Op. at 5 (Nov. 1992)). With respect to the issues under review, “the Commission may affirm, reverse, modify, set aside or remand for further proceedings, in whole or in part, the initial determination of the administrative law judge.” 19 C.F.R. § 210.45(c). The Commission also “may take no position on specific issues or portions of the initial determination,” and “may make any finding or conclusions that in its judgment are proper based on the record in the proceeding.” *Id.*; *see also Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984).

III. ANALYSIS

The Commission has determined to review the FID in part and, on review, for the reasons set forth below, to affirm with modification the FID’s finding of no violation of section 337 as to both of the Asserted Patents. Specifically, the Commission has determined to:

- modify the FID’s claim construction findings with respect to the terms “measurement” and “operational efficiency”;
- affirm with modifications the FID’s non-infringement findings as to both of the Asserted Patents;
- take no position as to the FID’s finding that the technical prong of the domestic industry requirement is not satisfied as to both of the Asserted Patents;

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- take no position as to the FID’s invalidity findings for lack of written description and patent ineligibility as to both of the Asserted Patents;
- take no position as to the FID’s finding that claim 1 of the ’488 patent is not anticipated by U.S. Patent No. 6,478,233 (“Shah”) and that claim 2 is not obvious over Shah in view of U.S. Patent No. 6,789,739 (“Rosen”); and
- take no position as to the economic prong of the domestic industry requirement with respect to both of the Asserted Patents.

The Commission adopts all findings in the FID that are not inconsistent with the Commission’s determination.

A. The ’550 Patent

Concerning the ’550 patent, the Commission has determined to review, and on review, affirms with modifications the FID’s findings with respect to non-infringement. The Commission has also determined to review, and on review, to take no position as to the FID’s findings with respect to the technical and economic prongs of the domestic industry requirement, invalidity for lack of written description, and patent ineligibility.

1. Technical Overview and Asserted Claims⁶

The ’550 patent relates to a “system, method and apparatus for identifying manual inputs to and adaptive programming of a thermostat.” *See* JX-5, ’550 patent at Title. The specification explains that it is desirable to adapt programmable thermostats based on “signaling from occupants in the form of manual temperature changes and incorporating [such] information . . . into long-term programming.” *Id.* at 2:9-12. In addition, the specification states that “[i]t

⁶ The FID determines that “[a] person having ordinary skill in the art of the ’550 patent at the time of invention would have had a bachelor’s degree in engineering, computer science, or a comparable field, with 2-3 years’ experience in temperature controls, embedded control systems, electronic thermostats, or HVAC controls, or similarly relevant industry experience, with relevant experience substituting for education and vice versa.” FID at 16.

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would also be desirable to take 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 2:12-17.

The Abstract explains that the claimed systems “incorporat[e] manual changes to the setpoint for a thermostatic controller into long-term programming of the thermostatic controller.” *Id.* at Abstract. For example, the claimed systems “compare[] the actual setpoint at a given time for the thermostatic controller to an expected setpoint for the thermostatic controller in light of the scheduled programming” and “[a] determination is then made as to whether the actual setpoint and the expected setpoint are the same or different.” *Id.* In addition, “a manual change to the actual setpoint for the thermostatic controller is compared to previously recorded setpoint data for the thermostatic controller” and “[a]t least one rule is then applied for the interpretation of the manual change in light of the previously recorded setpoint data.” *Id.*

The specification provides examples of such rules, including “weather and time-related inferences such as ‘if outside temperature is greater than 85 degrees and inside temperature is more than 2 degrees above setpoint and manual override lowers setpoint by 3 or more degrees, then revert to original setpoint in 2 hours,’ or ‘if heating setpoint change is scheduled from ‘away’ to ‘home’ within following 2 hours after detected override, and override increases setpoint by at least 2 degrees, then change to ‘home’ setting,’ or the like.” *See id.* at 6:52-60.

As noted above, Complainant asserts claims 9 and 17 of the ’550 patent (with disputed limitations emphasized):

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Claim 9 of the '550 Patent	Claim 17 of the '550 Patent
[pre] A method for incorporating manual changes to the setpoint for a thermostatic controller into long-term programming of said thermostatic controller comprising:	[pre] An apparatus for detecting manual changes to the setpoint for a thermostatic controller comprising:
	[a] at least a programmable communicating thermostat;
	[b] at least a remote processor;
	[c] at least a network connecting said remote processor and said communicating ⁷ ;
[a] accessing stored data comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure;	[d] at least a database comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure;
[b] using the stored data to predict a rate of change of temperatures inside the structure in response to at least changes in outside temperatures;	[e] computer hardware comprising one or more computer processors configured to use the stored data to predict a rate of change of temperatures inside the structure in response to changes in outside temperatures;
[c] calculating scheduled programming of setpoints in the thermostatic controller based on the predicted rate of change, the scheduled programming comprising at least a first automated setpoint at a first time and a second automated setpoint at a second time;	[f] the one or more computer processors configured to calculate scheduled setpoint programming of the programmable communicating thermostat for one or more times based on the predicted rate of change, the scheduled programming comprising one or more automated setpoints;
	[g] at least a database that stores the one or more automated setpoints associated with the scheduled programming for said programmable communicating thermostat;
	[h] at least a database that stores actual setpoint programming of said programmable communicating thermostat; and

⁷ The term “thermostat” appears to be missing.

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Claim 9 of the '550 Patent	Claim 17 of the '550 Patent
[d] comparing the actual setpoint at the first time for said thermostatic controller to the first automated setpoint for said thermostatic controller;	[i] the one or more computer processors configured to compare the one or more automated setpoints associated with said scheduled setpoint programming with said actual setpoint programming.
[e] detecting a manual change to the first automated setpoint by determining whether said actual setpoint and said first automated setpoint are the same or different;	
[f] changing the second automated setpoint at the second time based on at least one rule for the interpretation of said manual change.	

See JX-5, '550 patent at claims 9 and 17 (emphasis added).

2. Claim Construction

a. FID

Before the ALJ, the parties did not dispute the meaning of the term “measurement,” recited in limitations 9[a] and 17[d] of the '550 patent. See Order No. 18. The parties agreed that the term “measurement” carried its plain and ordinary meaning. See Complainant’s Pet. at 4; Respondents’ Resp. at 1-2.

For purposes of infringement, the parties disputed whether the Google Accused Products satisfy limitation 17[d]: “at least a database comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure.” See FID at 21-25. Specifically, regarding the “outside temperature measurement” limitation, the parties agreed that the outside temperature data originates from [], but disagreed as to whether: (1) “the data from [], such that it cannot be considered a ‘measurement’” and (2) “the

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fact that the data is [] means that it cannot be considered a ‘measurement’” *Id.* at 24.

The FID rejects the first argument, finding that the [], and that “Google’s own document indicates that the Google Accused Products [].” *Id.*; *see also id.* at 38 (“[T]o a skilled artisan, ‘a temperature measurement . . . is a direct physical observation, for example, using an instrument such as a temperature sensor,’ while a forecast ‘is an output of a predictive model, a mathematical model, a metrological model and is not a measurement in any way.’”) (citing Hr’g Tr. (Souri⁸) at 1108:10-18).

As to the second argument, the FID finds that “EcoFactor has not established that the data used by the Google Accused Products can be considered a measurement, because the [], before making it available to the Google Accused Products.” *Id.* The FID rejects Complainant’s argument that this [] is still a “measurement.” Specifically, the FID relies on the testimony of Google’s technical expert, Dr. Duncan Callaway, that “[]” such that, in his opinion, “Google is not using the outside temperature measurements.” *Id.* at 25 (citing Hr’g Tr. (Callaway) at 1257:8-11). The FID finds that the Google Accused Products do not satisfy limitation 9[a] for the same reasons. *See* FID at 35. Complainant petitioned for review of these findings. Complainant’s Pet. at 10-11, 14.

Relevant to the Commission’s review of these findings is the FID’s infringement analysis of limitation 1[c] of the ’488 patent, which recites: “one or more processors comprising

⁸ Dr. Shukri Souri is ecobee’s technical expert in this investigation.

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computer hardware that is configured to receive outside temperature measurements from at least one source other than said HVAC system.” Despite also requiring “outside temperature measurements,” the FID reaches a different conclusion as to infringement by the Google Accused Products with respect to that limitation. *See* FID at 84-85. Specifically, the FID determines that the Google Accused Products satisfy the “outside temperature measurements” of limitation 1[c] on the ground that “outside temperature measurements” must be construed more broadly for purposes of the ’488 patent. *See id.* The FID states that claim 2 of the ’488 patent, which depends from claim 1, recites that the “processors . . . receive outside temperatures for geographic regions based on ZIP codes from sources other than said HVAC system.” *Id.* at 85 (citing JX-6, ’488 patent at claim 2). The FID explains that the “temperatures” recited in claim 2 “must qualify as the ‘temperature measurements,’ as in claim 1.” *Id.* The FID reasons that:

a temperature established for a geographic region based on ZIP code implies some minimum amount of processing of the raw measured temperature data, [] if for no other reason [than] because temperature based on ZIP code is likely to be an average of multiple temperature sensors rather than a single direct measurement.

Id. The FID concludes that “the term ‘measurements’ in limitation 1[c] of the ’488 patent must have a broader meaning than the same term in limitation 17[d] of the ’550 patent” and finds that the Google Accused Products satisfy limitation 1[c] of the ’488 patent. *Id.*

b. Analysis

Complainant argues that the FID errs in finding that “the term ‘measurements’ in limitation 1[c] of the ’488 patent must have a broader meaning than the same term in limitation 17[d] of the ’550 patent.” Complainant’s Pet. at 4 (citing FID at 84-85). Complainant asserts that “[a]bsent lexicography or disclaimer, there is no legal authority to construe ‘measurement’ more narrowly than its plain meaning.” *Id.* at 5 (citing *InterDigital Comm’s, LLC v. ITC* 690

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F.3d 1318, 1324 (Fed. Cir. 2012); *Thorner v. Sony Comp. Ent. Am. LLC*, 669 F.3d 1362, 1366-67 (Fed. Cir. 2012) (explaining that the only two exceptions to giving a term its “full ordinary and customary meaning” are lexicography or disclaimer)).

Complainant further asserts that the FID errs in finding “that the claims require not only a quantitative value in degrees, but also limit *how* the measurement is obtained.” *Id.* (emphasis in original) (citing FID at 23). Rather, Complainant argues, “even courts that have adopted a narrower construction of ‘measurement’ than its plain meaning have only required a ‘quantitative value.’” *Id.* at 5 (citing *Transonic Sys., Inc. v. Fresenius USA, Inc.*, 425 F. Supp. 2d 1082, 1088 (N.D. Cal. 2006), *aff’d* 215 F. App’x 995 (Fed. Cir. 2007)). Complainant contends that the FID errs in finding that the ’550 patent claims require an “‘actual, direct measurement’ by a temperature sensor in direct physical contact with the ambient air,” arguing that “there is no basis for narrowing the plain meaning of ‘measurements’ to require raw temperature sensor values, when the plain meaning fairly encompasses (as the ID found with respect to the ’488 patent) processed quantitative values of temperature.” *Id.* at 5-6.

The Commission finds that the term “measurement” should be construed consistently for the ’550 and ’488 patents to carry its plain and ordinary meaning. Claim 2 of the ’488 patent reflects the breadth of that plain and ordinary meaning, but does not justify a narrower construction in the context of the ’550 patent. Respondents suggest that the plain meaning of “measurement” is distinct in the context of the ’550 patent in view of the specification which “makes clear that the only contemplated ‘measurement’ of the internal temperature is one that is sensed directly from an indoor air temperature sensor.” *See* Respondents’ Resp. at 2 (citing JX-5, ’550 patent at 4:9-12). The cited language from the specification, however, states that “[t]hermostat **108** includes temperature sensing means **252**, which may be a thermistor, thermal

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diode or other means commonly used in the design of electronic thermostats.” JX-5, ’550 patent at 4:9-12. Neither this language, nor anything else in the ’550 patent specification, supports limiting the plain meaning of the term “measurement” based on lexicography or disclaimer; nor does the language support interpreting the plain meaning differently between the ’550 and ’488 patents.

