Trials@uspto.gov
571-272-7822

Paper 8
Date: April 10, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SOLAREDGE TECHNOLOGIES LTD.,
Petitioner,

v.

SMA SOLAR TECHNOLOGY AG,
Patent Owner.

IPR2020-00021
Patent 8,922,048 B2

Before JONI Y. CHANG, KRISTEN L. DROESCH, and SCOTT B. HOWARD, *Administrative Patent Judges.*

HOWARD, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

INTRODUCTION

A. Background and Summary

SolarEdge Technologies Ltd ("Petitioner") filed a Petition to institute an *inter partes* review of claims 1–10 of U.S. Patent No. 8,922,048 B2 (Ex. 1001, "the '048 patent"). Paper 2 ("Petition" or "Pet."). SMA Solar Technology AG ("Patent Owner") filed Patent Owner Preliminary Response. Paper 7 ("Preliminary Response" or "Prelim. Resp.").

We have authority, acting on the designation of the Director, to determine whether to institute an *inter partes* review under 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a). *Inter partes* review may not be instituted unless "the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a) (2018). On April 24, 2018, the Supreme Court held that a decision to institute under 35 U.S.C. § 314 may not institute on fewer than all claims challenged in the Petition. *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1359–60 (2018).

For the reasons set forth below, upon considering the Petition and the evidence of record, we determine that the information presented in the Petition establishes a reasonable likelihood that Petitioner will prevail with respect to at least one of the challenged claims. Accordingly, we institute *inter partes* review on all of the challenged claims based on all of the grounds identified in the Petition.

B. Real Parties in Interest

Petitioner identifies SolarEdge Technologies Ltd. as the real party in interest. Pet. 1.

Patent Owner identifies SMA Solar Technology AG as the real party in interest. Paper 5, 1 (Patent Owner's Mandatory Notices).

C. Related Matters

The parties identify the following *inter partes* review proceeding involving the '048 patent: *Solaredge Technologies Ltd. v. SMA Solar Technologies AG*, IPR2020-00022. Paper 3, 2 (Petitioner's Petition Ranking and Explanation of Material Differences Between Petitions), Paper 5, 1.

D. The '048 Patent

The '048 patent issued on December 30, 2014, from a PCT application filed on February 11, 2009. Ex. 1001, codes (45), (22). The '048 patent is titled "[Photo Voltaic (PV)] Sub-generator Junction Box, PV Generator Junction Box, and PV Inverter for a PV System, and PV System." *Id.*, code (54).

Figure 1 of the '048 patent is reproduced below.

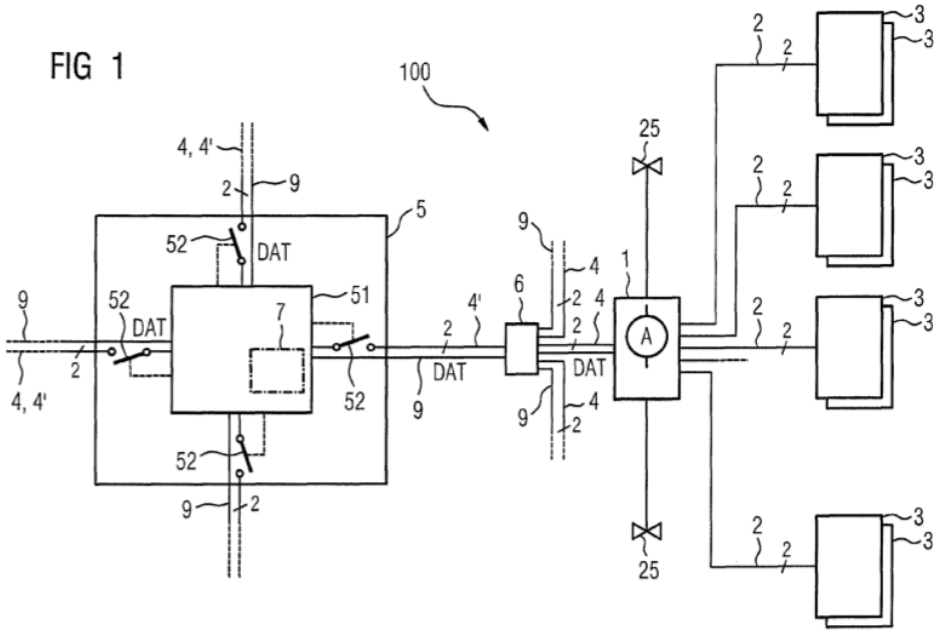


Figure 1 "is an illustration of PV system, in accordance with the prior art" which includes various PV modules 3, PV sub-generator 1, PV generator 6, and PV inverter 5. Ex. 1001, 6:58–59, 7:7–51. Figure 1 shows PV sub-generator lines and PV main DC power lines 4'. *Id.* at 7:9–11. "The mark across the PV sub-generator lines 4 or the PV main DC power lines 4' identified by numeral 2 indicates that the line is preferably a two-wire line." *Id.* at 7:11–14. The system is configured to disconnect "PV sub-generator lines 4 or PV main DC power lines 4' . . . by a controllable circuit breaker device 52 from a power section 51 of the PV inverter 5." *Id.* at 7:14–17.

Additionally, "[i]n parallel to each of four PV sub-generator lines 4 or PV main DC power lines 4' in each case is a communication line 9 for bidirectional transmission of data DAT between the central PV inverter 5 and the respective PV sub-generator junction box 1 shown in the right-hand part of FIG. 1." *Id.* at 7:17–22.

The '048 patent describes an improvement in which the data lines are removed and data communication is undertaken by "PV sub-generator line 4 or PV main DC power line 4'." Ex. 1001, 8:53–59. Furthermore, "[t]o guarantee bidirectional data transmission, a data signal coupler 56 is connected between each of the possible separation points." *Id.* at 8:59–64. Figure 3 of the '048 patent is reproduced below.

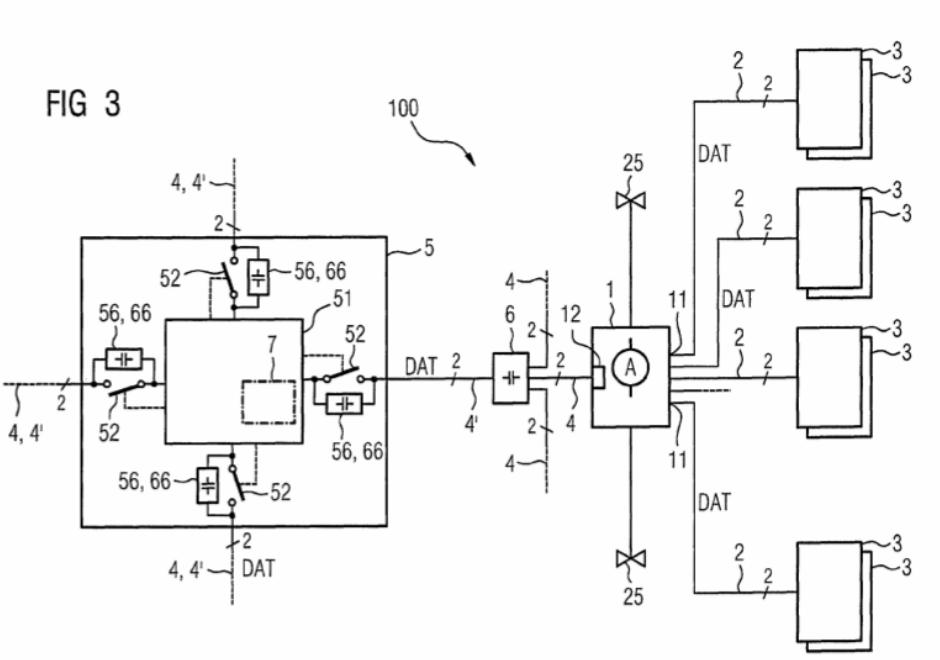


Figure 3 "is an illustration of an exemplary PV system in accordance with the invention" disclosed in the '048 patent. *Id.* at 6:62–63. As shown in Figure 3, the data lines have been removed and only a single line—a DC power line—connects inverter 5 with PV generator box 6 and a single line—

a DC power line—connects PV generator box 6 with each PV sub-generator box 1. *Id.*, Fig. 3.

Figure 6 of the '048 patent is reproduced below.

FIG 6

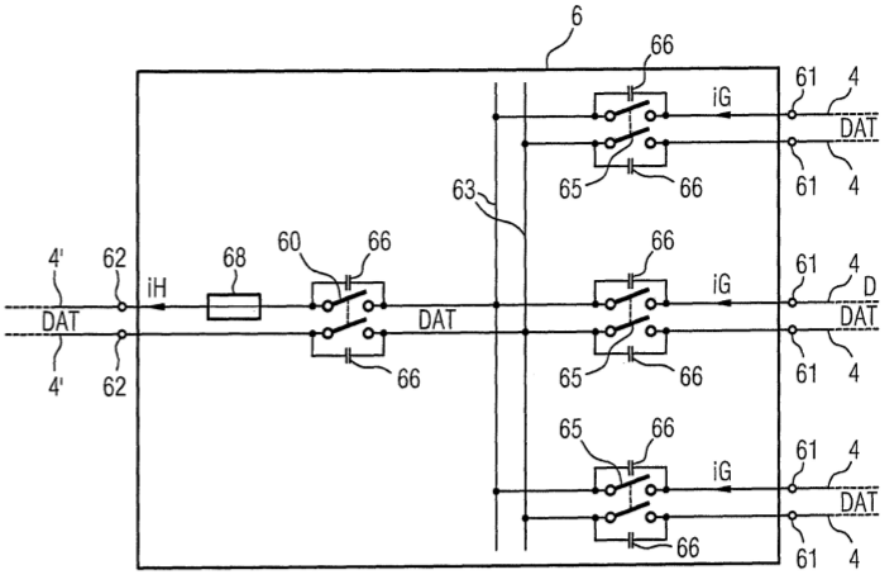


Figure 6 "is an illustration of an exemplary generator junction box in accordance with the invention" disclosed in the '048 patent. Ex. 1001, 7:1–2. Figure 6 shows "data signal coupler 66 . . . connected in parallel to the respective circuit breakers 60, 65 so that data DAT which is fed into the respective PV sub-generator lines 4 and into the PV main DC power line 4' is also able to be forwarded in the opened state of the respective circuit breaker 60, 65." *Id.* at 10:28–33.