The Commission also rejects Complainant’s proposed “quantitative value” construction for the terms “internal temperature measurements” and “outside temperature measurements.” Complainant’s proposed construction is overbroad and inconsistent with the intrinsic record of the ’550 patent which contemplates the use of conventional means to obtain temperature measurements. *See* JX-5, ’550 patent at 4:8-12 (“Thermostat **108** includes temperature sensing means **252**, which may be a thermistor, thermal diode or other means commonly used in the design of electronic thermostats.”). For instance, a “quantitative value” can refer to a calculated value without any measurement taking place at all. In any event, the Commission also finds that Complainant waived any reliance on its proposed construction, raised for the first time in its petition for review, for failing to present it before the ALJ. *See* Respondents’ Resp. at 1, 4 n.3; *see also* *Ajinomoto Co., Inc. v. ITC*, 597 F.3d 1267, 1277 (Fed. Cir. 2010) (finding waiver where appellant failed to raise a validity argument before the ALJ); *Conoco, Inc. v. Energy & Envtl Int’l, L.C.*, 460 F.3d 1349, 1358-59 (Fed. Cir. 2006) (“[A] party may not introduce new claim construction arguments on appeal or alter the scope of the claim construction positions it took below.”) (citations omitted).

Thus, the Commission has determined to review the FID’s application of the plain and ordinary meaning of the term “measurement” and the related infringement findings. On review,

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the Commission confirms that the plain and ordinary meaning of the term “measurement” applies and has the same scope both in the context of the ’550 patent and the ’488 patent.

3. Infringement

Complainant asserts that the Google Accused Products satisfy claims 9 and 17 of the ’550 patent, and that the ecobee Accused Products satisfy claim 17 of the ’550 patent.

The FID finds that Complainant failed to establish infringement with respect to any of the accused products, literally or under the doctrine of equivalents. *See* FID at 19-45. Specifically, the FID finds that the Google Accused Products (both the NT and NLT) do not meet limitations 17[d] and 17[e]. *See id.* at 21-27. In addition, the FID finds that the NLT does not meet limitation 17[i]. *Id.* at 31-35. The FID also finds that the Google Accused Products “do not meet claim 9 for the same reasons as . . . for claim 17.” *Id.* at 34-36. As to the ecobee Accused Products, the FID finds that they do not infringe claim 17 of the ’550 patent because “[they] do not meet limitations 17[d], 17[e], or 17[f].” *Id.* at 36-45. The FID, however, finds that the ecobee Accused Products satisfy limitation 17[i]. The FID does not reach Complainant’s indirect infringement claims as to any of the accused products because Complainant failed to establish direct infringement. *See id.* at 36, 45; *Novartis Pharm. Corp. v. Eon Labs Mfg. Inc.*, 363 F.3d 1306, 1308 (Fed. Cir. 2004).

The Commission has determined to review the FID’s non-infringement findings as to the ’550 patent. On review, as set forth below, the Commission has determined to affirm with modification the FID’s findings that the Google Accused Products and the ecobee Accused Products do not infringe the asserted claims of the ’550 patent. The Commission adopts the findings and analyses of the FID that are not inconsistent with the Commission’s findings below.

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a. Google Accused Products

(1) Claim 17

- (a) “An apparatus for detecting manual changes to the setpoint for a thermostatic controller comprising” (17[pre]) “one or more computer processors configured to compare the one or more automated setpoints associated with said scheduled setpoint programming with said actual setpoint programming” (17[i])

i. FID

Complainant accuses the Savings Finder function of Google’s NT product and the Seasonal Savings function of Google’s NLT product as the infringing functionality for purposes of claim 17 of the ’550 patent. *See* FID at 31-32. Complainant asserts that “Savings Finder [

].” *Id.* at 32 (citing CIB⁹ at 30; CRB¹⁰ at 14). Complainant contends that it is accusing, not this [], but “[

].” *Id.* Specifically, Complainant argues, “[

].” *Id.*

The FID finds that the preamble of claim 17 is limiting and that the Google Accused Products (both the NT and NLT) satisfy the preamble of claim 17. *See id.* at 19-20. As the FID explains, “[t]he preamble is the only place in claim 17 that specifies that the apparatus must

⁹ Complainant’s Opening Post-Hearing Br. (“CIB”).

¹⁰ Complainant’s Reply Post-Hearing Br. (“CRB”).

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detect a manual change to the setpoint” and therefore, “the preamble provides ‘life, meaning, and vitality to the claim.’” *Id.* at 19 (citing *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999)); *accord* Respondents’ Resp. at 3. The FID further explains that “[while] the preamble states that the apparatus detects manual changes to the setpoint, it does not state *how* the apparatus must detect the manual changes.” *Id.* (emphasis in original). Instead, the FID continues, “the ‘how’ is dictated by limitation 17[i].” *Id.*

The FID also finds that the NT product, but not NLT product, satisfies limitation 17[i]. *Id.* at 32-34. The FID finds with respect to the NT product that “[

], which compares automated setpoints to the actual setpoint programming entered by the user.” *Id.* at 32 (citing Hr’g Tr. (de la Iglesia¹¹) at 497:6-499:11; CDX-5C.166-167; CPX-9C [

]). The FID finds that “[

].” *Id.* The FID further explains that “[

].” *Id.* at 32-33 (citing Hr’g Tr. (de la Iglesia) at 497:6-499:11). In other words, the FID finds that “[

].” *Id.* at 33 (citing Hr’g Tr. (de la Iglesia) at 497:6-498:7).

The FID finds, however, that the NLT does not infringe because the comparison of the setpoints is not what indicates to the system that a manual change has occurred. Instead, the NLT []. *See id.* The FID

¹¹ Dr. Erik de la Iglesia is one of Complainant’s technical experts in this investigation.

credits Google’s expert testimony that the [].” *See id.* at 33-34 (citing Hr’g Tr. (Callaway) at 1276:22-1277:11). The FID also credits the testimony of Dr. Eric Burger, a senior software engineer at Google, and finds that “[].” *See id.* at 33 (citing Hr’g Tr. (Burger) at 1196:6-16).

ii. Analysis

Complainant argues that the FID errs in finding that NT satisfies 17[i] while NLT does not “[].” Complainant’s Pet. at 13. Specifically, Complainant asserts that “[i]t is undisputed that the NLT [].” *Id.* (citing Hr’g Tr. (de la Iglesia) 433:3-435:20, 443:1-25, 453:14-454:22; CX-1196 (Google - Seasonal Savings)). Complainant contends that, contrary to the FID’s finding, claim 17 “does not require comparing setpoints *before or after* a manual change is detected—indeed, it does not require detecting a manual change at all.” *Id.* (emphasis in original). Complainant argues that the “ID wrongly construed the preamble as limiting and wrongly interpreted [limitation] 17[i] to further require ‘detecting a manual change.’” *Id.*

Complainant also argues that, as a “comprising” claim, “claim 17 does not preclude additional steps.” *Id.* at 14. Thus, Complainant asserts, “even if the ID were correct that the NLT []”, that is an additional element that is not relevant to infringement.” *Id.*

Furthermore, Complainant argues that the FID’s finding is erroneous because “the Accused Products []”

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].” *Id.* (citing Hr’g Tr. (Burger) at 1217:17-1218:15 (agreeing Seasonal Savings []), 1218:16-1220:24 (confirming that the thermostat [] that Seasonal Savings has been making)). Complainant contends that “Dr. Burger’s testimony proves that the NLT [],” and that “[t]his shows [], which practices 17[i].” *Id.*

The Commission agrees with the FID that the preamble is limiting and infringed but disagrees that the NLT product does not satisfy limitation 17[i]. The preamble recites “[a]n apparatus for detecting manual changes to the setpoint for a thermostatic controller” and limitation 17[i] further requires comparing the automated setpoint with the actual setpoint. *See also* JX-5, ’550 patent at Abstract (“[A] manual change to the actual setpoint for the thermostatic controller is compared to previously recorded setpoint data for the thermostatic controller.”).

As explained in the FID, “[t]he preamble is the only place in claim 17 that specifies that the apparatus must detect a manual change to the setpoint” and therefore, “the preamble provides ‘life, meaning, and vitality to the claim.’” *Id.* at 19 (citing *Pitney Bowes*, 182 F.3d at 1305). The Commission also finds that Complainant fails to present any persuasive argument as to why the preamble is not limiting. Complainant relies on Dr. Sourì’s testimony, but whether the preamble is limiting is not a proper subject matter for expert testimony. *See id.* (citing Hr’g Tr. at 1167:14-23 (Sourì)); *see also* *Teva Pharm. USA Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 841

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(2015) (“Experts may be examined to explain terms of art, and the state of the art, but they cannot be used to prove the proper or legal construction of any instrument of writing.”).

As to limitation 17[i], the Commission finds that the claim language does not support the FID’s finding that the detection of a manual change must occur as a result of the comparison between the automated and the actual setpoints. *See* FID at 33-34. Respondents state that limitations “17[pre]/17[i] explicitly require the comparison to take place before the manual change is detected.” Respondents’ Resp. at 11. The Commission finds that the claim language has no temporal requirement, and agrees with Complainant that “[t]he claim does not require comparing setpoints *before* or *after* a manual change is detected.” *See* Complainant’s Pet. at 13 (emphasis in original). Because Respondents do not otherwise dispute that the Google Accused Products perform a comparison of the automated and actual setpoints, the Commission finds that both the NLT and NT devices satisfy limitation 17[i]. *See* Respondents’ Resp. at 10-12.

Accordingly, the Commission finds that the Google Accused Products (both NT and NLT) satisfy limitations 17[pre] and 17[i].

(b) **“at least a database comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure” (17[d])**

i. **“internal temperature measurements”**

a. **FID**

The FID finds that the Google Accused Products do not satisfy the “internal temperature measurements” requirement of limitation 17[d]. The FID explains that the Google Accused Products do not measure ambient temperature but, instead, measure a temperature inside the enclosed products, and then use “a temperature compensation algorithm that tries to estimate . . . the ambient temperature.” *See* FID at 21-22 (citing Hr’g Tr. (Burger) at 1180:20-25, 1181:1-4).

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The FID also finds no infringement under the doctrine of equivalents because Google’s Accused Products use “a sufficiently different way of obtaining ambient air temperature that it is not equivalent to an actual, direct measurement.” *Id.* at 23. The FID credits Dr. Callaway’s testimony and finds that “calculating temperatures using the compensation algorithm involves ‘[] instead of measuring.’” *Id.* (citing Hr’g Tr. (Callaway) at 1290:22-24). In addition, the FID continues, “Mr. de la Iglesia himself admitted that thermal modelling for small, enclosed electronic devices is ‘a significant endeavor.’” *Id.* (citing Hr’g Tr. (de la Iglesia) at 428:22-429:10).

b. Analysis

Complainant argues that the FID errs in “requiring an ‘actual, direct measurement’ by a temperature sensor in direct physical contact with the ambient air.” *See* Complainant’s Pet. at 7-8. Complainant contends that “[t]he Google Nest Thermostats ‘obtain[] ambient air temperature’ using the internal temperature sensor” and, “[a]s an additional step, the Nest Thermostats correct the sensor measurements to produce an even more accurate measurement of the ambient indoor temperature—[].” *Id.* (citing Hr’g Tr. (de la Iglesia) at 459:20-462:17; CX-935C).

Complainant also asserts that the FID errs in not finding infringement under the doctrine of equivalents. *Id.* at 8. Complainant reasons that the Google Accused Products perform “substantially the same function—indeed, measuring temperature is the *only* function of this process,” in “substantially the same way—using a temperature sensor in a thermostat to obtain the indoor ambient air temperature.” *Id.* at 9 (emphasis in original). In addition, Complainant continues, “the result is the same—a thermostat that obtains a value in degrees for the ambient air temperature using its temperature sensors.” *Id.*

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Respondents argue that the Google Accused Products do not measure ambient room temperature. *See* Respondents' Resp. at 4. Rather, Respondents explain, "the thermostat's sensors can only sense the power consumed by and the non-uniform heat emanating from the components within the thermostat, which are substantially hotter than the room temperature." *Id.* In addition, Respondents disagree with Complainant's argument that there is "a trivial difference" between a measurement of the ambient air temperature and an estimate produced by a complex compensation algorithm. *See id.* at 5-6.

The Commission agrees with the FID that the Google Accused Products do not satisfy "internal temperature measurements" limitation 17[d] either literally or under the doctrine of equivalents. The Google Accused Products are distinct from the claimed apparatus and operate in a significantly different manner. The Google Accused Products use a ventless design that does not measure but rather calculates an estimate for the ambient temperature.¹² *See* FID at 21; Hr'g Tr. (Callaway) at 1290:22-24; CX-294C (Burger) at 83:14-84:15; Hr'g Tr. (Burger) 1180:17-1181:4. The evidence shows that the Google Accused Products measure a different temperature variable, the temperature inside the enclosed device, which is not the same as the ambient temperature or the claimed internal temperature. *See* FID at 21; Hr'g Tr. (Callaway) at 1290:22-24; CX-294C (Burger) at 83:14-84:15; Hr'g Tr. (Burger) 1180:17-1181:4. The temperature inside the enclosed ventless device does not correspond to the ambient temperature; instead, the Google Accused Products must perform significant processing of the temperature inside the enclosed device to calculate or estimate the ambient temperature. *See* Hr'g Tr.

¹² Complainant does not dispute that the claimed "internal temperature" refers to ambient room temperature because such temperature (not the temperature inside the enclosed accused device) is what is used to predict the rate of change of temperatures inside a structure (*e.g.*, a house) in which the HVAC system is installed. *See* Complainant's Pet. at 7.

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(Callaway) at 1290:22-24; CX-294C (Burger) at 83:14-84:15; Hr’g Tr. (Burger) 1180:17-1181:4. Complainant’s literal infringement argument, therefore, fails as it is based on the incorrect conflation of the temperature inside the ventless device with the ambient temperature or internal temperature.

The Commission also finds no infringement under the doctrine of equivalents. While the Google Accused Products appear to perform the same “function” (determining the ambient temperature) to achieve the same “result” (obtaining the ambient temperature value), the evidence shows that the “way” is significantly different and far from trivial. The Google Accused Products use a ventless design that is not capable of measuring ambient temperature. *See* Respondents’ Resp. at 4. Rather, the accused devices measure much higher temperatures inside the enclosed devices and then calculate or estimate the ambient temperature by using a complex temperature compensation algorithm. *See* Respondents’ Resp. at 5-6 (citing Hr’g Tr. (Callaway) at 1290:22-24; CX-294C (Burger) at 83:14-84:15); *see also* Hr’g Tr. (Burger) at 1181:24-1182:4 (“[

].”), 1182:20-25).

Complainant argues that the “way” is substantially the same because the Google Accused Products “us[e] a temperature sensor in a thermostat to obtain the indoor ambient air temperature.” Complainant’s argument is conclusory and contradicted by the evidence. A ventless design that measures a temperature inside the device and applies a complex temperature compensation algorithm is not equivalent to the claimed design which measures ambient temperature. *See* FID at 38 (“[T]o a skilled artisan, ‘a temperature measurement . . . is a direct physical observation, for example, using an instrument such as a temperature sensor.’”) (citing Hr’s Tr. (Souri) at 1108:10-18); *see also* JX-5, ’550 patent at 4:9-12 (“Thermostat **108** includes

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temperature sensing means **252**, which may be a thermistor, thermal diode or other means commonly used in the design of electronic thermostats.”). Indeed, “using a complex weighting model that []” is not “measuring” the ambient room temperature as required by limitation 17[d]. *See* FID at 23 (citing Hr’g Tr. (Callaway) at 1290:22-24).

Thus, the Commission affirms, with the modified analysis discussed above, the FID’s finding that the Google Accused Products do not satisfy the claim term “internal temperature measurements” either literally or under the doctrine of equivalents.

ii. “outside temperature measurements”

a. FID

The FID finds that the Google Accused Products do not satisfy the “outside temperature measurements” requirement of limitation 17[d]. As discussed *supra* at section III(A)(2), this finding is inconsistent with the FID’s finding that the Google Accused Products satisfy the same term as used in the context of limitation 1[c] of the ’488 patent in that the FID applies a broader construction for “measurement” in limitation 1[c] of the ’488 patent.

b. Analysis

As discussed *supra* at section III(A)(2), the Commission finds that the term “measurement” should be given its plain and ordinary meaning and should be construed consistently across both the ’550 and ’488 patents. Respondents do not petition for review of the FID’s finding that the Google Accused Products satisfy limitation 1[c] of the ’488 patent and do not persuasively address the inconsistency in the FID’s infringement findings between the ’550 and ’488 patents. Thus, the Commission finds that the Google Accused Products satisfy this (same) limitation in the context of both the ’550 and ’488 patents.

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- (c) **“computer hardware comprising one or more computer processors configured to use the stored data to predict a rate of change of temperatures inside the structure in response to changes in outside temperatures” (17[e])**

i. **FID**

The FID finds that the Google Accused Products do not satisfy limitation 17[e] either literally or under the doctrine of equivalents. *See* FID at 26-28. The FID finds that the Google Accused Products “predict a rate of change of temperatures,” but that Complainant failed to establish that the computer processors use the stored data to predict such rate. *See id.* at 26-27.

The FID notes that Complainant “asserts that the relevant data is stored in the [],” but finds that Complainant “does not even allege that either of the Google Accused Products access data stored in the [] in order to predict a rate of change of temperatures.” *Id.* at 26. Instead, Complainant identifies the Heat Pump Balance system and alleges that it “maintains a copy of the stored data in order to predict a rate of change.” *Id.* (citing CIB at 15-16). In finding no infringement, the FID credits Google’s explanation that “the ‘Heat Pump Balance’ [] on the NL or NLT device’ and does not use any data from the accused database.” *Id.* (citing RIB¹³ at 11). The FID also finds no infringement under the doctrine of equivalents because Complainant failed to “explain how using [] rather than accessing data from the claimed database results in performing substantially the same function, in substantially the same way, to achieve substantially the same result.” *Id.* at 26-27.

¹³ Respondents Initial Post-Hearing Brief (“RIB”).

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ii. Analysis

Complainant does not persuasively dispute any of the FID’s findings. Complainant argues that the FID errs in “constru[ing] ‘use the stored data’ to require storing the data before using it, rather than storing the data concurrently with its use.” *See* Complainant’s Pet. at 12. Complainant agrees that the “the stored data” refers to “the indoor and outdoor measurements that get stored in the [],” and Complainant admits that the data used by the Google Accused Products to predict the rate of change is not data stored in the []

[]. Complainant, however, asserts that the Google Accused Products maintain “copies of that stored data.” *Id.* (citing Hr’g Tr. (de la Iglesia) 474:10-13). Complainant contends that “[t]here is literal infringement because the *same* indoor and outdoor temperatures that get stored in the database are ‘used’ to predict the rate of change.” *Id.* (emphasis added). As to infringement under the doctrine of equivalents, Complainant argues that “[i]t is a trivial difference whether the data is stored before, during, or after its use, so long as it is both stored and used.” *Id.* Indeed, Complainant continues, “the same data is being used concurrently with the storage step rather than being used after the storage step already transpired.” *Id.* at 27.

The Commission finds that Complainant’s infringement arguments are conclusory and unsupported by the evidence. The claim language requires “us[ing] the stored data” – not just any data – in “predict[ing] a rate of change of temperatures.” *See* JX-5, ’550 patent at claim 17. Contrary to Complainant’s contention, the Google Accused Products do not use the stored data, or even the same data, but a different set of data and a different process to predict a rate of change of temperatures. Complainant concedes that data from the Heat Pump Balance service, not the [], is used to predict the rate of change. *See* Complainant’s Pet. at 13 (citing Hr’g Tr. (de la Iglesia) at 474:14-18 (“[

].”)).

However, as Respondents explain, “the accused service Heat Pump Balance [

], meaning that the Google Accused Products ‘[

].” *See* Respondents’ Resp. at 8-9 (citing Hr’g Tr. (Burger) at 1202:12-23). Rather, Respondents continue, “[

].” *Id.* at 9 (emphasis in original) (citing CX-1122C, Burger Dep. Tr. at 75:15-24). Thus, the evidence shows that “the stored data” from the [] (the database accused by Complainant) is not and cannot be used to predict a rate of change of temperatures. The evidence also shows that data from the Heat Pump Balance service (identified by Complainant for predicting a rate of change) is distinct from “the stored data” of the [].

As to the doctrine of equivalents, Respondents explain that the Google Accused Products are not equivalent to “us[ing] the stored data” because “the ‘way’ the Google Accused Products operate is to “[].” *Id.* at 10 (citing Hr’g Tr. (Burger) 1211:1-14, 1210:9-16, 1214:4-8). Respondents continue, [

]. *Id.*; *see also* RIB at 11. Furthermore, Respondents argue, “[

].” *Id.* (citing Hr’g Tr. (Burger) 1212:22-1213:10).

Thus, the Commission agrees with the FID that Complainant failed to satisfy its burden to show that the Google Accused Products satisfy limitation 17[e]. Accordingly, the Commission affirms the FID’s finding of no infringement of claim 17 with respect to the Google Accused Products with the modified and supplemented analysis provided above.

(2) Claim 9

The FID finds that the Google Accused Products do not infringe claim 9 for the same reasons as claim 17. *See* FID at 34-36. Specifically, the FID finds that “the Google Accused Products do not meet the ‘internal temperature measurements’ or ‘outside temperature measurements’ of limitation 9[a].” *Id.* at 35. “Nor do they meet the limitation in 9[b] of ‘using the stored data to predict a rate of change of temperature inside the structure in response to at least changes in outside temperatures.’” *Id.*

For the same reasons as discussed above in connection with limitation 17[d], the Commission agrees with the FID that the Google Accused Products do not meet the “internal temperature measurements” as required by limitation 9[a]. The Commission disagrees, however, as to the “outside temperature measurements” limitation 17[d]. The Commission also agrees with the FID for the same reasons as discussed in connection with limitation 17[e], that the Google Accused Products do not use the stored data to predict a rate of change of temperatures as required by limitation 9[b].

As to limitation 9[d], the FID finds that “a comparison [between the automated setpoint and the actual setpoint] occurs in both the NT and NLT.” *Id.* (citing Hr’g Tr. (de la Iglesia) at 500:15-501:17). This is consistent with the Commission’s finding that the corresponding

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limitation 17[i] is satisfied by both the NT and NLT products. The FID also finds that “the NLT does not meet limitation in 9[e] of ‘detecting a manual change to the first automated setpoint by determining whether said actual setpoint and said first automated setpoint are the same or different,’ although the NT does.” *Id.*; JX-5, ’550 patent at claim 9. The Commission finds that the FID correctly finds that the NLT product does not meet the limitation in 9[e] of “detecting a manual change to the first automated setpoint by determining whether said actual setpoint and said first automated setpoint are the same or different,” while the NT does meet that limitation.¹⁴ *See* FID at 33-34. The FID explains that in the NLT device, “the comparison occurs after a manual change has been detected.” *Id.* Thus, the FID concludes that “the detection of the manual change is not the result of the comparison.” *Id.*; *see also* Respondents’ Resp. at 3 (“EcoFactor has repeatedly acknowledged and argued the differences between NT and NLT.”) (citing CIB at 7-9, 15, 18-23, 25-30; Hr’g Tr. (de la Iglesia) 460:3-6; 466:12-467:1; 473:21-474:1; 495:9-499:1).