E. Illustrative Claims

Petitioner challenges claims 1–10 of the '048 patent. Pet. 1. Claims 1, 4, 5, and 7 are independent. *See* Ex. 1001, 10:58–12:60. Claims 1 and 4 are illustrative of the subject matter of the challenged claims and read as follows:

> 1. A photovoltaic (PV) sub-generator junction box for a PV system, comprising:

a plurality of electrical terminals for connection to respective PV string lines of at least one series-connected PV module; and

a sub-generator line terminal for connection to a remote central PV inverter;

an electronic control unit connected for data communication to a central control unit within the remote central PV inverter for exchange of data;

wherein the PV sub-generator line is configured to deliver power received from respective PV string lines to the remote central PV inverter; and

a power line modem configured to transmit and receive the data over the PV sub-generator line that delivers power;

wherein the electronic control unit includes at least one electrical output for activating at least one switching device of the PV sub-generator junction box, and wherein the data receivable from the central control unit within the PV inverter by the power line modem comprises corresponding control data.

4. A photovoltaic (PV) generator junction box for a PV system, comprising:

a plurality of sub-generator line terminals for connection to respective PV sub-generator lines of PV sub-generator junction boxes;

a main DC power line terminal for connecting a PV main DC power line of a remote central PV inverter;

at least one of a main circuit breaker for disconnecting the PV main power line and a collective circuit breaker for disconnecting a respective one of the PV sub-generator lines; and a data signal coupler connected in parallel to a respective circuit breaker of the at least one of the main circuit breaker and the collective circuit breaker, so that data to be transferred between the respective PV sub-generator line and the PV main DC power line is also able to be forwarded through the data signal coupler when the respective circuit breaker is in an open state.

Id. at 10:58–11:11, 11:27–44.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–10 would have been unpatentable on the following grounds:[1]

Claims Challenged	35 U.S.C. §[2]	References
1–10	103(a)	Applicant Admitted Prior Art (AAPA),[3] Rodgers[4]
1–3, 5, 7	103(a)	AAPA, Frezzolini[5]
4, 6, 8–10	103(a)	AAPA, Frezzolini, Iwamura[6]
4, 10	103(a)	AAPA, Richter,[7] Rodgers

In its analysis, Petitioner relies on the Declaration of Jonathan R. Wood, Ph.D. Ex. 1011. In its analysis, Patent Owner relies on the Declaration of Thomas Blackburn. (Ex. 2001).

[1] Petitioner identifies three grounds, two of which have alternative combinations: (1) AAPA and Rodgers or Frezzolini and (2) AAPA and Rodgers or Frezzolini-Iwamura. Pet. 19. Each alternative combination has been identified separately. Petitioner also lists AAPA and Rodgers as two separate grounds. *Id.* Those grounds have been combined.

[2] The Leahy-Smith America Invents Act ("AIA") included revisions to 35 U.S.C. §§ 102, 103 that became effective on March 16, 2013. Because the '048 patent issued from an application filed before March 16, 2013, we apply the pre-AIA versions of the statutory bases for unpatentability.

[3] Petitioner identifies Figures 1 and 2 and the text at column 2, line 54 through column 3, line 62, column 6, lines 58 through 61, and column 7, line 7 through column 8, line 50 of the '048 patent as applicant admitted prior art ("AAPA"). *See* Pet. 9.

[4] US 2007/0008076 A1, published Jan. 11, 2007 (Ex. 1003).

[5] US 2007/0019613 A1, published Jan. 25, 2007 (Ex. 1005).

[6] US 2007/0213879 A1, published Sept. 13, 2007 (Ex. 1006).

[7] WO 2007/048421 A2, published May 3, 2007 (Ex. 1004).

ANALYSIS

A. Discretionary Denial under 35 U.S.C. § 325(d)

Patent Owner asserts that the Petition should be denied pursuant to our discretion under 35 U.S.C. § 325(d) because (1) AAPA and Frezzolini were considered during the prosecution of the '048 patent, (2) Rodgers is no more relevant than Frezzolini, which was considered during prosecution, and (3) Iwamura and Richter are less relevant than Presher, a prior art reference considered during the prosecution of the '048 patent. *See* Prelim. Resp. 28–44.

Petitioner does not expressly address discretionary denial under section 325(d). *See generally* Pet. However, Petitioner argues that only Frezzolini was cited during prosecution of the '048 patent and that "[n]o arguments presented in this Petition were raised during prosecution of the '048 patent." Pet. 1.

In *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, the Board enumerated non-exhaustive factors to be considered in exercising discretion under 35 U.S.C. § 325(d) on whether to institute *inter partes* review. IPR2017-01586, Paper 8 at 17–18 (PTAB Dec. 15, 2017) (designated precedential as to § III.C.5, first paragraph). The non-exhaustive *Becton* factors are:

> (a) the similarities and material differences between the asserted art and the prior art involved during examination;
>
> (b) the cumulative nature of the asserted art and the prior art evaluated during examination;
>
> (c) the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection;

> (d) examination and the manner in which Petitioner relies on the prior art or Patent Owner distinguishes the prior art;
>
> (e) whether Petitioner has pointed out sufficiently how the Examiner erred in its evaluation of the asserted prior art; and
>
> (f) the extent to which additional evidence and facts presented in the Petition warrant reconsideration of the prior art or arguments.

Id. (separate paragraphs added); *see also* Patent Trial and Appeal Board Consolidated Trial Practice Guide November 2019, 62–63, https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf?MURL= ("Consolidated Trial Practice Guide" or "CTPG").

Factors (a), (b), and (d) address whether or not the same or substantially the art or arguments were previously presented to the Office. *See Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6, 10 (PTAB Feb. 13, 2020) (precedential). If the art or arguments were previously presented, then we consider factors (c), (e), and (f) to determine whether Petitioner has demonstrated a material error by the Office. *Id.* "At bottom, this framework reflects a commitment to defer to previous Office evaluations of the evidence of record unless material error is shown." *Id.* at 9.

For the reasons set forth below, under the facts presented and arguments made, we decline to exercise our discretion under 35 U.S.C. § 325(d) to deny instituting trial.[8]

[8] Because, as discussed *infa*, we have not determined that Petitioner has established a reasonable likelihood of success with regard to the grounds based on Rodgers and/or Richter, we do not address Rodgers and Richter in this analysis.

1. Whether the Same or Substantially the Same Art Previously Was Presented to the Office

On the one hand, we agree with Petitioner that the Office previously considered AAPA and Frezzolini. With regards to AAPA, the version of the MPEP in effect during the prosecution of the '048 patent required the Examiner to read the specification. *See*, *e.g.*, MPEP § 704.01 (8th ed. Rev. 6 Sept. 2007); *cf.* MPEP § 2103 (9th ed. rev. 08.2017 Jan. 2018) ("Examiners will review the complete specification, including the detailed description of the invention, any specific embodiments that have been disclosed, the claims and any specific, substantial, and credible utilities that have been asserted for the invention."). Because AAPA was in the original specification, *see*, *e.g.*, Ex. 1002, 17–18, 26–30, 102 (amended and original specification), the Examiner reviewed it and considered AAPA during the prosecution of the '048 patent.

We also agree with Patent Owner that because Frezzolini was identified on an IDS which was initialed by the Examiner, Frezzolini was also considered during the prosecution of the '048 patent. *See* Ex. 1002, 121, 466 (IDS and signed IDS); *see also* Pet. 1 (stating that Frezzolini was cited during the prosecution of the '048 patent).

Accordingly, considering *Becton* factors (a), (b), and (d), the AAPA and Frezzolini were previously considered by the Office.

One the other hand, we are not persuaded by Patent Owner's arguments regarding Iwamura. Patent Owner simply asserts Iwamura is less relevant that Presher, which was relied on by the Examiner in rejecting claims during the prosecution of the '048 patent. *See* Prelim. Resp. 40–41. Specifically, Patent Owner argues that Iwamura is less relevant than Presher

because Presher uses DC power lines while Iwamura uses AC power lines. *Id.* at 40–41.

However, Patent Owner does not perform the correct comparison. The issue is not whether the Examiner previously found a prior art reference taught a claim limitation. *See Comcast Cable Commc'ns, LLC v. Rovi Guides, Inc.*, IPR2019-01431, Paper 10, 45 (PTAB Jan. 23, 2020). Instead, Patent Owner must direct us to record evidence that shows actual subject matter overlap between the prior art in the Petition and the prior art considered and applied during prosecution. *See Runway Safe Grp. AB v. Earthstone Int'l LLC*, IPR 2019-01490, Paper 17, 30–31 (PTAB Feb. 20, 2020). In this case, where Patent Owner simply identified differences between the prior art in the Petition and Presher, Patent Owner's arguments were not sufficiently persuasive.

Accordingly, we are not persuaded that Iwamura is substantially the same as prior art previously considered by the Office.

2. Whether Petitioner Sufficiently Demonstrates that the Office Erred

Having determined that the "same or substantially the same prior art" previously were presented to the Office, we evaluate whether Petitioner sufficiently demonstrates that the Office erred. For the reasons given below, we determine that the Examiner erred in a manner material to the patentability of challenged claims.

First, although AAPA and Frezzolini were cited during the prosecution of the '048 patent, the Examiner never relied on those prior art references when rejecting a claim. *See generally* Ex. 1002 (prosecution history). Instead, the Examiner's analysis—including the reasons for allowance—focused on two references Petitioner does not rely on. *See*, *e.g.*,

id. at 486–498 (Final Office Action), 528–533 (Submission Accompanying RCE), 545–549 (Notice of Allowance). Because the Examiner did not rely on AAPA or Frezzolini to reject a claim, *Becton* Factor (c) weighs strongly against exercising our discretion to deny institution. *See*, *e.g.*, *Zip-Top LLC v. Stasher, Inc.*, IPR2018-01216, Paper 14 at 35–36 (PTAB Jan. 17, 2019) (Institution Decision); *Intex Recreation Corp., Bestway (USA) Inc. v. Team Worldwide Corp.*, IPR2018-00874, Paper 14 at 13–14 (PTAB Oct. 29, 2018) (Institution Decision); *Shenzhen Zhiyi Tech. Co. v. iRobot Corp.*, IPR2017-02137, Paper 9 at 9–10 (PTAB Apr. 2, 2018) (Institution Decision).

Second, during prosecution of the '048 patent, the Examiner found that "[t]he prior art of record *namely Adest et al. and Presher et al.* individually or combined in any other form failed to disclose . . . elements and features of the claimed invention." Ex. 1002, 545–549 (emphasis added) (Notice of Allowance). Those limitations include the power line modem, control data, and the data signal coupler. *Id.* However, for the reasons discussed below in Subsections F.5.(b)(2)(a), F.5.(c), and G.2.(b)(2), the combination of either (1) AAPA and Frezzolini or (2) AAPA, Frezzolini, and Iwamura teaches those limitations. Accordingly, Petitioner has sufficiently shown how the Office erred in evaluating the asserted prior art. Accordingly, *Becton* Factor (e) weighs strongly against exercising our discretion to deny institution.

Third, with regard to *Becton* Factor (f), Petitioner submitted comprehensive testimony from Dr. Wood explaining both how AAPA, Frezzolini, and Iwamura work and how a person having ordinary skill in the art would have combined the references. *See generally* Ex. 1011. No such testimony was present during the examination of the '048 patent. Although the mere introduction of declaration testimony alone does not strongly

support reconsideration of the prior art and arguments, we, nonetheless, find Dr. Wood's testimony slightly weighs against denying institution.

Accordingly, based on the current record, Petitioner has sufficiently shown that the Office erred during the prosecution of the '048 patent.

3. Conclusion Regarding § 325(d) Analysis

When considering all the factors together for and against institution, the particular circumstances of this case do not indicate that we should exercise our discretion under 35 U.S.C. § 325(d) to deny institution. *See* CTPG 62 ("Whether to deny institution of trial on the basis of 35 U.S.C. § 325(d) is a fact-dependent decision, in which the Board balances the petitioner's desire to be heard against the interest of the patent owner in avoiding duplicative challenges to its patent."). Put differently, under our particular circumstances, where although some of the prior art in the Petition was previously presented to the Office, Petitioner has sufficiently shown that that the Examiner erred in a manner material to the patentability of challenged claims by demonstrating that AAPA, Frezzolini, and Iwamura teach the various limitations that the Examiner found were not in Adest and Presher (the two references the Examiner relied on to reject the then pending claims). Accordingly, we are not persuaded that we should deny institution under 35 U.S.C. § 325(d).

B. Discretionary Denial Under 35 U.S.C. § 314(a)

Under 35 U.S.C. § 314(a), the Director has discretion to deny a petition. *See* 37 C.F.R. § 42.4(a) (2019) ("The Board institutes the trial on behalf of the Director."); *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1356 (2018). "[T]he PTO is permitted, but never compelled, to institute an IPR proceeding." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1367 (Fed. Cir. 2016).

Petitioner has filed two petitions challenging the same claims of the '048 patent. Instituting on a single petition seeking *inter partes* review is consistent with the Consolidated Trial Practice Guide's discussion of multiple parallel petitions challenging the same patent. *See* CTPG 59. The Consolidated Trial Practice Guide states that "multiple petitions by a petitioner are not necessary in the vast majority of cases" and that "a substantial majority of patents have been challenged with a single petition." *Id.* The Consolidated Trial Practice Guide, however, acknowledges that there are situations where multiple petitions directed to the same patent may be appropriate. *Id.*

Petitioner filed a paper to explain why it should be allowed to file multiple petitions, and to rank the two filed petitions in order of preference for consideration by the Board. Paper 3. Patent Owner contends that Petitioner's articulated reasons for justifying the filing of multiple petitions are inadequate and without merit. Prelim. Resp. 61–63. In this proceeding, however, we need not reach the issue of discretionary denial based on the filing of multiple petitions, because the Petition here is ranked the highest in preference for consideration by Petitioner and because Petitioner has shown a reasonable likelihood here that it would prevail in establishing the unpatentability of at least one challenged claim. The issue of whether an additional petition is justified will be considered separately in the IPR2020-00022 preliminary proceeding.

C. Legal Standard for Assessing Obviousness

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

art," (3) the "differences between the prior art and the claims at issue," and (4) "secondary considerations" of non-obviousness such as "commercial success, long-felt but unsolved needs, failure of others, etc." *Id.* at 17–18. "While the sequence of these questions might be reordered in any particular case," *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 407 (2007), the U.S. Court of Appeals for Federal Circuit has "repeatedly emphasized that an obviousness inquiry requires examination of all four *Graham* factors and that an obviousness determination can be made only after consideration of each factor," *Nike, Inc. v. Adidas AG*, 812 F.3d 1326, 1335 (Fed. Cir. 2016), *overruled on other grounds by Aqua Prods., Inc. v. Matal*, 872 F.3d 1290 (Fed. Cir. 2017) (en banc). We note that, with respect to the fourth *Graham* factor, the parties have not presented argument or evidence directed to secondary considerations of nonobviousness. *See generally* Pet.; Prelim. Resp. The analysis below addresses the first three *Graham* factors.

D. Level of Ordinary Skill in the Art

Factors pertinent to a determination of the level of ordinary skill in the art include (1) the educational level of the inventor; (2) the types of problems encountered in the art; (3) prior art solutions to those problems; (4) the rapidity with which innovations are made; (5) the sophistication of the technology; and (6) the educational level of workers active in the field. *Envtl. Designs, Ltd. v. Union Oil Co. of Cal.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983) (citing *Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc.*, 707 F.2d 1376, 1381–82 (Fed. Cir. 1983)). Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case. *Id.* Moreover, these factors are not exhaustive, but are merely a guide to determining the level of ordinary skill

in the art. *Daiichi Sankyo Co., Ltd., Inc. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007).

Petitioner argues—supported by the testimony of Dr. Wood—that a person having ordinary skill in the art "would have had a bachelor's degree in mechanical engineering, electrical engineering, or a similar discipline and *at least* two years of design experience with photovoltaic systems." Pet. 20 (emphasis added) (citing Ex. 1011 ¶¶ 18–22). Patent Owner does not address the level of skill. *See generally* Prelim. Resp.

Accordingly, we adopt Petitioner's proposed level of ordinary skill in the art, except that we delete the qualifier "at least" to eliminate vagueness as to the amount of practical experience. The qualifier expands the range indefinitely without an upper bound, and thus precludes a meaningful indication of the level of ordinary skill in the art. Therefore, a person having ordinary skill in the art would have had a bachelor's degree in mechanical engineering, electrical engineering, or a similar discipline and two years of design experience with photovoltaic systems.

E. Claim Construction

We apply the same claim construction standard used in the federal courts, in other words, the claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), which is articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b) (2019). Under the *Phillips* standard, the "words of a claim are generally given their ordinary and customary meaning," which is "the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." *Phillips*, 415 F.3d at 1312–13 (quotation marks and citations omitted).

Petitioner argues that all claim terms should be construed according to their ordinary and customary meaning at the time of the invention. Pet. 20. Patent Owner argues that two terms require explicit constructions: "the power line modem" and "the data signal coupler."

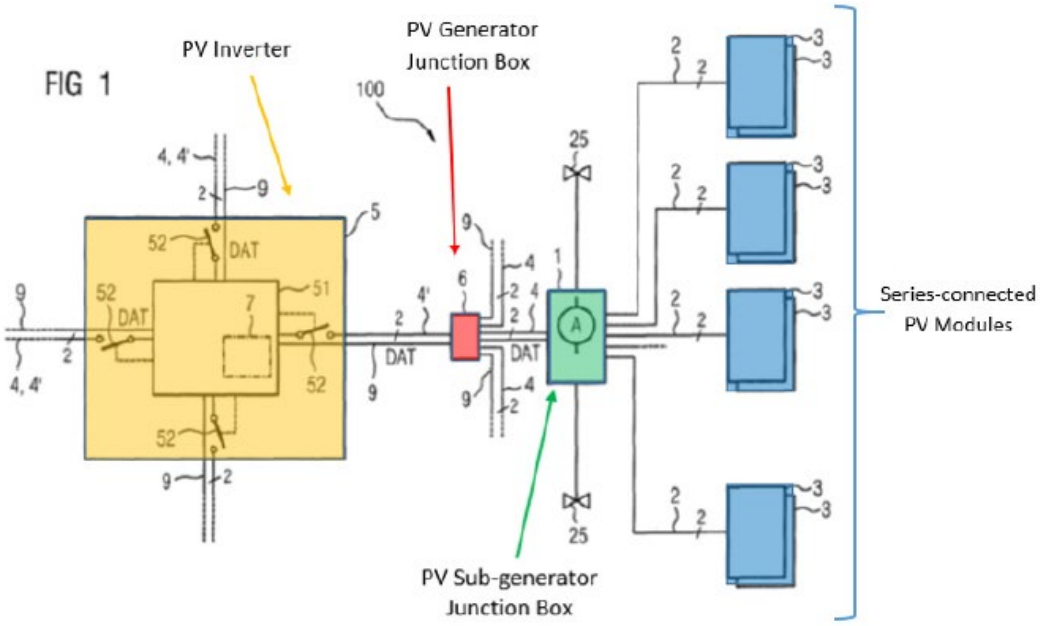
Patent Owner's proposed claim constructions limit the "power line modem" and the "data signal coupler" to DC power lines. *See* Prelim. Resp. 20–22. However, as discussed in more detail below, Petitioner's combination of prior art references use DC power lines. Because no express construction is needed to resolve any dispute in this proceeding, we do not construe any of the claim limitations. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (noting that "we need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy'" (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

F. AAPA and Rodgers or Frezzolini (Claims 1–3, 5, 7)

1. Summary of AAPA

The '048 patent identifies a prior art PV system including inverter 5, generator junction box 6, sub-generator junction boxes 1, and connected PV modules 3. *See also* Ex. 1001, 2:64–3:52, 7:7–8:50, Fig. 1. AAPA includes DC power lines—main DC power line 4' and sub-generator line 4—for transferring power and a separate data communication line 9 for exchanging data. Ex. 1001 at 7:7–67, Fig. 1.