Complainant argues that the NLT satisfies limitation 9[e] for the same reasons as limitation 17[i], *i.e.*, because “the Accused Products detect manual overrides to automated setpoints based on comparing the user setpoints to the automated setpoints.” *See* Complainant’s Pet. at 14 (citing Hr’g Tr. (Burger) at 1217:17-1220:24). Complainant contends that Dr. Burger, a senior software engineer at Google, “agre[ed] [that] Seasonal Savings [

],” and “confirm[ed] that the thermostat [

].” *Id.* Thus, Complainant concludes, “Dr. Burger’s

¹⁴ Respondents do not petition for Commission review of the FID’s finding that the NT product satisfies limitation 9[e].

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testimony proves that the NLT []” which “shows detecting that the user is changing the Seasonal Savings setpoint through a comparison of the user’s dial turns to the algorithm’s calculated temperatures.” *Id.*

As the FID notes, Complainant provides no testimony from its own expert to support its position. *See* FID at 34-35. Complainant’s arguments are insufficient to sustain its burden of proof as to limitation 9[e] for the NLT product. The Commission also agrees with Respondents that Dr. Burger’s testimony pertains to “users’ dissatisfaction with Seasonal Savings adjustments” but does not establish that the “Seasonal Savings compares setpoints to detect manual changes.” *See* Respondents’ Resp. at 12. Respondents explain that “Dr. Burger’s testimony describes the functionality of Seasonal Savings, specifically [

].” *See id.* (citing Hr’g Tr. (Burger) 1217:17-1220:24). The Commission agrees that this testimony does not establish that “any manual overrides, or changes, are detected based on comparing setpoints.” *See id.*

Accordingly, the Commission affirms the FID’s finding that the Google Accused Products do not infringe claim 9 of the ’550 patent, with the modified and supplemented analysis discussed above.

(3) Conclusion

For the foregoing reasons, the Commission affirms with the modified and supplemented analysis discussed above, the FID’s finding that the Google Accused Products do not infringe claims 9 and 17 of the ’550 patent. Accordingly, the Commission affirms the FID’s finding of no violation of section 337 by Google as to the ’550 patent.

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b. ecobee Accused Products

(1) “at least a database comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure” (17[d])

(a) FID

The FID finds that the ecobee Accused Products do not satisfy the “outside temperature measurements” limitation because they do not use current temperature measurements but, instead, forecast data. *See* FID at 37. Such forecast data, the FID finds, does not satisfy the “outside temperature measurements” limitation either literally or under the doctrine of equivalents. *See id.* at 37-39. Specifically, the FID finds that the “only pertinent evidence shows that to a skilled artisan, ‘a temperature measurement . . . is a direct physical observation, for example, using an instrument such as a temperature sensor,’ while a forecast ‘is an output of a predictive model, a mathematical model, a metrological model and is not a measurement in any way.’” *Id.* at 38 (citing Hr’g Tr. (Souri) at 1108:10-18)). The FID explains that “ecobee’s [

].” *Id.* at 37 (citing CX-229C (Malchiondo¹⁵) at 234:3-235:5).

The FID notes that “[t]he parties agree that the ecobee Accused Products [

]. *Id.* As to

[], the FID finds that “EcoFactor itself acknowledges that [

].” *Id.* (citing CIB at 37; Hr’g Tr. (Noble-Marks¹⁶) at 1044:1-5). Similarly, as to

¹⁵ Mark Evan Malchiondo is ecobee’s vice president of software development.

¹⁶ Adam Noble-Marks is a senior data scientist at ecobee.

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[], the FID finds that “it is not clear whether the data used by the ecobee Accused Products is, in fact, [].” *Id.* at 37-38.

Regarding Complainant’s doctrine of equivalents argument, the FID finds that “EcoFactor’s argument is largely premised on the assumption that [] provide actual measurements and not forecasts.” *Id.* at 39. The FID notes, however, that “EcoFactor also asserts that the ecobee Accused Products perform the function in substantially the same way, by ‘obtaining [].” *Id.* (citing CIB at 39).

The FID finds that “[],” and that “[].” *Id.*

(b) Analysis

Complainant disputes the FID’s finding that limitation 17[d] requires current data, as opposed to forecasted data, arguing that the plain meaning of “temperature measurements” “is broad enough to include, at least, quantitative values of temperature.” Complainant’s Pet. at 18. Thus, Complainant asserts, the FID errs in finding that “‘measurement’ must be ‘a direct physical observation’ that cannot include any forecast data . . . despite the obvious fact that ‘forecast data’ [] would include quantitative values of outside temperature.” *Id.* (citing FID at 38).

Complainant also argues that the ecobee Accused Products do, in fact, receive current temperature data from []. *See id.* at 15-17. Complainant contends that “while the [FID] points out that Mr. Zeidman¹⁷ was only able to locate an [

¹⁷ Robert Zeidman was one of Complainant’s technical experts in this investigation.

].” *Id.* at 17

(citing CX-1097.3-4).

Complainant further argues that forecast data is equivalent to “outside temperature measurements.” *See id.* at 18-20. Specifically, Complainant contends that ecobee “[

].” *Id.* at 19 (citing CX-229C (Malchiondo) at 233:16-235:5). Complainant explains that “[

].” *Id.* (citing CX-343C (Shahandeh¹⁸) at 156:14-21; CX-257C (Trinh¹⁹) at 83:3-8).

The Commission agrees with the FID that Complainant failed to demonstrate that the ecobee Accused Products satisfy limitation 17[d] either literally or under the doctrine of equivalents. As the FID finds, “it is not clear whether the data used by the ecobee Accused Products is, in fact, current conditions data as opposed to forecasted data.” FID at 38 (citing CX-252C.7, 14). Indeed, Complainant’s expert, Mr. Zeidman, “acknowledged that the [

].” *Id.*

(citing Hr’g Tr. (Zeidman) at 222:25-223:17); *see also* Respondents’ Resp. at 18 (citing RIB at 30; Hr’g Tr. (Zeidman) at 220:7-221:8; CDX-4C at 55). A forecast is not a “measurement” or

¹⁸ Sina Shahandeh is ecobee’s vice president for data science.

¹⁹ Kevin Trinh is a senior data scientist at ecobee.

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measured value, but a calculated value. *See* Hr’g Tr. (Souri) at 1130:17-1131:1. In addition, Respondents explain that Complainant’s reliance on the value “[]” is “unsupported by the record” because “[] that is used in the []” *See* Respondents’ Resp. at 20-21 (citing Hr’g Tr. (Zeidman) at 247:13-248:17, 228:2-19; CX-265C) (emphasis in original). As to “[

].” *Id.* at 21 (citing Hr’g Tr. (Noble-Marks) at 1044:17-1045:13; Hr’g Tr. (Souri) at 1110:6-20 (“[

].”)). Complainant therefore failed to meet its burden to show by a preponderance of the evidence that the ecobee Accused Products use current conditions data, *i.e.*, observed temperatures, rather than forecasted temperatures.

We also agree with Respondents that a forecast is not equivalent to a measurement. As Respondents’ expert, Dr. Souri, explained, forecasts “serve a different purpose” and “perform a different function.” *See id.* at 22 (citing Hr’g Tr. (Souri) at 1111:4-12). “Measurements are ‘an output of a . . . direct observation of an instrument;’ while forecasts are ‘an output of a mathematical model or a meteorological model,’ such that they are ‘calculated, not measured,’ and thus, they ‘achieve different results’ than measurements.” *Id.* at 22-23 (citing Hr’g Tr. (Souri) at 1130:17-1131:1); *see also* FID at 38-39 (citing Hr’g Tr. (Souri) at 1108:10-18).

Thus, the Commission finds that Complainant failed to establish that the ecobee Accused Products meet the “outside temperature measurements” limitation. Accordingly, the

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Commission affirms with the modified and supplemented analysis provided above, the FID’s finding that the ecobee Accused Products do not satisfy limitation 17[d].

- (2) **“computer hardware comprising one or more computer processors configured to use the stored data to predict a rate of change of temperatures inside the structure in response to changes in outside temperatures” (17[e])**

(a) **FID**

The FID finds that the ecobee Accused Products do not satisfy this limitation either literally or under the doctrine of equivalents. The FID notes (and the parties do not dispute) that “[r]ate of change of temperatures inside the structure” means “the difference between inside temperature measurements divided by the span of time between the measurements.” *See* FID at 39 (citing Order No. 18 at 17).

Complainant argues that “the ecobee Accused Products ‘[]’ and that this amounts to calculating a rate of change.” *Id.* (citing CRB at 23). The FID finds that the ecobee Accused Products use []. *See id.* at 40 (citing Hr’g Tr. (Souri) at 1113:5-1114:2; RDX-3C.17-18 (reproduced below); CX-273C; Hr’g Tr. (Noble Marks) at 1034:5-17 (explaining that [])). Rather, the FID finds, “the use of []”.

[

]

Id. (citing RDX-3C.18; Hr’g Tr. (Souri) at 1113:13-1114:2).

The FID also finds no infringement under the doctrine of equivalents. The FID explains that “the result of using a rate differs substantially from the result of using [],” and that “[

].” *Id.* at 40-41 (citing Hr’g Tr. (Noble Marks) at 1040:4-6).

In addition, the FID credits Dr. Souri’s testimony that “[a] rate of change in temperature serves a different function, different purpose, different result,” because a “[

].” *See id.* at 41 (citing Hr’g Tr. (Souri) at 1121:23-1122:3).

(b) Analysis

Complainant argues that the ecobee Accused Products predict a rate of change because they “[

].” *See* Complainant’s Pet. at 20. Complainant contends that “ecobee predicts a rate of change of inside temperatures . . . because [

²⁰ Complainant notes that “ecobee’s [

].” Complainant’s Pet. at 20 n.2.

].” *Id.* at 21

(citing CDX-4C.68; Hr’g Tr. (Zeidman) 146:7-147:15). Complainant also argues that the [] is equivalent to the claimed “predicted rate of change” because the claim, like the [], requires calculating “automated setpoints” based on the predicted rate of change. *See id.* at 23 (citing Hr’g Tr. (Zeidman) 149:21-150:3; CDX-4C.71).

Respondents argue there is no literal infringement because Complainant “failed to show that the ecobee Accused Products calculate the difference between inside temperature measurements . . . , let alone divide any such difference by the span of time between the measurements.” *See* Respondents’ Resp. at 24 (citing Hr’g Tr. (Zeidman) at 250:14-21, 217:2-7; Hr’g Tr. (Souri) at 1132:1-9). Respondents also argue there is no infringement under the doctrine of equivalents because a “rate of change in temperature serves a different function, different purpose,” and achieves a “different result” than []. *See id.* at 27-28 (citing Hr’g Tr. (Souri) at 1121:23-1122:3).

The Commission agrees with the FID that Complainant failed to establish that the ecobee Accused Products satisfy limitation 17[e], which requires the use of the stored data to predict a rate of change of temperatures. As Respondents explain, there is no literal infringement because the ecobee [] does not calculate differences in temperature and does not divide such temperature differences over time, as would be required to predict a rate of change of temperatures. *See* Respondents’ Resp. at 24-25 (citing Hr’g Tr. (Zeidman) at 250:14-21, 217:2-7; Hr’g Tr. (Souri) at 1132:1-9); *see also* FID at 39-40 (citing Hr’g Tr. (Souri) at 1113:5-11; RDX-3C.17; CX-273C, Hr’g Tr. (Noble Marks) at 1034:5-17).