Petitioner annotated a version of Figure 1 of the '048 patent, which is reproduced below.



Pet. 21. Figure 1 "is an illustration of [a] PV system, in accordance with the prior art" and has been annotated by Petitioner to identify the PV inverter (yellow), the PV Generator Junction Box (red), the PV Sub-generator Junction Box (green), and Series-connected PV Modules (blue). *Id.*; Ex. 1001, 6:58–59.

2. Rodgers

Rodgers teaches a residential power distribution system 100, which includes a power management system 300. Ex. 1003 ¶ 23. A webserver communicates messages throughout the residential power distribution system by "send[ing]] and receiv[ing] power line communications (PLC) messages via a conventionally known PLC modem." *Id.* ¶ 24; *see also id.* ¶ 59 ("The dynamic load management system 300 further includes . . . a PLC modem 304.").

According to Rodgers, "[o]ne of the problems with PLC messaging is that when current state-of-the-art circuit breakers are in the open position the communication link is broken." Ex. 1003 ¶ 34. In order to "overcome this

problem," Rodgers teaches that "the PLC module (communications interface 224) spans the gap to provide a communication path between the line side of the circuit and the load side by means of power line couplers 250a-d." *Id.*

3. Frezzolini

Frezzolini teaches "a system wherein the transmission of data takes place via power line carrier transmission along the power supply line of the various electrical devices to which the control devices are associated." Ex. 1005 ¶ 2. More specifically, the "transmission occurs via power line carrier transmission on the power supply line by means of modems specifically produced for this function and known as PLM (Power Line Modem)." *Id.* ¶ 16; *see also id.* ¶ 45.

4. Using AAPA During an Inter Partes *Review*

a) The Parties' Arguments

Petitioner argues that the patent applicant made admissions in the specification "regarding the scope of the prior art that can be relied upon for obviousness determinations during *inter partes* review." Pet. 9 (citing *Apple Inc., v. Qualcomm Inc.*, IPR2018-01316, Paper 7 at 22 (PTAB Jan. 18, 2019) (Institution Decision); *One World Techs., Inc. v. The Chamberlain Group, Inc*., IPR2017-00126, Paper 8 at 8–10 (PTAB May 4, 2017) (Institution Decision); MPEP § 2129) (other citations omitted).

Patent Owner argues 35 U.S.C. § 311(b) limits *inter partes* review such that "(1) ***only*** grounds under Section 102 or Section 103 can be raised, and such 102/103 grounds can be raised based ***only*** on (2a) prior art patents, or (2b) prior art printed publications." Prelim. Resp. 23. Patent Owner further argues that its "statutory interpretation is supported by the promulgated rule to implement the statutory provision. 37 C.F.R. § 42.104(b)(4) states that an IPR petition 'must specify where each element

of the claim is found in the prior art patents or printed publications relied upon.'" *Id.* at 24. According to Patent Owner, under the Supreme Court's *Henson* decision, "[w]ith a clear, unambiguous statutory text, such as in the present case with Section 311(b), . . . the proper judicial role 'is to apply, not amend, the work of the People[']s representatives.'" *Id.* (quoting *Henson v. Santander Consumer USA*, 137 S. Ct. 1718, 1726 (2017)).

Patent Owner also argues that neither of the two PTAB decisions cited by Petitioner "explains how the statutory text of Section 311(b) is ambiguous and thus warrants extra-textual interpretation to expand the textual language to include admissions as a basis for institution." Prelim. Resp. 25. Patent Owner further argues that those cases "contradict a holding by another, earlier PTAB panel that holds under Section 311(b) that AAPA description in the patent under review does not qualify as prior art on which an *inter partes* review may be instituted." *Id.* at 25–26 (citing *Fresenius Kabi USA, LLC v. Cephalon, Inc.*, IPR2016-00098, Paper 10 at 17 (PTAB May 4, 2016) (Institution Decision)). Patent Owner further argues that using applicant admitted prior art is inconsistent with statements by Administrative Patent Judges in a PTO blog. *Id.* at 26 (citing Jacqueline Bonilla & Sheridan Sneddan, *AIA Blog Message from Administrative Patent Judges Jacqueline Bonilla and Sheridan Snedden: Routine and Additional Discovery in AIA Trial Proceedings: What Is the Difference?*, USPTO Website (Sept. 30, 2014, 10:01 AM), https://www.uspto.gov/patent/laws-and-regulations/america-invents-act-aia/aia-blog-message-administrative-patent-judges).

b) Our Analysis

We agree with Petitioner that an admission in a patent that is the subject of an *inter partes* review—that is, applicant admitted prior art—can be used to challenge claims in an *inter partes* review.

We begin our analysis with the statute. Pursuant to 35 U.S.C. § 311(b), "[a] petitioner in an inter partes review may request to cancel as unpatentable 1 or more claims of a patent only on a ground that could be raised under section 102 or 103 and *only on the basis of prior art consisting of patents or printed publications*" (emphasis added). Our regulations include substantially similar language. *See* 37 C.F.R. § 42.104(b)(2) (requiring the petition to "[identify] . . . the *patents or printed publications* relied upon for each ground" (emphasis added)). The requirement at issue is that the "prior art consist[] of patents or printed publications." Because AAPA is admitted to be prior art and is found in the '048 patent, which is a "patent or printed publication," based on the plain and unambiguous meaning of section 311(b), it can be used to challenge the claims in an *inter partes* review. *See Barnhart v. Sigmon Coal Co.*, 534 U.S. 438, 450 (2002) ("As in all statutory construction cases, we begin with the language of the statute. The first step 'is to determine whether the language at issue has a plain and unambiguous meaning with regard to the particular dispute in the case.'" (quoting *Robinson v. Shell Oil Co.*, 519 U.S. 337, 340 (1997))); *One World*, Paper 8 at 10 ("To find otherwise would require us to interpret the phrase 'prior art consisting of patents and publications' to mean prior art consisting of prior art patents and prior art publications.").

This is consistent with prior use of identical statutory language. Prior to enactment of the Leahy-Smith America Invents Act ("AIA"), Congress used the phrase "prior art consisting of patents or printed publications" to exclusively identify the prior art that could be relied upon in reexamination proceedings. *See* 35 U.S.C. § 302 (1980) ("Any person . . . may file a request for reexamination . . . on the basis of any prior art cited under the provisions of section 301."); 35 U.S.C. § 301 (1980) (identifying "prior art

consisting of patents or printed publications" as the only prior art that could be cited in reexamination proceedings). The Federal Circuit affirmed the Board's decisions in reexamination proceedings holding claims unpatentable as obvious based on applicant admitted prior art and other prior art references, and specifically relied upon applicant admitted prior art to support a finding by the Board. *See In re NTP, Inc.*, 654 F.3d 1279, 1304 (Fed. Cir. 2011).[9] By relying on applicant admitted prior art in affirming the Board's reexamination decisions, the Federal Circuit treated applicant admitted prior art as "prior art consisting of patents or publications," which is consistent with our conclusion above. *NTP*, 654 F.3d at 1304; *see also In re Nomiya*, 509 F.2d 566, 570–71 (CCPA 1975) (holding that applicant admitted prior art may "be considered as prior art in determining obviousness of their improvement" during prosecution); *cf. Koninklijke Philips N.V. v. Google LLC*, 948 F.3d 1330, 1337 (Fed. Cir. 2020) (holding *inter partes* reviews can consider patents, printed publications, and "the skilled artisan's knowledge"). Because Congress used the same language—"prior art consisting of patents or printed publications"—in both the pre-AIA reexamination statute and the *inter partes* review statute, we give the same phrase the same meaning.

We do not agree with Patent Owner that, based on 37 C.F.R. § 42.104(b), "the subject matter to be applied against a claim element must be found solely within a prior art patent or printed publication." Prelim.

[9] The patent owner in *NTP* did not appeal the Board's decision to rely on the applicant admitted prior art. *NTP*, 654 F.3d 1279. However, we consider the Federal Circuit's decision as persuasive in determining that application admitted prior art is "prior art consisting of patents and printed publications."

Resp. 24. The language in § 42.104(b)(4) cannot be read in isolation, as Patent Owner has done, to contradict the related statutory and regulatory provisions. Instead, it must be read in the context of the entire rule and the governing statute.

The quoted language in § 42.104(b)(4) refers back to § 42.104(b)(2): The petition must state "[h]ow the construed claim is unpatentable under the *statutory grounds identified in paragraph (b)(2)* of this section." 37 C.F.R. § 42.104(b)(4) (emphasis added). According to § 42.104(b)(2), the petitioner must state the "*statutory grounds* under 35 U.S.C. 102 or 103 on which the challenge to the claim is based and *the patents or printed publications* relied upon for each ground." 37 C.F.R. § 42.104(b)(2) (emphases added). Thus, § 42.104(b)(2) echoes the statutory language that requires a challenge to be based "only on a ground that could be raised under section 102 or 103 and only on the basis of *prior art consisting of patents or printed publications*." 35 U.S.C. § 311(b) (emphasis added). Therefore, considered as a whole, our rules simply reflect the limitations of the governing statute and do not impose any additional limitations that would exclude applicant admitted prior art.

We are not persuaded by the decision cited by Patent Owner that it is improper in this case for us to consider AAPA in combination with other prior art patent(s). First, *Fresnius* is a routine decision. Accordingly, it is not binding on us. *See* Standard Operating Procedure 2 (Revision 10), 3, https://www.uspto.gov/sites/default/files/documents/SOP2%20R10%20FINAL.pdf ("Every decision other than a precedential decision by the Precedential Opinion Panel is, by default, a routine decision. A routine decision is binding in the case in which it is made, even if it is not

designated as precedential or informative, but it is not otherwise binding authority.").

Second, because *Fresnius* does not explain its reasoning or address the Federal Circuit's *Nomiya*, *NTP*, and *Koninklijke Philips* decisions, we do not find the reasoning of *Fresnius* sufficiently persuasive. *See Fresnius*, Paper 10 at 17. In contrast, we find the reasoning in the Final Written Decisions in *One World* and *Apple* persuasive. Those decisions include a detailed analysis, discuss relevant case law, and address the statutory and regulatory language in depth. *One World*, Paper 56 at 35–41; *Apple*, Paper 26 at 18–22.

Because we determine applicant admitted prior art is "prior art consisting of patents," Petitioner's asserted grounds fall within the scope of 35 U.S.C. § 311(b).

5. Analysis of Claim 1

a) The Undisputed Limitations

The preamble[10] of claim 1 recites "[a] photovoltaic (PV) sub-generator junction box for a PV system." Ex. 1001, 10:58–59. Petitioner argues AAPA teaches the preamble. Pet. 20–21. Specifically, Petitioner argues that Figure 1 of the '048 patent show that "AAPA's PV system includes a sub-generator junction box 1." Pet. 20 (citations omitted).

Claim 1 further recites "a plurality of electrical terminals for connection to respective PV string lines of at least one series-connected PV module; and." Ex. 1001, 10:60–62. Petitioner argues AAPA teaches this

[10] Neither Petitioner nor Patent Owner address whether the preamble is limiting. Because Petitioner has shown that the recitation in the preamble is satisfied by the prior art, there is no need to determine whether the preamble is limiting. *See Nidec*, 868 F.3d at 1017.

limitation. Pet. 21–23. Specifically, Petitioner argues that "AAPA's system includes 'PV modules 3 connected in series,' which form string lines 2" and that "AAPA's sub-generator junction box 1 includes electrical terminals 11 . . . for connecting the string lines." Pet. 21–22 (citations omitted).

Claim 1 further recites "a sub-generator line terminal for connection to a remote central PV inverter." Ex. 1001, 10:63–64. Petitioner argues AAPA teaches that limitation. Pet. 23–24. Specifically, Petitioner argues "AAPA's sub-generator junction box 'has a sub-generator line terminal 12 . . . by which the PV sub-generator junction box 1 can be connected to the central PV inverter 5. . . .'" *Id.* at 23 (citations omitted).

Claim 1 further recites "an electronic control unit connected for data communication to a central control unit within the remote central PV inverter for exchange of data." Ex. 1001, 10:65–67. Petitioner argues AAPA teaches that limitation. Pet. 24–25. Specifically, Petitioner argues "AAPA's sub-generator junction box 'features an electronic control unit 10 . . . which has a data connection to the central control unit 7 of the PV inverter 5 for exchanging the data DAT.'" *Id.* at 24 (quoting Ex. 1001, 7:62–65) (citations omitted).

Claim 1 further recites "wherein the PV sub-generator line is configured to deliver power received from respective PV string lines to the remote central PV inverter." Ex. 1001, 11:1–3. Petitioner argues AAPA teaches that limitation. Pet. 25. Specifically, Petitioner argues that AAPA's sub-generator junction boxes receive power generated by PV modules 32 and delivers the power to PV inverter 5. *Id.* (citations omitted).

Claim 1 further recites "wherein the electronic control unit includes at least one electrical output for activating at least one switching device of the PV sub-generator junction box." Ex. 1001, 11:6–8. Petitioner argues AAPA

teaches that limitation. Pet. 30. Specifically, Petitioner argues "AAPA's control unit 10 has electrical outputs 28 for activating a switching device of sub-generator junction box 1." *Id.* (emphasis omitted) (citations omitted).

After reviewing Petitioner's arguments and information regarding the limitations identified above, including the Wood Declaration, which are not addressed by Patent Owner at this stage (*see generally* Prelim. Resp.), we are persuaded that Petitioner sufficiently demonstrates, for purposes of this Decision, that AAPA teaches a "PV sub-generator junction box" including "a plurality of electrical terminals . . . ," "a sub-generator line terminal . . . ," "an electrical control unit . . . ," "the PV sub-generator line . . . configured to deliver power . . . ," and "the electronic control unit includ[ing] at least one electrical output . . ." as recited in claim 1.

b) The "Power Line Modem" Limitation

(1) The Parties' Arguments

Claim 1 also recites "a power line modem configured to transmit and receive the data over the PV sub-generator line that delivers power." Ex. 1001, 11:4–5.

Petitioner argues that, although AAPA does not teach a power line modem, it was "generally known in the art to communicate data over power lines using power line modems (Ex. 1001 at 2:11-25; Ex. 1011, ¶¶ 88–92, 94, 97–98, 102), and both Rodgers and Frezzolini teach this feature." Pet. 26. Petitioner further argues that a person having ordinary skill in the art

> would have known that modems were used to transmit and receive data via power lines, and would have been motivated and able to implement PLC within a PV system—particularly one that uses separate lines for delivering power and data—to reduce costs and installation complexity associated with wiring

> dedicated/separate communication lines." *Id.* (citations omitted). Therefore, according to Petitioner, a person having ordinary skill in the art "would have been motivated to modify AAPA's sub-generator junction box 1—using Rodgers' or Frezzolini's PLC modem—to exchange data with inverter 5 via sub-generator line 4 and/or PV main DC power line 4'.

Pet. 27 (citing Ex. 1011, ¶¶ 139, 142, 144, 147–148).

Petitioner further argues that the combination of AAPA with Rodgers/Fezzolini's power line modem "merely involves combining known prior-art elements . . . according to known methods . . . to yield predictable results." Pet. 28 (citing Ex. 1011 ¶ 141). Petitioner also argues that the person having ordinary skill in the art would have had a reasonable expectation of success:

> in combining AAPA with Rodgers or Frezzolini. [Ex. 1011] ¶¶ 137–138, 141–143. First, a PHOSITA would have appreciated the benefit of Rodgers/Frezzolini's PLC techniques, and that this benefit would also have applied to AAPA's PV system. *Id.*, ¶ 142. A PHOSITA would have recognized that Rodgers/Frezzolini's PLC modem would have operated with AAPA's system to exchange data over power lines in the same manner as it operates in the Rodgers/Frezzolini system—to control/monitor other devices within the system. *Id.*

Pet. 29. Petitioner also argues that "there would have been no undue technical hurdles to applying Rodgers/Frezzolini's PLC modem to AAPA's system—adding Rodgers/Frezzolini's modem to AAPA's sub-generator junction box to exchange data over sub-generator line 4 . . . would have been a simple modification to AAPA's PV system, readily accomplished by a PHOSITA." *Id.* (citing Ex. 1011 ¶ 143).

Patent Owner argues that although "Petitioner asserts that the modification involves combining known prior art elements according to known methods to yield predictable results," Petitioner "provides no

explanation as to how a power line modem operable to exchange data on an AC power line would operate in AAPA's sub-generator line that delivers DC power." Prelim. Resp. 48–49 (emphasis omitted). According to Patent Owner, a person having ordinary skill in the art would have "recognize[d] the deficiency of an AC power line modem when used in a DC application, and that an AC power line modem will not operate properly on a DC power line, if at all." *Id.* at 49 (citing Ex. 2001 ¶¶ 85–89).

Patent Owner identifies a number of issues associated with using an AC power line modem in a DC system. First, "the coupling circuitry for inserting the data onto the power line and retrieving such data from the power line differs when operating on an AC power line as opposed to when operating on a DC power line." Prelim. Resp. 49 (citing Prelim. Resp. Section VI.B.); *see also id.* at 34–36 (discussing difference in coupling circuitry). As an example, Patent Owner argues that transmitting data on an AC line requires filtering circuitry while transmitting data on a DC power line requires a blocking capacitor that blocks DC voltage and passes the high frequency data signal. Prelim. Resp. 49–50 (citing Ex. 2001 ¶ 86).

Second, Patent Owner argues that different driving circuitry needs to be used because "when performing PLC over an AC power line, the load on such line is inductive, while the load on a DC power line is capacitive in nature." Prelim. Resp. 50 (citing Ex. 2001 ¶ 87). According to Patent Owner, "the driver circuitry employed to transmit data on an AC power line that exhibits inductive loading will not perform adequately when utilized on a DC power line that exhibits a loading that is resistive and capacitive in nature." *Id.* (citing Ex. 2001 ¶ 87).

Third, Patent Owner argues that "the amplitude level of the data signal placed onto the power line in order to ensure a sufficient signal-to-noise

margin will typically be different for a PLC over AC application compared to a PLC over DC application." Prelim. Resp. 51 (citing Ex. 2001 ¶ 88). According to Patent Owner, this would result in the data signal in the DC power line being much higher, which "would most likely saturate the receiver input circuit, causing distortion and a poor signal to noise ratio." *Id.* (citing Ex. 2001 ¶ 88).

Fourth, Patent Owner argues there would be synchronization issues due to the lack of zero crossing detectors on a DC power line. Prelim. Resp. 51 (citing Ex. 2001 ¶ 88).

Fifth, Patent Owner argues that the AC power line modems "would not be able to achieve the needed DC internal supply voltage to power the receive/transmission circuitry, as well as any driver and filter circuitry." Prelim. Resp. 51–52 (citing Ex. 2001 ¶ 89).

(2) Our Analysis

(a) Frezzolini

Based on the current record, we are persuaded that Petitioner has sufficiently shown that Frezzolini teaches a power line modem that can be used on a DC power line and that a person having ordinary skill in the art would have modified AAPA to use that power line modem.

Frezzolini's Figure 9, as annotated by Petitioner, is reproduced below.