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The Commission further agrees with the FID and Respondents that [] is neither the same as, nor equivalent to a rate.²¹ See Respondents’ Resp. at 26. Rather, as Respondents explain, “[].” *Id.* (citing Hr’g Tr. (Souri) at 1113:3-1114:6, 1154:13-16; RDX-3C.18). Respondents’ expert, Dr. Souri, also explained that “[a] rate of change in temperature serves a different function, different purpose, different result’ than [],’ as ‘[] is not equivalent to how fast or slowly a temperature is changing,’ *i.e.*, ‘[] not equivalent quantities.’” *Id.* (citing Hr’g Tr. (Souri) at 1121:22-1122:3; RDX-3C.18); *see also* FID at 41 (citing Hr’g Tr. (Souri) at 1121:23-1122:3). The Commission agrees that the difference between [] and a rate of change is not insubstantial.

Complainant’s reliance on a different limitation—which requires calculating “automated setpoints”—does not excuse Complainant from its burden to establish that ecobee’s Accused Products perform a substantially similar function, in substantially the same way, to achieve a substantially similar result of predicting a rate of change of temperatures. Indeed, even if the result of [], the evidence shows that [] performs a substantially different “function” []. In addition, [] performs the function in a substantially different “way”

²¹ Commissioner Stayin would take no position regarding whether the ecobee Accused Products satisfy limitation 17[e] under the doctrine of equivalents. Because the ecobee Accused Products do not meet limitation 17[d], Commissioner Stayin joins the Commission’s finding that ecobee Accused Products do not infringe claim 17 of the ’550 patent.

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([] and the “result” is also substantially different because the values obtained with [].

As the FID finds, “[t]he evidence shows that the result of using a rate differs substantially from [].” FID at 40. The FID explains that “ecobee [

].” *Id.* at 40-41 (citing Hr’g Tr. (Noble Marks) at 1040:4-6); *see also* Respondents’ Resp. at 26 (citing FID at 40-41; Hr’g Tr. (Noble Marks) at 1040:4-6, 1026:10-24, 1029:3-6). Respondents also explain that “[

].” Respondents’ Resp. at 27 (citing Hr’g Tr. (Noble-Marks) at 1039:23-1040:8; Hr’g Tr. (Souri) at 1116:15-1117:18; CDX-4C at 66; CX-273C).

Thus, the Commission agrees with the FID that Complainant failed to satisfy its burden to establish that the ecobee Accused Products meet limitation 17[e]. Accordingly, the Commission affirms with the modified and supplemented analysis provided above the FID’s finding that the ecobee Accused Products do not satisfy limitation 17[e].

- (3) **“the one or more computer processors configured to calculate scheduled setpoint programming of the programmable communicating thermostat for one or more times based on the predicted rate of change, the scheduled programming comprising one or more automated setpoints” (17[f])**

The FID finds that “the ecobee Accused Products calculate[] scheduled setpoint programming, comprising automated setpoints, but do not do so based on predicted rates of

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change, and so do not meet this claim limitation.” *See* FID at 41-43. The FID explains that the ecobee Accused Products do not calculate a “predicted rate of change” as stated in connection with limitation 17[e]. *See id.* at 41. Because the Commission agrees with the FID’s findings as to limitation 17[e], as modified and supplemented above, the Commission affirms the FID’s findings as to limitation 17[f].

(4) **“one or more computer processors configured to compare the one or more automated setpoints associated with said scheduled setpoint programming with said actual setpoint programming” (17[i])**

(a) **FID**

Complainant argues that the ecobee Accused Products satisfy limitation 17[i] because the claimed “comparison is made when ecobee [

].”²² FID at 44 (citing CIB at 53). Complainant explains that such an analysis “necessarily involves comparing [

].” *Id.* (citing CIB at 53; Tr. (Zeidman) at 161:20-24)).

The FID finds that the ecobee Accused Products satisfy limitation 17[i]. *See id.* at 43-45. The FID rejects ecobee’s argument that Complainant’s infringement argument fails because Complainant’s expert, Mr. Zeidman, “has identified no code or functionality implemented by

²² The FID explains that “[a] customer may use

.” FID at 41-42 (citing Hr’g Tr. (Zeidman) at 151:25-153:6; CDX-4C.76).

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the ecobee Accused Products’ that compares the automated setpoint with the actual setpoint.” *Id.* at 44 (citing RIB at 36; RRB²³ at 23). The FID finds that “[t]here is no requirement that a patentee specifically point to source code in order to prove infringement.” *Id.* (citing *Liquid Dynamics Corp. v. Vaughan Co.*, 449 F.3d 1209, 1219 (Fed. Cir. 2006) (“A patentee may prove direct infringement or inducement of infringement by either direct or circumstantial evidence. . . . There is no requirement that direct evidence be introduced.”)).

The FID also rejects ecobee’s argument that “Mr. Zeidman’s conclusion that an analysis of whether a customer [] necessarily involves a comparison of the automated setpoints to the actual setpoint is ‘pure speculation.’” *Id.* (citing RIB at 36). The FID explains that “Mr. Zeidman testified . . . that when a user [], a comparison of the actual setpoint to the automated setpoint is required.” *Id.* at 44-45 (citing Hr’g Tr. (Zeidman) at 161:10-23 (testifying that when a user [], such an action “requires a comparison of the actual setpoint to the automated setpoint”)). The FID further finds that Mr. Zeidman explained that “ecobee [],” and that “[

].” *Id.* at 45 (citing Hr’g Tr. (Zeidman) at 162:9-16).

(b) Analysis

Respondents contingently petition for review of the FID’s finding that the ecobee Accused Products satisfy limitation 17[i]. *See* Respondents’ Pet. at 53-57. Specifically, Respondents argue that “the fact that ecobee [] does not mean that there was a comparison between an automated and actual setpoint.” *Id.* at

²³ Respondents’ Reply Post-Hearing Brief (“RRB”).

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54-55 (citing Hr’g Tr. (Souri) at 1141:2-17). Respondents contend that “Dr. Souri testified that [] ‘is not comparing.’” *Id.* at 55 (citing Hr’g Tr. (Souri) at 1141:9-17). Indeed, Respondents continue, “there is no ‘requirement to compare anything’ in order to []” *Id.* (citing Hr’g Tr. (Souri) at 1141:9-17). According to Respondents, “Dr. Souri’s testimony . . . clearly rebuts Mr. Zeidman’s conclusory assertion” and “Mr. Zeidman identified no code or functionality regarding []” *Id.* at 55 (citing Hr’g Tr. (Souri) at 1141:2-8).

Complainant responds that “[] necessarily means that ecobee determines whether [], which in turn requires making the claimed comparison.” *See* Complainant’s Resp. at 37. Complainant’s argument is conclusory and unsupported by the evidence. The Commission agrees with Respondents that [] is not necessarily the same as comparing automated setpoints with actual setpoints. As the FID acknowledges, Mr. Zeidman did not examine any source code to determine whether the claimed comparison actually occurs in the ecobee Accused Products. *See* FID at 44. While the FID is correct that circumstantial evidence may suffice, Mr. Zeidman fails to explain why [] necessarily involves the claimed comparison. The Commission finds that Mr.

Zeidman’s testimony is conclusory and does not adequately rebut Dr. Souri’s testimony that [] “is not comparing.” *See* Hr’g Tr. (Souri) at 1141:2-17; *compare* Hr’g Tr. (Zeidman) at 162:9-16. As Dr. Souri explained, there is no “requirement to compare anything” in order to [].²⁴ *See* Hr’g Tr. (Souri) at 1141:9-17. The Commission also agrees that “ecobee’s responses to

²⁴ As one example of how manual changes can be detected without a comparison, the Google NLT products [], rather than by a comparison of the setpoints. *See supra*, pp. 17-18.

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EcoFactor’s interrogatories, as well as requests for admission, merely state that ecobee’s

[

] requires a comparison of the actual setpoint to the automated setpoint.”

Respondents Pet. at 55 (citing Hr’g Tr. (Zeidman) at 161:6-23; CDX-4C at 95; CX-28C.16-17; CX-32C.54-57; Hr’g Tr. (Souri) at 1138:20-1139:4).

Complainant argues that the “[

]” and that “ecobee does this in order to [

].” Complainant’s Resp. at 36 (citing

Hr’g Tr. (Zeidman) 160:12-162:16, 164:1-21, 165:9-166:14, 167:2-12; CDX-4C.95-102). The cited testimony, however, shows that “ecobee [

]” but does not establish the claimed comparison between an actual setpoint

and an automated setpoint occurs []. See Respondents’ Pet. at 55-56; Hr’

Tr. (Zeidman) 160:12-162:16. Complainant also argues that “[o]ne example of an [

].” Complainant’s Resp. at 36.

Complainant’s hypothetical merely demonstrates how the [] but

does not establish that the processor performs the claimed comparison between actual and

automated setpoints in order to [].”

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Thus, the Commission finds that Complainant failed to satisfy its burden to establish that limitation 17[i] is satisfied by the ecobee Accused Products, and therefore, the Commission reverses the FID's findings as to this limitation.

(5) Conclusion

For the foregoing reasons, the Commission affirms with the modified and supplemented analysis provided above the FID's finding that the ecobee Accused Products do not infringe claim 17 of the '550 patent. Accordingly, the Commission affirms the FID's finding of no violation of section 337 by ecobee with respect to the '550 patent.

B. The '488 Patent

Concerning the '488 patent, the Commission has determined to review, and on review, affirm with modification the FID's findings with respect to non-infringement. The Commission has also determined to review, and on review, take no position as to the technical and economic prongs of the domestic industry requirement, invalidity for lack of written description, invalidity over Shah alone or in combination with Rosen, and patent ineligibility.

1. Technical Overview and Asserted Claims²⁵

The '488 patent relates to a "system and method for calculating the thermal mass of a building." See JX-6, '488 patent at Title. The specification states that conventional programmable thermostats do not achieve "the significant theoretical savings that are possible with them (sometimes cited as 25% of heating and cooling costs)" because they are not programmed to do so, or they are programmed sub-optimally. *Id.* at 1:54-62. In addition,

²⁵ The FID determines that "a person having ordinary skill in the art of the '488 patent at the time of invention would have had a bachelor's degree in engineering, computer science, or a comparable field, with 2-3 years' experience in temperature controls, embedded control systems, electronic thermostats, or HVAC controls, or similarly relevant industry experience, with relevant experience substituting for education and vice versa." FID at 77.