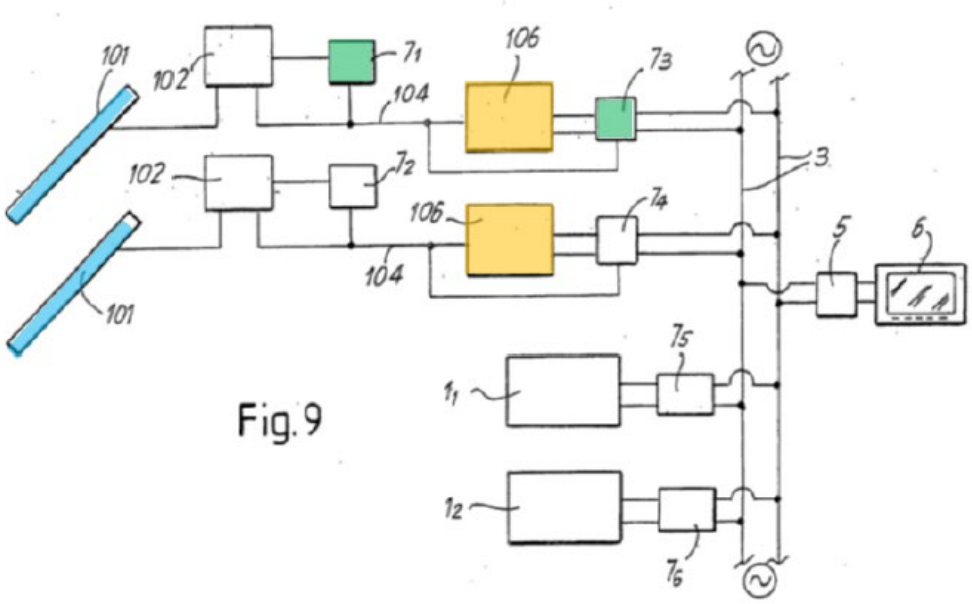


Fig. 9

Pet. 15. Frezzolini's Figure 9 "shows a block diagram of a different system in which the method according to the invention may be applied." Ex. 1005 ¶ 41. Figure 9 has been annotated by Petitioner to identify PV panels 101 (blue), inverters 106 (orange), and associated control devices 7_1 and 7_3 (green). *Id.*

Based on the current record, Petitioner has sufficiently shown, for purposes of this Decision, that PV panels 101 produce DC current which is transmitted over power lines 104 to inverters 106 for conversion to AC current. *See* Ex. 1011 ¶ 132; Ex. 1005 ¶ 140; *see also* Ex. 2004 (describing how PV cells produce DC current which is transformed by an inverter into AC current) (How Solar Technology Works). Because the PV cells produce DC current and that current is not transformed into AC current until it reaches the inverter, lines 104 are DC power lines.

For purposes of this Decision, Petitioner also sufficiently shows that control device 7_1, which is connected to DC power line 104, includes a

power line modem. *See* Pet. 12. Specifically, "Frezzolini teaches that although communications between control devices 7_i and the collecting unit 5 may occur via radio waves, or via a dedicated data line, or via a transmission bus, or via another 'suitable way,' a power supply line is preferable and is 'advantageous.'" Ex. 1011 ¶ 132 (citing Ex. 1005 ¶¶ 16, 17, 143). Frezzolini further teaches that when data is transmitted over power lines, a power line modem is used. Ex. 1005 ¶ 16; Ex. 1011 ¶ 129. Accordingly, based on the current record, Frezzolini teaches a power line modem that is used to transmit and receive data over DC power line 104.

Additionally, Petitioner sufficiently shows, for purposes of this Decision, that a person having ordinary skill in the art would have been motivated to modify AAPA to use Frezzolini's modem for data communication as opposed to separate data lines and would have had a reasonable expectation of success in making such a modification. *See* Pet. 26–29. Based on the current record, we find that Petitioner also sufficiently shows, for purposes of this Decision, that a person having ordinary skill in the art would have modified AAPA's sub-generator box to use Frezzolini's power line modem for data communication. *Id.* at 27 (citing Ex. 1011 ¶¶ 139, 142, 144, 147–148). Petitioner explains that such a modification "would allow entities to immediately employ effective data communications/connectivity via existing power infrastructure with little (or no) additional wiring or investment." *Id.* at 28 (citing Ex. 1011 ¶¶ 95–96, 98, 100, 136). Additionally, Dr. Wood testifies that because Frezzolini teaches a power line modem that transmits over a DC power line, the modification simply combines known prior art elements according to known methods to achieve a predictable result. *See* Ex. 1011 ¶ 141; *see also id.* ¶¶ 137–138, 141–143 (discussing reasonable expectation of success).

For the reasons set forth below, we have considered Patent Owner's arguments, but are nevertheless persuaded that Petitioner's arguments and evidence meet the threshold for institution.

Patent Owner's arguments are premised on Frezzolini only teaching modems that operate over an AC power line. *See* Prelim. Resp. 44–51. However, based on the current record, we do not agree with Patent Owner that Frezzolini only[11] teaches power line modems that operate on AC current power lines. *See* Prelim. Resp. 45–47. Specifically, we do not agree with Patent Owner that line 104 is not a power line. *See* Prelim. Resp. 47. Frezzolini specifically identifies line 104 as a "power line" and the control devices 7_1 and 7_2 transmit and receive data along power line 104. Ex. 1005 ¶ 140 ("The numbers 7_1 and 7_2 indicate two control devices associated with the units 101, 102 and connected, *via a power line 104*, to respective inverters 106." (emphasis added)). Frezzolini further teaches that "when a power supply line is provided, this is preferably also used to transmit data and information between devices connected to this line." *Id.* ¶ 143. Thus, for the reasons discussed above, Petitioner has sufficiently shown, for purposes of this Decision, that the modem in control devices 7_1 and 7_2 transmit and receive data over a DC power line. And because Frezzolini teaches modems that operate on a DC power line, Patent Owner's arguments are inapposite.

[11] Patent Owner presents persuasive arguments as to why the power line modem in Frezzolini's Figure 1 and control devices 7_3 and 7_4 in Figure 9 operate over AC power lines. *See* Prelim. Resp. 45–47.

(b) Rodgers

Based on the current record, we have concerns regarding whether Petitioner's arguments and evidence sufficiently show that a person having ordinary skill in the art would have modified AAPA to use Rodgers' power line modem and would have had a reasonable expectation of success in making such modification. Specifically, based on the current record, we are persuaded that Rodgers only teaches a power line modem that is used on AC power lines and Petitioner has not sufficiently shown why a person having ordinary skill in the art would have combined Rodgers' AC power line modem with the DC power lines used in AAPA or that there was a reasonable expectation of success in doing so.

Petitioner relies on Rodgers' Figure 3 for the PLC module—communication interface 224—that maintains communication even when the circuit breaker is open. *See* Pet. 12. Thus, Rodgers uses power lines 202, 204, and 206 for communication. A version of Rodgers' Figure 3 annotated by Petitioner is reproduced below.

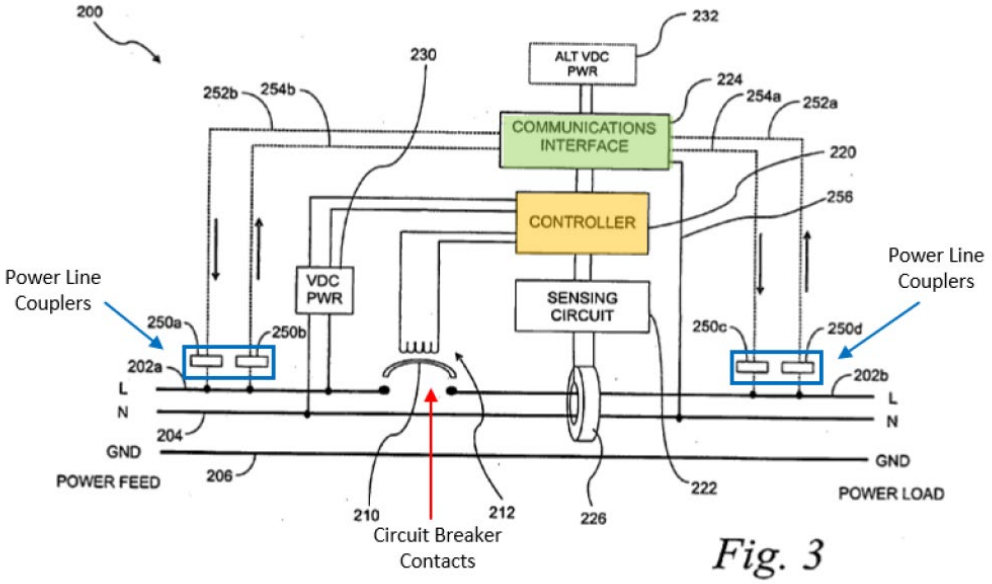


Fig. 3

Id. Rodgers' Figure 3 "is a functional representation of an intelligent circuit breaker device." Ex. 1003 ¶ 13. Petitioner annotated Rodgers' Figure 3 by identifying the communication interface 224 (green) and controller 220 (yellow), power line couples 250a-d (blue), and circuit breaker contacts (red). Pet. 12. Power lines 202 and 204 are AC power lines, whose power is converted to DC current by AC-to-DC power supply 230. *See* Ex. 1003 ¶¶ 36, 43; *see also* Ex. 2001 ¶ 60. Thus, Rodgers' Figure 3 shows that PLC system operates on AC power lines.

Rodgers' Figures 1 and 4 confirm that Rodgers' power line modem operates on AC power lines. Rodgers' Figure 1 is reproduced below.

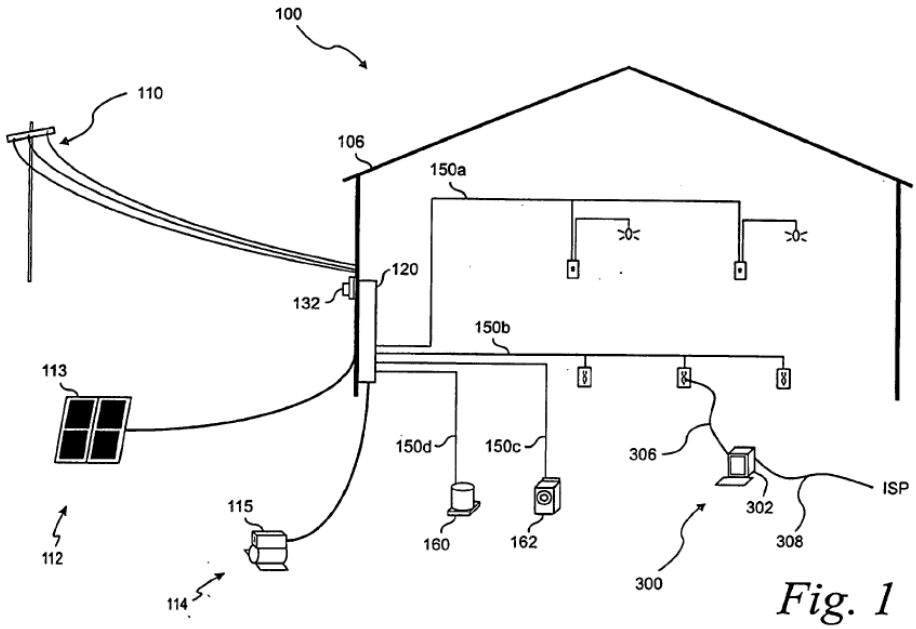


Fig. 1

Ex. 1003, Fig. 1. Rodgers' Figure 1 "is a functional block representation of an exemplary residential power distribution system" and shows dynamic load management system 300, which includes PLC modem 304, inside the house. *Id.* ¶¶ 11, 59, Fig. 1. Similarly, Rodgers' Figure 4, reproduced below, shows dynamic load management system 300, which includes PLC

modem 304 connected to residential power lines 150 inside of the house. *Id.* at Figs. 1, 2, 4.

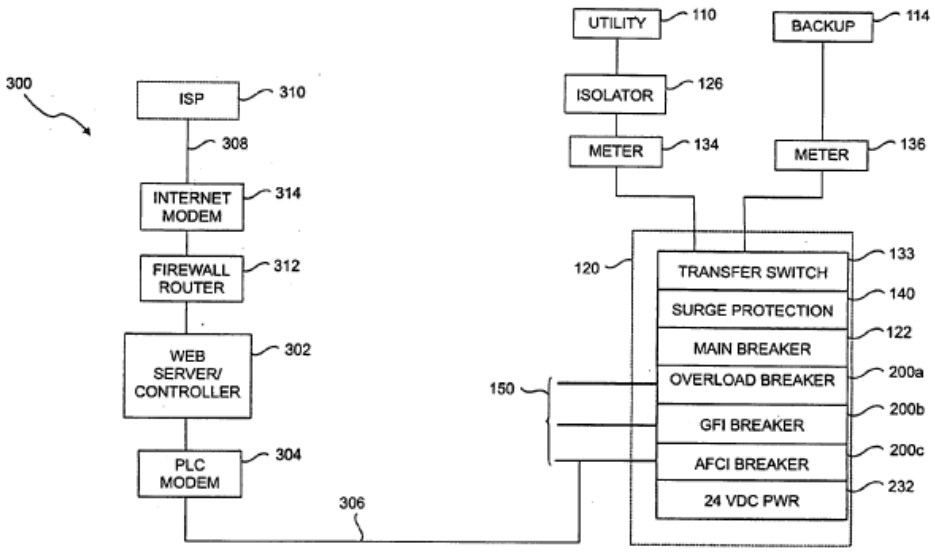


Fig. 4

Rodgers' Figure 4 "is a functional block diagram of a residential load management system and its components." *Id.* ¶ 14. Residential power lines are AC power lines. *See* Ex. 2001 ¶ 60; Ex. 2004, 1. Therefore, Rodgers' power line modem 304 is an AC power line modem connected to AC power lines.

We are not persuaded by Petitioner's argument that Rodgers' teaching of alternate power sources, such as solar cells 113, supports the use of DC power lines for the modem. *See* Pet. 11 (citing Ex. 1003 ¶ 19, Fig. 1; Ex. 1011 ¶ 123), 26–27 (citing Ex. 1003 ¶¶ 19, 24, 30); *see also* Ex. 1011 ¶ 137. Rodgers' Figure 1 shows solar cells 113 outside of residence 100 while the power line modem is located inside of the residence. Although Rodgers teaches using a DC power source outside of the house, Petitioner does not persuasively argue that the power lines inside of the house are DC power lines. *See* Pet. 11, 26–27.

Patent Owner and its expert identify several issues associated with using an AC power line modem on a DC power line. *See* Prelim. Resp. 48–53; Ex. 2001 ¶¶ 86–90. Neither Petitioner nor Petitioner's expert address any of the issues associated with using an AC power line modem over a DC power line. *See* Pet. 26–29; Ex. 1011 ¶¶ 137–138, 141–143. Accordingly, based on the current record, we have concerns on whether Petitioner has sufficiently shown a reason to combine Rodgers' AC modem with AAPA or that there is a reasonable expectation of success.[12]

c) The "Control Data" Limitation

Claim 1 further recites "wherein the data receivable from the central control unit within the PV inverter by the power line modem comprises corresponding control data." Ex. 1001, 11:9–11.

Petitioner argues "AAPA's control unit 10 of sub-generator junction box 1 receives control data from central control unit 7 of inverter 5 to activate switching means." Pet. 30 (citing Ex. 1001, 3:34–48, 8:1–8). Petitioner further argues that "it would have been obvious to modify AAPA's sub-generator junction box 1 to use [Frezzolini's] PLC modem to exchange data (e.g., control data) with inverter 5 via power lines." *Id.* at 31 (citations omitted).

Patent Owner argues that "Frezzolini disclose a power line modem that transmits or receives data ***over an AC power line and not over a DC power line***." Prelim. Resp. 53. According to Patent Owner, because

[12] The same concerns exists for all claims and grounds relying on the combination of AAPA and Rodgers. We do not address those claims or grounds separately.

Frezzolini only teaches an AC type modem, Frezzolini does not render this limitation obvious. *Id.* at 53–54.

Based on the current record, we are persuaded that Petitioner has sufficiently shown that the combination of AAPA and Frezzolini teaches this limitation. AAPA teaches using data transmitted from the inverter to the sub-generator box to control electrical outputs. Ex. 1001, 8:1–8. Additionally, as discussed above in subsection D.5(2)(a)(2), a person having ordinary skill in the art would have modified AAPA to use Frezzolini's DC power line modem for communications, including the control signals from the inverter. Accordingly, Petitioner has sufficiently shown, for purposes of this Decision, that the combination of AAPA and Frezzolini teaches this limitation.

d) Conclusion Regarding Claim 1

After reviewing the arguments and evidence cited in the Petition and the Preliminary Response, we are persuaded that Petitioner sufficiently demonstrates how the combination of AAPA and Frezzolini teaches each of the limitations recited in claim 1 and that a person of ordinary skill in the art would have had a reason to combine the teachings of the references with a reasonable expectation of success of achieving the claimed invention for purposes of this Decision. Accordingly, Petitioner has demonstrated, on this record, a reasonable likelihood of prevailing on its assertion that claim 1 is unpatentable over AAPA and Frezzolini.

Because Petitioner has demonstrated a reasonable likelihood of success in proving that at least one claim of the '048 patent is unpatentable, we will institute on all grounds and all claims raised in the Petition. *See SAS*, 138 S. Ct. at 1359–60 (holding an *inter partes* review may not institute on less than all claims challenged in the petition); *PGS Geophysical AS v.*

Iancu, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (indicating that a decision whether to institute an *inter partes* review "require[s] a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition"). Therefore, at this stage of the proceeding, it is not necessary for us to provide an assessment of every ground raised by Petitioner. Rather, emphasizing that our claim constructions and fact findings are not final and are based on a preliminary record, we address Patent Owner's arguments in the subsequent sections of this Decision.

6. Analysis of Claims 2, 3, 5, and 7

Petitioner provides detailed explanations supported by the testimony of Dr. Wood and specific citations to AAPA and Frezzolini indicating where in the references the limitations of claims 2, 3, 5, and 7 are taught. Pet. 31–48. We have reviewed Petitioner's contentions as to claims 2, 3, 5, and 7—which the Preliminary Response does not substantively address beyond the arguments advanced for claim 1 (*see* Prelim. Resp. 54–57)—and find them sufficiently persuasive on this record.

G. AAPA, Frezzolini, and Iwamura

1. Iwamura

Iwamura "provide[s] systems and methods for implementing and controlling local power line communication (PLC) networks." Ex. 1006, code (57). Iwamura teaches using circuit breakers between central controller 130 and other elements of the PLC network. *Id.* ¶ 47. Iwamura further teaches that "circuit breakers include a switch that opens when a current exceeding a threshold is drawn through the circuit breaker" and that "[t]his opening of the switch in a typical breaker also breaks PLC connections between devices of a local PLC network." *Id.*

In order to allow communication when the switch is open, Iwamura teaches using PLC signal coupler 742 to bridge circuit breaker switch even when the switch is open. Ex. 1006 ¶ 58. Iwamura further teaches that "the breaker PLC signal coupler 742 can include a transducer and may be an inductive coupler such as toroid coupling transformer, a capacitive coupler or other relevant coupler or combination of couplers, for coupling PLC data through the PLC circuit breaker 720." *Id.* ¶ 59.

2. Analysis of Claim 4

a) Undisputed Limitations

The preamble[13] and first limitation of claim 4 recites "[a] photovoltaic (PV) generator junction box for a PV system, comprising: a plurality of sub-generator line terminals for connection to respective PV sub-generator lines of PV sub-generator junction boxes." Ex. 1001, 11:27–31. Petitioner argues AAPA teaches the preamble and first limitation. Pet. 49–50. Specifically, Petitioner argues that "AAPA's PV system includes a generator junction box 6 . . . connected—via sub-generator lines 4—to respective sub-generator junction boxes." Pet. 49 (citations omitted). Petitioner further argues that a person having ordinary skill in the art "would have understood that terminals ('sub-generator line terminals') are used to connect sub-generator lines 4 to AAPA's generator junction box 6." *Id.* at 50 (emphasis omitted).

[13] What Petitioner has identified as the first limitation includes the preamble of the claims. Neither Petitioner nor Patent Owner address whether the preamble is limiting. Because Petitioner has shown that the recitation in the preamble is satisfied by the prior art, there is no need to determine whether the preamble is limiting. *See Nidec*, 868 F.3d at 1017.

Claim 4 further recites "a main DC power line terminal for connecting a PV main DC power line of a remote central PV inverter." Ex. 1001, 32–33. Petitioner argues AAPA teaches that limitation. Pet. 50–51. Specifically, Petitioner argues that "AAPA's generator junction box 6 . . . is connected to inverter 5 . . . via main DC power line 4'." Pet. 50 (citations omitted).