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conventional programmable thermostats “only have two input signals—ambient temperature and the preset desired temperature.” *Id.* at 1:65-67. The specification explains that “[t]here are many other sources of information that could be used to increase comfort, decrease energy use, or both.” *Id.* at 2:6-7. For example, the specification describes that “[i]n at least one embodiment, the invention comprises a thermostat attached to an HVAC system, a local network connecting the thermostat to a larger network such as the Internet, and [*sic*] one or more additional thermostats attached to the network, and a server in bi-directional communication with a plurality of such thermostats.” *Id.* at 5:4-9. The specification further states that “[t]he server logs the ambient temperature sensed by each thermostat vs. time and the signals sent by the thermostats to their HVAC systems.” *Id.* at 5:9-11. In addition, “[t]he server preferably also logs outside temperature and humidity data for the geographic locations for the buildings served by the connected HVAC systems.” *Id.* at 5:12-14. The specification explains that “[b]y combining data from multiple thermostats in a given neighborhood, the system can correct for flaws in the location of a given thermostat, and can evaluate the efficiency of a given system, as well as assist in the diagnosis of problems and malfunctions in such systems.” *Id.* at 5:26-30. Furthermore, “[c]ombining these data sources . . . allow[s] the server to calculate the effective thermal mass of the structures conditioned by those thermostats” and allows “the system [to] correct for flaws in the location of a given thermostat, and [to] evaluate the efficiency of a given system, as well as assist in the diagnosis of problems and malfunctions in such systems.” *Id.*

As noted above, Complainant asserts claims 1 and 2 of the ’488 patent (with disputed limitations emphasized) against Google and ecobee:

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Claim 1 of the '488 Patent	Claim 2 of the '488 Patent
[pre] A system for calculating a value for the operational efficiency of a heating, ventilation and air conditioning (HVAC) system comprising:	The system as in claim 1 in which said processors receive outside temperatures for geographic regions based on ZIP codes from sources other than said HVAC system.
[a] at least one HVAC control system that receives inside temperature measurements from at least a first location conditioned by at least one HVAC system;	
[b] one or more databases that store at least said temperatures measured at said first location over time;	
[c] one or more processors comprising computer hardware that is configured to receive outside temperature measurements from at least one source other than said HVAC system,	
[d] wherein said one or more processors are configured to calculate one or more predicted rates of change in said inside temperature measurements at said first location based on the status of the HVAC system and to relate said one or more predicted rates of change to said outside temperature measurements; and	
[e] said one or more processors further configured to compare at least one predicted temperature based on the one or more predicted rates of change, with an actual inside temperature measurement.	

See JX-6 ('488 Patent) at claim 1 (emphasis added).

2. Claim Construction

a. Order No. 18 and the FID

The parties dispute the ALJ's finding that the preamble in claim 1 of the '488 patent, including the term "operational efficiency," is limiting. See Order No. 18 at 34. The parties

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also dispute the construction of the term “operational efficiency,” which the ALJ construed to mean the “energy required by the HVAC system to change inside temperature by a given amount over a given time for a set of indoor and outdoor conditions.” *See id.* at 18-20; *see also* FID at 78-80 (further determining that “the ‘value’ of ‘operational efficiency’ is construed to [] require at least units of energy”).

The ALJ found that the preamble is limiting because “[w]ithout the preamble term ‘operational efficiency,’ one of ordinary skill in the art simply would not understand the point of the system of claim 1.” Order No. 18 at 34. Specifically, the ALJ found that the preamble provides “life, meaning, and vitality to the claim[s].” *Id.* (citing *Pitney Bowes*, 182 F.3d at 1305). As to the construction of the term “operational efficiency,” the ALJ found that “the specification does not equate ‘time’ by itself with efficiency” but “defines the measure as a duration of time over which changes in efficiency are evaluated.” *See* Order No. 18 at 19. The ALJ, however, recognized that “the specification teaches that a longer cycle time might be indicative of lower operational efficiency due to clogged filter, refrigerant leak, etc., but this time lag, by itself, is not equated with a measure of efficiency.” *Id.* (citing JX-3, ’567 patent at 3:33-35 (corresponding to JX-6, ’488 patent at 3:40-42)). The FID further supplements the claim construction findings and finds that “the ‘value’ of ‘operational efficiency’ is construed to be require at least units of energy.” FID at 80.

b. Analysis

Complainant first argues that “[t]he preamble of claim 1 is not limiting because the body of the claim undisputedly recites a structurally complete invention, and no preamble provides antecedent basis for elements recited in the body of the claim.” *See* Complainant’s Pet. at 47. The Commission agrees with the FID that construing the preamble as limiting is necessary to give meaning to the claim. As Respondents note, “the remainder [of the claim] recites receiving

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temperature measurements and performing other calculations.” As the FID finds, a person of ordinary skill in the art would not understand the point of such measurements and calculations, and therefore, the preamble provides “life, meaning, and vitality to the claim[s].” *See* Order No. 18 at 34 (citing *Pitney Bowes*, 182 F.3d at 1305).

The Commission, however, disagrees with the ALJ’s construction of the term “operational efficiency. Complainant argues that the term should be construed as “energy *or time* required” by the HVAC system to change inside temperature by any given amount for a set of one or more indoor and outdoor conditions. *See* Complainant’s Pet. at 49. Both Complainant (and the FID) correctly state that the number of cycle times for a given inside and outside temperature can be indicative of operational efficiency. As the ’488 patent specification explains:

Many factors affect the efficiency of HVAC systems. Some may be thought of as essentially fixed, such as the theoretical efficiency of a central air conditioner (often expressed as its SEER rating), the matching of a given system to the characteristics of a given home, the location and size of forced-air ductwork, etc. Other contributors to efficiency are more dynamic, such as clogged filters, refrigerant leaks, duct leakage and “pop-offs,” and the like.

Most of these problems are likely to manifest themselves in the form of higher energy bills. *But the “signature” of each different problem can be discerned from the way in which each such problem affects the cycle times of a given HVAC system over time and relative to weather conditions and the performance of other HVAC systems in other houses.* If two otherwise identical houses are located next door to each other and have gas furnaces, but one is rated at 50,000 BTUs and the other is rated at 100,000 BTUs, the cycle times for the higher-capacity furnace should be shorter than for the lower-capacity unit. If both of those same houses have identical furnaces, but one has a clogged filter, the cycle times should be longer in the house with the clogged filter. Because cycling of the HVAC system is controlled by the thermostat, those differences in cycle time would be reflected in the data sensed by and control signals generated by the thermostat. It would be advantageous for a thermostat system to be able to use that

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information to diagnose problems and make recommendations based upon that data.

See JX-6, '488 patent at 3:35-61 (emphasis added). The specification explains that longer cycle times would be indicative of a problem with the furnace, *e.g.*, a clogged filter, and suggests that cycle times correspond to a value of operational efficiency. See *id.*; see also Order No. 18 at 19 (“[A] longer cycle time might be indicative of lower operational efficiency.”). The specification also provides that the SEER rating²⁶ corresponds to theoretical efficiency.

The specification further provides for calculating the relative efficiency based on historical performance data (*e.g.*, cycle times) and on the performance of nearby houses. A drop in efficiency can be identified through a drop in the percentile value of a house relative to nearby houses based on a comparison of their cycle times.

Assume that, based upon comparison of the performance of House A on date X relative to House A’s historical performance and in comparison to the performance of House A relative to other nearby houses on date X, the HVAC system in House A is presumed to be operating at normal efficiency, and that House A is in the 86th percentile as compared to those other houses. FIG. 8b shows a graph of outside temperature 408, inside temperature 410 and HVAC cycle times 412 in House A for the 24-hour period on date X+1. House A’s HVAC system now requires *significantly longer cycle times* in order to try to maintain the same internal temperature. If those longer cycle times were due to higher outside temperatures, those cycle times would not indicate the existence of any problems. But because server 106 is aware of the outside temperature, the system can eliminate that possibility as an explanation for the higher cycle times. Because server 106 is aware of the cycle times in nearby houses, it can determine that, for example, on date X+1 the

²⁶ As explained further below, the SEER rating indicates the amount of cooling received or heat removed (output) per unit of energy consumed (input). See *Certain Smart Thermostats, Smart HVAC Systems, & Components Thereof*, Inv. No. 337-TA-1185, Final ID at 39, 2021 WL 1997747 (Apr. 20, 2021) (“Dr. James testified that the American Society of Heating, Refrigeration, and Air Conditioning Engineers defines the efficiency estimate ‘SEER’ (*i.e.*, ‘Seasonal Energy Efficiency Ratio’) as a ‘ratio of the total heat removed from the conditioned space to the total electrical input if the combined appliance operated exclusively in a space-cooling-only (COOL) mode.’”).

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efficiency of House A is only in the 23rd percentile. The server will be programmed with a series of heuristics, gathered from predictive models and past experience, correlating the drop in efficiency and the time interval over which it has occurred with different possible causes. For example, a 50% drop in efficiency in one day may be correlated with a refrigerant leak, especially if followed by a further drop in efficiency on the following day. A reduction of 10% over three months may be correlated with a clogged filter. Based upon the historical data recorded by the server, the server **106** will be able to alert the homeowner that there is a problem and suggest a possible cause.

JX-6, '488 patent at 9:16-44.

Respondents argue that “time alone cannot be a measure of operational efficiency” because longer cycle times do not necessarily indicate a problem with operational efficiency. *See* Respondents’ Resp. at 53. That is true for energy as well. Both the energy or time it takes for the HVAC system to change inside temperature by a given amount can depend on several factors such as indoor and outdoor conditions as well as the size of the house, the level of insulation, etc. *See* JX-6, '488 patent at 3:35-42.

The Commission agrees with the FID that both energy and cycle times are indicative of the operational efficiency. *See* FID at 90-91. But equating operational efficiency with energy or time required by the HVAC system to achieve a desired temperature is problematic because the higher the energy or longer the time required to change inside temperature by a given amount, the lower (not higher) the efficiency of the HVAC system; that is, energy and time are both inversely related to operational efficiency.

The Commission also agrees with Complainant that the “operational efficiency” of an HVAC system does not “require at least units of energy” as the FID finds. *See* Complainant’s Pet. at 48-49; FID at 80. The SEER rating, for example, is not the energy consumed by an HVAC system. Rather, it is the amount of cooling received or heat removed (output) per unit of

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energy consumed (input), analogous to the mileage of a car per gallon of fuel. The higher the SEER rating or mileage, the more efficient the HVAC system or the car, respectively. The SEER rating is defined as the “theoretical efficiency” in the specification (*see* JX-6, ’488 patent at 3:35-40), and the “operational efficiency” could similarly be defined as the output of the HVAC system per unit of energy consumed or per cycle time.

The Commission further agrees with Complainant that the specification supports a finding that efficiency can be expressed as a value relative to a “normal efficiency.” *See* Complainant’s Pet. at 52; JX-6, ’488 patent at 9:16-42 (“For example, a 50% drop in efficiency in one day may be correlated with a refrigerant leak, especially if followed by a further drop in efficiency on the following day. A reduction of 10% over three months may be correlated with a clogged filter.”); *see also* FID at 79-80 (finding “some support for a percentage; when the specification describes ‘efficiency,’ it does so in percentage terms” but ultimately finding that such value refers to relative efficiency) (citing JX-6, ’488 patent at 9:10-44).

Thus, the Commission finds that the term “operational efficiency” is broad enough to encompass both “energy or time . . .” consistent with the full scope of the term in view of the specification. Accordingly, the Commission has determined to construe the term “a value for the operational efficiency” to mean “energy or time required by the HVAC system to change inside temperature by a given amount for a set of indoor and outdoor conditions.”

3. Infringement

Complainant asserts that the Google Accused Products and ecobee Accused Products satisfy claims 1 and 2 of the ’488 patent.

The FID finds that Complainant failed to establish infringement with respect to the Google Accused Products and the ecobee Accused Products. *See* FID at 80-93. Specifically,

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the FID finds that the Google Accused Products do not satisfy limitations 1[pre], 1[a], 1[d], and 1[e], and the ecobee Accused Products do not satisfy limitations 1[pre], 1[c], 1[d], or 1[e]. *See id.* The FID finds dependent claim 2 not infringed because claim 1 is not infringed. *Id.* at 88, 99; *Muniauction Inc. v. Thomson Corp.*, 532 F.3d 1318, 1328-29 n.5 (Fed. Cir. 2008). The FID does not reach Complainant’s indirect infringement arguments because Complainant failed to establish direct infringement. *See* FID at 88, 93; *Novartis*, 363 F.3d at 1308.

As explained below, the Commission has determined to review the FID’s infringement findings both based on its review of the FID’s construction of “operational efficiency,” as discussed above, and otherwise as discussed below. On review, the Commission has determined to affirm with modifications the FID’s findings that the Google Accused Products and the ecobee Accused Products do not infringe the asserted claims of the ’488 patent. The Commission adopts the findings and analysis of the FID that are not inconsistent with the Commission’s findings below.

a. Google Accused Products²⁷

(1) Claim 1

(a) “A system for calculating a value for the operational efficiency of a heating, ventilation and air conditioning (HVAC) system comprising” (1[pre])

i. FID

With respect to the Google Accused Products, Complainant asserts that the Cooling Degradation alert of the HVAC Monitoring service meets asserted claim 1 and 2 of the ’488

²⁷ Complainant argues in its petition that “[t]he Google Products are an ‘article that . . . infringes’ under Section 337.” *See* Complainant’s Pet. at 6, 53. Google responds that Complainant’s “infringement theories for the ’488 patent are entirely dependent upon a cloud service that [], the NLT or NT devices.” *See* Respondents’ Resp. at 55-56; *see also id.* at 3-4. Google failed to raise these arguments in its

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patent. *See* FID at 80. Regarding the preamble of claim 1, the parties agreed that Google’s “Cooling Degradation model [

].” *Id.* at 81 (citing Hr’g Tr. (Callaway) at 1267:5-1258:15; Hr’g Tr. (de la Iglesia) at 561:1-24). [

].” *Id.* (citing CDX-5C.304; CX-1124C (Burger) at 320:23-321:15).

[

]

Id. (citing CDX-5C.315). The FID explains that “[

].” *Id.* (citing Hr’g Tr. (Callaway) at 1261:15-1262:1, 1268:6-15).

Complainant advanced two infringement theories. Under the first, Complainant

“[

].” *Id.* at 82 (citing CIB at 85). The FID rejects this theory, finding that “the construction of the preamble necessitates that the operational efficiency must possess units of energy” while “[

petition for review and thereby waived them. *See* 19 C.F.R. § 210.43(b)(2); *see also Finnigan Corp. v. ITC*, 180 F.3d 1354, 1362-63 (Fed. Cir. 1999).

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].” *Id.* at 82 (citing Hr’g Tr. (Callaway) at 1267:5-1268:15); Respondents’ Resp. at 57 (“[

].”) (citing Hr’g Tr. (Callaway) 1268:4-15); *id.* at 58 (“[] . . . does not meet ‘operational efficiency’ because it is a [], not an ‘energy’ having units of energy.”).

Under Complainant’s second infringement theory, “[] the operational efficiency, because it “[

].” FID at 82 (citing CIB at 86). The FID also rejects this theory finding that “[] , not a quantity of energy.” *Id.* The FID further notes that, “although it would seemingly be simple to calculate daily energy consumption by [], EcoFactor points to no evidence that Cooling Degradation actually performs that calculation.” *Id.*

The FID likewise rejects Complainant’s doctrine of equivalents argument. *Id.* at 82. Complainant argues that the model “performs substantially the same function of calculating values for the energy required to change the inside temperature by a given amount over a given time for a set of indoor and outdoor conditions.” *Id.* at 82-83 (citing CIB at 86-87). The FID finds, however, that the testimony of Complainant’s expert, Mr. de la Iglesia, is conclusory, and that Complainant neglected to “provide evidence of equivalents from the perspective of someone of skill in the art in order to meet its burden.” *Id.* at 83 (citing *AquaTex Indus. v. Techniche Solutions*, 419 F.3d 1374, 1382 (Fed. Cir. 2005); Tr. (de la Iglesia) at 563:10-17)). Nor, the FID finds, “does EcoFactor establish that the Google Accused Products perform the function in the

same way with the same result” again finding Mr. de la Iglesia’s testimony conclusory. *Id.* (citing Hr’g Tr. (de la Iglesia) at 563:17-25).

ii. Analysis

Complainant argues that “[u]nder the proper construction, [] meets ‘calculating a value for the operational efficiency of the HVAC system’” because “[]’ . . . is a measure of that HVAC system’s efficiency—specifically, [].” *See* Complainant’s Pet. at 53-54. This, Complainant continues, “[]” *Id.* at 54 (citing JX-6, ’488 patent at 9:1-44).

Complainant also argues that [] satisfies the “operational efficiency” limitation because “[]” *Id.* at 54 (citing CX-1174C (Bonvini²⁸) 58:17-59:9, 61:19-23). Complainant explains that “[t]he energy consumption rate of a given HVAC system is fixed, and therefore, the time it is consuming energy tells you the energy consumed.” *Id.* (citing Hr’g Tr. (Palmer) 1385:14-24; Hr’g Tr. (Zeidman) 173:4-174:2).

The Commission agrees with Complainant that the Google Accused Products satisfy the “operational efficiency” limitation literally based on []. As discussed *supra* at section III(B)(2), the Commission finds that “operational efficiency” does not exclusively require units of energy. Rather, the Commission finds that []

²⁸ Marco Bonvini is a senior software engineer at Google.

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] are indicative of operational efficiency and therefore correspond to “a value for the operational efficiency” of the HVAC system.

As the FID explains, “[
].” See FID at 81 (citing Id. at CDX-5C.304; CX-1124C (Burger) at 320:23-321:15); see also CIB at 85-86 (“[

].”) (citing Hr’g Tr. (Callaway) 1261:12-14, 1264:6-1265:6). In addition, as Complainant explains, “[

].” Complainant’s Pet. at 53 (citing FID at 81; Hr’s Tr. (Callaway) at 1267:5-1268:15; Tr. (de la Iglesia) at 561:1-24); *id.* (“[

].”) (citing Hr’g Tr. (de la Iglesia) at 561:15-21, 564:6-13). The Commission also agrees that [] are comparable to the operation of the preferred embodiment disclosed in the ’488 patent specification which describes that “House A is presumed to be operating at normal efficiency” on Day X, and determines the drop in efficiency based on a comparison of the length of the cycle times on Day X+1. See Complainant’s Pet. at 53-54; JX-6, ’488 patent at 9:16-38.

Respondents distinguish [] on the basis that they are “[
],” not an “‘energy’ having units of energy.” See Respondents’ Resp. at 57-58 (citing Hr’g Tr. (Callaway) at 1267:20-1268:15). As discussed *supra* at section III(B)(2), however, “operational efficiency” can encompass “energy or time . . .” and does not require units of energy. The Commission also credits Complainant’s evidence that “the time the A/C is

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running is an expression of how much energy it uses.” *See* Complainant’s Pet. at 54 (citing CX-1174C (Bonvini) at 58:17-59:9, 61:19-23; Hr’g Tr. (Palmer) at 1385:14-24; Hr’g Tr. (Zeidman) 173:4-174:2).

Under the doctrine of equivalents, the Commission finds that any difference between the claimed “value for the operational efficiency” and Google’s [] is insubstantial. The FID acknowledges that “it would seemingly be simple to calculate daily energy consumption by [

].” *See* FID at 82. As Complainant explains, “[] but that based on [Google’s] observations [it] received much [].”

See Complainant’s Pet. at 55 (citing CDX-5C.324; CX-1124C (Burger) at 321:17-323:3); *id.* at 56 (“Mr. de la Iglesia testified that that the function-way-result test is satisfied because the Cooling Degradation model ‘[].’”) (citing FID at 83; Hr’g Tr. (de la Iglesia) at 563:10-17).

The Commission agrees there is “an insubstantial difference between calculating a value for operational efficiency and [].” *Id.* (citing FID at 81; Hr’g Tr. (Callaway) at 1267:5-1268:15; Hr’g Tr. (de la Iglesia) 561:1-24). In this case, the Commission finds that the [] correlate substantially with the energy or time it takes to cool a structure. The Commission finds that the Cooling Degradation model performs

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the same function as the claimed “operational efficiency” (“calculating values for the energy required to change the inside temperature by a given amount for a set of indoor and outdoor conditions” and “[

]”), in the same way (“[

]”), to

achieve the same result (“[

]”). *See* Hr’g Tr. (de la Iglesia) at 563:10-564:5;

see also FID at 82-83; CIB at 87 (citing Hr’g Tr. (de la Iglesia) 563:8-564:13; CDX-5C.317).

Respondents incorrectly argue that Complainant cannot establish infringement under the doctrine of equivalents because it failed to offer expert testimony. To the contrary, the Commission credits Complainant’s expert testimony discussed above, and notes that Respondents failed to offer testimony from their own expert to rebut Complainant’s expert testimony with respect to infringement under the doctrine of equivalents. *See* Respondents’ Resp. at 58-60.

For these reasons, the Commission finds that the Google Accused Products satisfy limitation 1[pre] both literally and under the doctrine of equivalents.

(b) **“at least one HVAC control system that receives inside temperature measurements from at least a first location conditioned by at least one HVAC system” (1[a])**

The FID finds that “the Google Accused Products do not meet limitation 1[a] either literally or under the doctrine of equivalents” for the same reasons as discussed in connection with limitation 17[d] of the ’550 patent. *See* FID at 84. As discussed *supra* at section III(A)(3)(a)(1)(b), the Commission agrees that the Google Accused Products do not include the

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claimed “inside temperature measurements.” Thus, the Commission affirms the FID’s finding that the Google Accused Products do not satisfy this limitation.

- (c) **“wherein said one or more processors are configured to calculate one or more predicted rates of change in said inside temperature measurements at said first location based on the status of the HVAC system and to relate said one or more predicted rates of change to said outside temperature measurements” (1[d])**

i. **FID**

The FID finds that the Google Accused Products do not satisfy limitation 1[d]. *See* FID at 85-87. The FID explains that Complainant failed to establish that the Google Accused Products include the claimed “predicted rates of change,” as construed, *i.e.*, “the difference between inside temperature measurements divided by the span of time between the measurements.” *Id.* at 85 (citing Order No. 18 at 17). The FID agrees with Respondents that “[n]o term in the Cooling Degradation Model has units [of] temperature divided by time.” *Id.* (citing RIB at 73).

[]

CDX-5C.315 (Cooling Degradation Model). The FID finds that “none of the variables are rates of change, so even if algebraic manipulation could result in solving the equation for any one variable, that variable would not be a (predicted) rate of change.” FID at 86. Complainant asserts that “[t]he first variable [in the Cooling Degradation Model] is the ‘[

],’ which corresponds’ to ‘the difference between two inside temperature measurements divided by the span of time between the measurements, which is [],’ and therefore, the ‘[].’” *Id.* at 87 (citing

CIB at 92-93). The FID finds that “[

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] . . . does indeed determine the difference between inside temperature measurements, but it does not expressly divide the difference by the span of time between the measurements.” *Id.* at 87 (citing CDX-5C.306; CX-1122C (Burger) at 193:20-194:7; Hr’g Tr. (Callaway) at 1300:8-18).

ii. Analysis

Complainant argues that [] satisfies the construction for ‘rate of change in indoor temperatures,’ because it is [].” Complainant’s Pet. at 59-60. Complainant also states that the “[]” *Id.* at 60 (citing Hr’g Tr. (de la Iglesia) 570:8-20). Complainant contends that the [] are “predicted rates of change” and “the Cooling Degradation feature uses the [] to compute the predicted temperature.” *Id.* (citing Hr’g Tr. (Burger) at 1225:20-1226:4). Respondents disagree, and contend that “the only expert who reviewed the Cooling Degradation source code, Dr. Callaway, testified the code [].” Respondents’ Resp. at 62-63 (citing Hr’g Tr. (Callaway) at 1300:3-18) (testifying that “[]”).

The Commission finds that Complainant’s argument that the expression “[]” is divided by time ([]) is unsupported by the cited evidence. *See* Complainant’s Pet. at 59-60. As Respondents explain, “none of the [] [] has unit temperature divided by time.” Respondents’ Resp. at 62-63 (citing Hr’g Tr. (Callaway) at 1300:3-18). The Commission also agrees with the

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FID that “even assuming that [

].” FID at 87.