Claim 4 further recites "at least one of a main circuit breaker for disconnecting the PV main power line and a collective circuit breaker for disconnecting a respective one of the PV sub- generator lines." Ex. 1001, 11:34–37. Petitioner argues that a person having ordinary skill in the art would have modified AAPA to include that limitation. Pet. 51–54. Specifically, Petitioner argues circuit breakers were known in the art and included in AAPA's sub-generator boxes. *Id.* 51–52. Petitioner further argues that a person having ordinary skill in the art would have expected that the related generator junction box would also have included circuit breakers and

> would have been motivated to implement or replicate circuit breakers 15 and 20 of sub-generator junction box 1—which enable the selective disconnecting of input and/or output power lines (respectively)—within AAPA's generator junction box 6 to provide added safety, flexibility and increased power flow control within the PV system.

Id. at 52–53 (citations omitted). According to Petitioner, such a modification involves using known elements to yield predictable results and that a person having ordinary skill in the art would have had a reasonable expectation of success. *Id.* at 53–54 (citations omitted).

After reviewing Petitioner's arguments and information regarding the limitations identified above, including the Wood Declaration, which are not

addressed by Patent Owner at this stage (*see generally* Prelim. Resp.), we are persuaded that Petitioner sufficiently demonstrates, for purposes of this Decision, that AAPA teaches a "PV generator junction box" including "a plurality of sub-generator line terminals . . . ," "a main DC power line terminal . . . ," and "at least one of a main circuit breaker . . . and a collective circuit breaker . . ." as recited in claim 4.

b) The "Data Signal Coupler" Limitation

(1) The Parties' Arguments

Claim 4 also recites:

> a data signal coupler connected in parallel to a respective circuit breaker of the at least one of the main circuit breaker and the collective circuit breaker, so that data to be transferred between the respective PV sub-generator line and the PV main DC power line is also able to be forwarded through the data signal coupler when the respective circuit breaker is in an open state.

Ex. 1001, 11:37–43.

Petitioner argues the combination of AAPA, Frezzolini, and Iwamura teach this limitation. Pet. 54–59. Specifically, Petitioner argues that a person having ordinary skill in the art would have modified AAPA to include Fezzolini's power line modem. *Id.* at 54–55. Petitioner further argues that PLC systems have a problem transferring data across open circuit breakers. *Id.* at 56 (citing Ex. 1003 ¶¶ 3, 34, code (57); Ex. 1006 ¶ 47; Ex. 1011 ¶¶ 121, 171, 177, 178, 197). According to Petitioner, in order to overcome that problem, a person having ordinary skill in the art would have added Iwamura's signal coupler to maintain data communication even when a switch is open. *Id.* at 56–57 (citing Ex. 1006 ¶¶ 48, 58, 59, Fig. 7; Ex. 1011 ¶¶ 172, 180–182, 195, 198, 199, 209, 210, 229[4D]). Petitioner argues that such a modification would have involved using known elements to

achieve predictable results and that a person having ordinary skill in the art would have reasonably expected the modification to work. *Id.* at 57–59.

In addition to the arguments made regarding claim 1, Patent Owner argues "using a data signal coupler for a PLC over AC solution, as taught in . . . Iwamura, will not work in a PLC over DC environment, as exists in AAPA, and thus the combination is improper, and even if proper, fails to result in the claimed invention." Prelim. Resp. 58. Specifically, Patent Owner argues "Iwamura employs a galvanic coupler 726 to couple signals onto an AC power line 722, and a data coupler 742 couples such signals from the AC power mains to the AC power load when the circuit breaker 736 is open." *Id.* at 58–59 (citing Ex. 1006, ¶¶ 48–59, Fig. 7; Ex. 2001 ¶ 97). Patent Owner further argues that "a data signal coupler designed for an AC power line is different than a data signal coupler designed for a DC power line." *Id.* at 59 (emphasis omitted) (citing Ex. 2001 ¶ 98). According to Patent Owner, "attempting to insert the data signal couplers of . . . Iwamura into the DC power line of AAPA would render such data signal couplers either inoperable or unsatisfactory for their intended purpose." *Id.* at 60 (citing Ex. 2001 ¶¶ 84–92, 100).

(2) Our Analysis

Based on the current record, we are persuaded that Petitioner has sufficiently shown, for purposes of this Decision, that (1) Frezzolini teaches a power line modem that can be used on a DC power line, (2) Iwamura teaches a data signal coupler to transmit data when a switch is open/circuit breaker, and (3) that a person having ordinary skill would have modified AAPA to use Frezzolini's power line modem and a data signal coupler as taught by Iwamura for PLC communications when the circuit breakers are open.

Specifically, as discussed in subsection F.5.b.(2)(a), Petitioner has shown sufficiently, for purposes of this Decision, that a person having ordinary skill in the art would have modified AAPA to use Frezzolini's DC power line modem for power line communication.

Furthermore, Iwamura teaches that the power line cannot be used for communications when a circuit breaker/switch is open. Ex. 1006 ¶ 58. However, Iwamura also teaches a solution to that problem: placing a data signal coupler (PLC signal coupler 742) in parallel with the switch to allow communication when the switch is open. *See id.* ¶ 58, Fig. 7; Ex. 1011 ¶¶ 172–174. Petitioner has sufficiently shown, for purposes of this Decision, that Iwamura teaches the "data signal coupler" limitation recited in claim 4 and that a person having ordinary skill in the art would have modified AAPA to use a data signal coupler in order to allow communication when the circuit is open. *See* Ex. 1011 ¶¶ 172–227.[14] Petitioner has also sufficiently shown a reasonable expectation of success. *Id.*

We do not agree with Patent Owner's argument that Iwamura's PLC signal coupler 742—which Patent Owner argues is intended for an AC power line—would not work on AAPA's DC power line and, therefore, the combination is not obvious. "The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference." *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Instead, the relevant issue is "what the combined teachings of the references would have suggested to those of ordinary skill in the art." *Id.* "Combining the *teachings* of references does not involve an ability to

[14] The cited paragraphs of the Wood Declaration discuss both Rodgers and Iwamura. We are only relying on the discussion of Iwamura.

combine their specific structures." *In re Nievelt*, 482 F.2d 965, 968 (CCPA 1973); *see also In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) ("It is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements." (citing *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (en banc))). Iwamura contains a broad teaching of using a data signal coupler to provide an alternate data path when a circuit breaker switch is open. *See* Ex. 1006 ¶ 58. That teaching is not limited to AC power lines.

Moreover, we do not agree with Patent Owner that Iwamura is limited to an AC power line signal coupler. Instead, Iwamura teaches using any type of "relevant coupler":

> In some embodiments, the breaker PLC signal coupler 742 can include a transducer and may be an inductive coupler such as toroid coupling transformer, a capacitive coupler *or other relevant coupler or combination of couplers*, for coupling PLC data through the PLC circuit breaker 720.

Id. ¶ 59 (emphasis added); *see also* Ex. 1011 ¶ 174 ("Iwamura also makes clear that these breakers may be used at various points in the PLC system and in various configurations." (citing Ex. 1006 ¶ 59)). Accordingly, a person having ordinary skill in the art would have selected a relevant data signal coupler for AAPA's DC power lines. *See* Ex. 1006 ¶ 59; Ex. 1011 ¶¶ 174, 180, 183, 185.

c) Conclusion Regarding Claim 4

After reviewing the arguments and evidence cited in the Petition and the Preliminary Response, we are persuaded that Petitioner sufficiently demonstrates, for purposes of this Decision, how the combination of AAPA, Frezzolini, and Iwamura teaches each of the limitations recited in claim 4 and that a person of ordinary skill in the art would have had a reason to

combine the teachings of the references with a reasonable expectation of success of achieving the claimed invention. Accordingly, Petitioner has demonstrated, on this record, a reasonable likelihood of prevailing on its assertion that claim 4 is unpatentable over AAPA, Frezzolini, and Iwamura.

3. Analysis of Claims 6 and 8–10

Petitioner provides detailed explanations supported by the testimony of Mr. Wood and specific citations to AAPA, Frezzolini, and Iwamura, indicating where in the references the limitations of claims 6 and 8–10 are taught. Pet. 59–75. We have reviewed Petitioner's contentions as to claims 2, 3, 5, and 7—which the Preliminary Response does not substantively address beyond the arguments advanced for claim 4 (*see* Prelim. Resp. 60)—and find them sufficiently persuasive on this record.

CONCLUSION

Our review of the Petition under 35 U.S.C. § 314 is to determine whether the totality of the information presented at this stage shows that there is a reasonable likelihood that Petitioner would prevail with respect to at least one of the claims challenged in the Petition. For the reasons expressed above, we determine that Petitioner has established the requisite reasonable likelihood of prevailing as to claims 1–10 of the '048 patent.

Our factual findings, conclusions of law, and determinations at this stage of the proceeding are preliminary, and based on the evidentiary record developed thus far. This is not a final decision as to the patentability of claims for which *inter partes* review is instituted. Our final decision will be based on the record as fully developed during trial.

ORDER

In consideration of the foregoing, it is hereby:

ORDERED that an *inter partes* review of all challenged claims of the '048 patent is instituted with respect to all grounds set forth in the Petition (*see* Section I.F, *supra*); and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), *inter partes* review of the '048 patent is hereby instituted commencing on the entry date of this Decision, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

FOR PETITIONER:

Frederic Meeker
John R. Hutchins
Azuka C. Dike
Kurt C. Riester
Zachary Getzelman
Banner & Witcoff, Ltd.
fmeeker@bannerwitcoff.com
jhutchins@bannerwitcoff.com
adike@bannerwitcoff.com
kriester@bannerwitcoff.com
zgetzelman@bannerwitcoff.com
SolaredgeIPRService@ bannerwitcoff.com

FOR PATENT OWNER:

Steven H. Slater
Michael Kucher
John D. Koetter
Slater Matsil, LLP
sslater@slatermatsil.com
mkucher@slatermatsil.com
jkoetter@slatermatsil.com

Thomas G. Eschweiler
Eschweiler & Potashnik, LLC
teschweiler@epiplaw.com