Complainant also argues without support that “[

] has ‘units of temperature.’” Complainant’s Pet. at 59 (citing Hr’g Tr.

(Callaway) 1263:7[sic]-1263:6). Dr. Callaway, however, testified that “[

certainly not units of 1/time as would be required for the expression to correspond to a predicted

rate of change. *See* Respondents’ Resp. at 63-64 (citing Hr’g Tr. (Callaway) 1262:23-25,

1262:7-1263:11). The Commission therefore disagrees with Complainant that the “[

] will correspond to the predicted rate of change because they are relating each of these three

learned elements in such a way that you can make a prediction of any one given the other two.”

See Complainant’s Pet. at 60 (citing Hr’g Tr. (de la Iglesia) 570:8-20); *see also* FID at 87

(“There is no evidence that [

the []”).

Thus, Complainant fails to establish literal infringement by the Google Accused Products with respect to limitation 1[d]. Complainant does not assert infringement under the doctrine of equivalents in its petition for review. Accordingly, the Commission affirms with the supplemented analysis provided above the FID’s finding that the Google Accused Products do not satisfy this limitation.

- (d) **“said one or more processors further configured to compare at least one predicted temperature based on the one or more predicted rates of change, with an actual inside temperature measurement” (1[e])**

The FID finds that the Google Accused Products do not satisfy limitation 1[e] because “[they] do not have any ‘actual inside temperature measurement,’” *i.e.*, limitation 1[a]. *See* FID

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at 87-88. In addition, the FID finds that “because the Google Accused Products do not include a ‘predicted rate of change,’ [*i.e.*, limitation 1[d],] they cannot be ‘configured to compare at least one predicted temperature based on the one or more predicted rates of change,’” as required under limitation 1[e]. *Id.* at 88.

As discussed *supra* at sections III(B)(3)(a)(1)(b) and (c), the Commission agrees with the FID that the Google Accused Products do not include inside temperature measurements and do not calculate a predicted rate of change. Thus, the Commission finds that the Google Accused Products do not satisfy limitation 1[e] for the same reasons as discussed *supra* at sections III(B)(3)(a)(1)(b) and (c).

(2) Claim 2

The FID finds that the Google Accused Products do not infringe claim 2 because it depends from claim 1 which is not infringed. *See* FID at 88 (citing *Muniauction Inc.*, 532 F.3d at 1328-29 n.5). In addition, the FID finds that claim 2 is not infringed because Google’s outside temperatures are based on [], not ZIP code, as required by claim 2. *See id.* (citing CX-1052C.2; CX-294C at 40:19-41:8). The Commission reviews the FID’s finding with respect to claim 2 only in so far as it reviews the FID’s findings with respect to independent claim 1. On review, the Commission affirms the FID’s non-infringement findings as to claim 2.

(3) Conclusion

For the foregoing reasons, the Commission affirms with the modified and supplemented analysis discussed above, the FID’s finding that the Google Accused Products do not infringe claims 1 and 2 of the ’488 patent. Accordingly, the Commission affirms the FID’s finding of no violation of section 337 by the Google Accused Products with respect to the ’488 patent.

b. ecobee Accused Products

(1) Claim 1

- (a) “A system for calculating a value for the operational efficiency of a heating, ventilation and air conditioning (HVAC) system comprising” (1[pre])

i. FID

Complainant argues that “ecobee’s [

].” *See* FID

at 89 (citing CIB at 98). Complainant asserts that “[

].” *Id.*

Complainant contends that “[b]ecause of the strong correlation between HVAC runtime and energy usage, [] is a value’ for operational efficiency.” *Id.*

The FID finds that the ecobee Accused Products do not satisfy the “operational efficiency” limitation because “the [

]” and “[a]s a time value, it cannot meet the construction of ‘operational efficiency of a heating, ventilation and air conditioning (HVAC) system.’” *Id.* at 89-90; Order No. 18 at 19.

The FID rejects Complainant’s argument that “[

].” FID at 90

(citing CIB at 98). The FID finds that “[] calculated by [

].” *Id.* (citing

Hr’g Tr. (Souri) at 1174:2-1176:7). Rather, the FID finds, “[

].” *Id.* (citing Hr’g Tr. (Noble-Marks) at 1041:21-1042:8). The FID also rejects

Complainant’s argument that a longer runtime of the HVAC system is indicative of operational

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efficiency, noting that time, “by itself, is not equated with a measure of efficiency.” *Id.* at 90-91 (citing Order No. 18 at 19).

The FID further rejects Complainant’s argument under the doctrine of equivalents. Complainant asserts that “the function is ‘[

].” *Id.* at 91 (citing CIB at 101). The FID finds that “[b]ecause EcoFactor did not demonstrate that [] reflects an [], EcoFactor’s doctrine of equivalents argument fails, because the ecobee Accused Products do not perform the same function.” *Id.*

ii. Analysis

Complainant argues that “ecobee’s [].” *See* Complainant’s Pet. at 63-64 (citing Hr’g Tr. (Zeidman) 168:18-171:19, 172:23-176:8, 176:18-182:17; CDX-4C.108-121). Complainant also argues that “HVAC runtime and energy use are directly related to one another.” *Id.* at 64 (citing Hr’g Tr. (Souri) at 1146:12-16, 1148:1-5; CDX-4C.113 (reproduced below); CX-426.5-6).

[

]

Complainant explains that its expert’s opinion is not that “time by itself is operational efficiency, but that [

].” *Id.* at 65 (citing Hr’g Tr. (Zeidman) 169:20-171:19); *see also* CIB at 100 (citing Hr’g Tr. (Zeidman) at 244:12-245:3) (testifying that “although [ecobee’s

[],” such that

“[

]”).

The Commission agrees that Complainant has demonstrated literal infringement with respect to the ecobee Accused Products. As explained above, the ALJ’s construction of “operational efficiency” is too narrow and cycle times like energy can be indicative of operational efficiency and can be a value for operational efficiency. *See supra* at Section III(B)(2). Respondents argue that “[b]ecause [

].” Respondents’ Resp. at 70 (citing FID at 90). As Complainant explains, however, it is

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irrelevant that [] because “the correlation between runtime and energy use still applies” and such correlation is “near-perfect.” *See* Complainant’s Pet. at 66; *see also id.* at 64-65 (citing Hr’g Tr. (Souri) at 1146:12-16, 1148:1-5; CDX-4C.111, 113; CX-267C.5; CX-257C (Trinh) at 99:12-100:10; Hr’g Tr. (Zeidman) at 173:4-174:2).

The Commission also agrees with Complainant that limitation 1[pre] is satisfied under the doctrine of equivalents. *See* Complainant’s Pet. at 66-67. The Commission finds that Complainant persuasively demonstrated that “ecobee’s [].” *See* Complainant’s Pet. at 66-67 (citing Hr’g Tr. (Souri) 1148:1-5; CX-426.5-6). Complainant also established that “determining a [] . . . is directly correlated to [].” *Id.* (citing Hr’g Tr. (Zeidman) at 181:22-182:13; CDX-4C.121). Thus, any difference between ecobee’s [] and operational efficiency is insubstantial. The Commission further agrees that the “ecobee [Accused] Product performs substantially the same function of []

[].” Complainant’s Pet. at 66 (citing Hr’g Tr. (Zeidman) 181:22-182:13; CDX-4C.121); *see also* CIB at 101-02 (arguing that the ecobee Accused Products perform the function “in substantially the same way (*e.g.*, []

]” and “achieve the same result of understanding the HVAC

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system’s operational efficiency (*e.g.*, []”).

Respondents argue that energy or time alone are not “a measure of operational efficiency of an HVAC system.” Respondents’ Resp. at 72 (citing Hr’g Tr. (Souri) at 1102:4-19, 1106:11-1107:1). As Complainant explains, however, Mr. Zeidman’s testimony is not that “time by itself is operational efficiency, but that [] is a value for operational efficiency.” Complainant’s Pet. at 65 (citing Hr’g Tr. (Zeidman) at 169:20-170:22); *see also* Hr’g Tr. (Zeidman) at 169:10-14 (“[]”).

Thus, the Commission reverses the FID’s finding that the ecobee Accused Products do not satisfy limitation 1[pre] literally and under the doctrine of equivalents.

(b) **“one or more processors comprising computer hardware that is configured to receive outside temperature measurements from at least one source other than said HVAC system” (1[c])**

The FID finds that the ecobee Accused Products do not satisfy limitation 1[c] either literally or under the doctrine of equivalents because “a skilled artisan would not consider forecasts to qualify as measurements.” *See* FID at 91. As discussed above, in the context of limitation 17[d] of the ’550 patent, a forecast is not the same or equivalent to a measurement. *See supra* at section III(A)(3)(b)(1). Thus, the Commission affirms with the modified and supplemented analysis discussed *supra* at section III(A)(3)(b)(1), the FID’s finding that the ecobee Accused Products do not satisfy limitation 1[c].

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- (c) **“wherein said one or more processors are configured to calculate one or more predicted rates of change in said inside temperature measurements at said first location based on the status of the HVAC system and to relate said one or more predicted rates of change to said outside temperature measurements” (1[d])**

The FID finds that the ecobee Accused Products do not satisfy limitation 1[d] either literally or under the doctrine of equivalents. *See* FID at 92. As discussed above, in the context of limitation 17[e] of the ’550 patent, the ecobee Accused Products do not predict rates of change in inside temperature measurements. *See supra* at section III(A)(3)(b)(2). Thus, the Commission affirms with the modified and supplemented analysis discussed *supra* at section III(A)(3)(b)(2), the FID’s finding that the ecobee Accused Products do not satisfy limitation 1[d].

- (d) **“said one or more processors further configured to compare at least one predicted temperature based on the one or more predicted rates of change, with an actual inside temperature measurement” (1[e])**

The FID finds that “[t]he ecobee Accused Products do not meet this limitation [1[e]] because they do not meet the ‘rates of change’ limitation [1[d]] either literally or under the doctrine of equivalents.” *See* FID at 92. The Commission agrees with the FID’s findings as to limitation 1[d] as explained *supra* at section III(B)(3)(b)(1)(c), and therefore agrees as to limitation 1[e]. Accordingly, the Commission affirms with the modified and supplemented analysis discussed *supra* at sections III(B)(3)(b)(1)(c) and III(A)(3)(b)(2), the FID’s finding that the ecobee Accused Products do not satisfy limitation 1[e].

(2) Claim 2

The FID finds that the ecobee Accused Products do not infringe claim 2 because it depends from claim 1, which is not infringed. *See* FID at 92 (citing *Muniauction Inc.*, 532 F.3d at 1328-29 n.5). In addition, the FID finds that claim 2 is not infringed because Complainant “concedes that the temperature information ecobee receives is [],”

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not ZIP codes. *See id.* The Commission reviews the FID's finding with respect to claim 2 only in so far as it reviews the FID's findings with respect to independent claim 1. On review, the Commission affirms the FID's non-infringement findings as to claim 2.

(3) Conclusion

For the foregoing reasons, the Commission affirms with the modified and supplemented analysis discussed above, the FID's finding that the ecobee Accused Products do not infringe claims 1 and 2 of the '488 patent. Accordingly, the Commission affirms the FID's finding of no violation of section 337 by the ecobee Accused Products with respect to the '488 patent.

IV. CONCLUSION

For the reasons set forth herein, the Commission has determined that Complainant has not established a violation of section 337 by the Respondents with respect to any asserted claim of the Asserted Patents. Accordingly, the investigation is terminated with a finding of no violation of section 337.

By order of the Commission.



Lisa R. Barton
Secretary to the Commission

Issued: July 19, 2022

Certificate of Service – Page 1

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **COMMISSION OPINION** has been served upon the following parties as indicated, on **July 19, 2022**.



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