

UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

HANWHA SOLUTIONS CORPORATION AND  
HANWHA Q CELLS USA, INC.,  
Petitioner,

v.

REC SOLAR PTE. LTD.,  
Patent Owner.

---

IPR2021-00988  
Patent 10,749,060 B2

---

Before GRACE KARAFFA OBERMANN, CHRISTOPHER M. KAISER,  
and BRIAN D. RANGE, *Administrative Patent Judges*.

RANGE, *Administrative Patent Judge*.

JUDGEMENT  
FINAL WRITTEN DECISION  
Determining All Challenged Claims Unpatentable  
*35 U.S.C. § 318(a)*

## I. INTRODUCTION

This is a Final Written Decision addressing the *inter partes* review challenging claims 1–6, 11, and 13 of U.S. Patent No. 10,749,060 B2 (“the ’060 patent”). We have jurisdiction under 35 U.S.C. § 6. The evidentiary standard is a preponderance of the evidence. *See* 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2019). We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Hanwha Solutions Corporation and Hanwha Q CELLS USA, Inc. (collectively “Petitioner”) demonstrates, by a preponderance of the evidence, that claims 1–6, 11, and 13 are unpatentable.

## II. BACKGROUND

### A. *Procedural History*

Petitioner filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of the ’060 patent. We instituted trial on three grounds.<sup>1</sup> After institution, REC Solar Pte. Ltd. (“Patent Owner” or “REC”) filed a Patent Owner Response. *See* Patent Owner’s Response (“PO Resp.”), Paper 22. Petitioner filed a Reply (Paper 26, “Reply”), and Patent Owner filed a Sur-Reply (Paper 30, “Sur-Reply”). Additionally, Patent Owner filed a motion to exclude evidence (Paper 34, “Mot. Excl.”), Petitioner responded (Paper 35, “Opp. Mot. Excl.”), and Patent Owner provided a Reply brief (Paper 38, “Mot. Excl. Reply”).

We heard oral argument for this *inter partes* review (as well as for related *inter partes* review, IPR 2021-00989) on September 13, 2022, and a transcript of the hearing is part of the record of this proceeding. Paper 39 (“Tr.”).

---

<sup>1</sup> *See* Paper 12.

B. *Related Matters*

The parties identify the following as a related matter: *REC Solar Pte. Ltd. v. Hanwha Solutions Corp., et al.*, 1-20-cv-01622 (D. Del. Nov. 30, 2020). Pet. 2; Paper 7, 1.<sup>2</sup> Patent Owner also identifies the following as a related matter: *Hanwha Solutions Corporation and Hanwha Q Cells USA, Inc. v. REC Solar Pte Ltd.*, IPR2021-00989 (PTAB June 2, 2021). Paper 7, 1. Petitioner filed the petition for IPR2021-00989 on the same day as the instant Petition.

C. *The '060 Patent (Ex. 1001)*

The '060 patent is titled “Solar Cell Assembly.” Ex. 1001, code 54. The challenged claims relate to a “solar cell assembly [that] includes one or more solar cell units coupled in series.” *Id.* at 2:40–41.

Below, we reproduce Figure 2a of the '060 patent.

---

<sup>2</sup> On October 29, 2021, the District Court granted without prejudice a motion to dismiss the complaint in *REC Solar Pte. Ltd. v. Hanwha Solutions Corp., et al.* Paper 11, 1. The District Court provided the plaintiff 21 days from October, 29, 2021, to refile the complaint. *Id.*

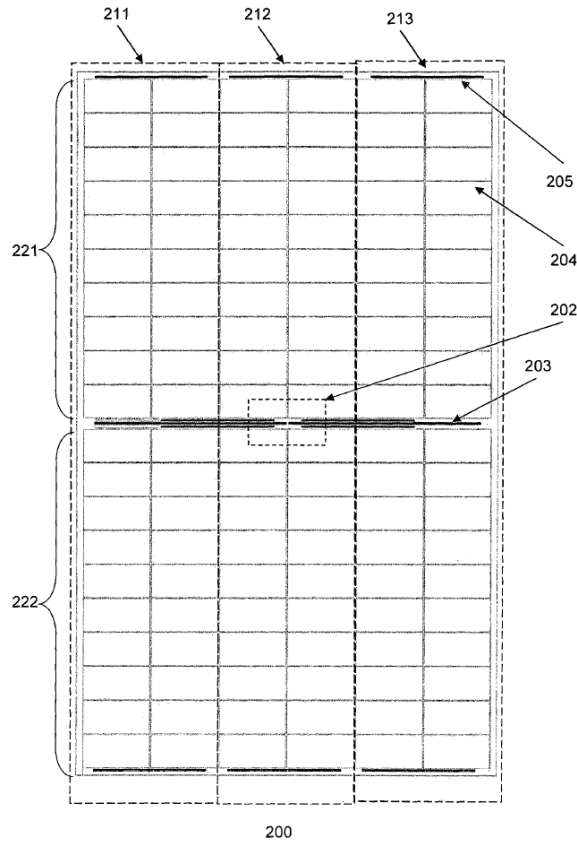


Fig. 2a

The '060 patent describes Figure 2a as “a solar cell assembly layout 200.” *Id.* at 3:22–23. The '060 patent describes that the solar cell assembly includes solar cells 204 which are arranged in one or more solar cell units. *Id.* at 3:26–28. As illustrated in Figure 2a, the solar cell assembly includes three solar cell units: a first solar cell unit 211, a second solar cell unit 212, and a third solar cell unit 213. *Id.* at 3:28–31. The '060 patent further describes that “a solar cell unit includes a first solar cell series and a second solar cell series.” *Id.* at 3:34–35. As illustrated in Figure 2a, “the first solar cell unit 211 ... includes a first solar cell series 221 and a second solar cell series 222.” *Id.* at 3:35–37. As also illustrated in Figure 2a, the solar cells are cut into half and connected in series with each other within each solar cell series. *Id.* at 3:46–48.

We reproduce Figure 2b of the '060 patent below.

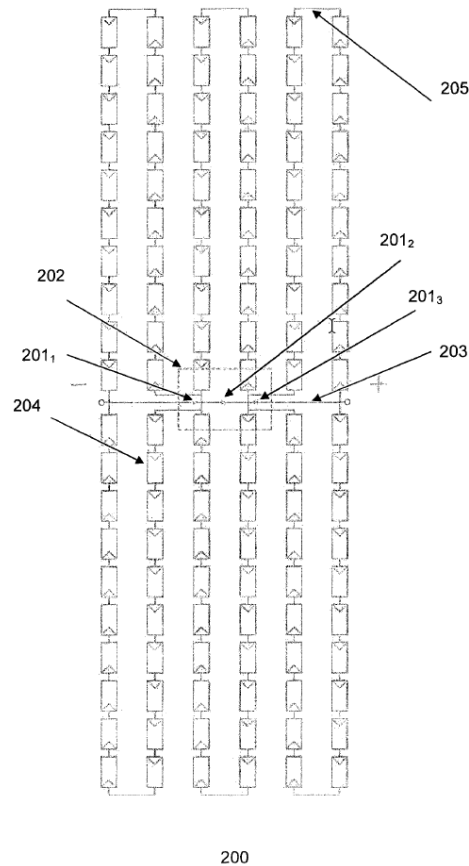


Fig. 2b

The '060 patent describes Figure 2b as “a corresponding electrical schematic diagram.” *Id.* at 3:23–24. The '060 patent further describes “the first and second solar cell series within the same solar cell unit share a same by-pass diode.” *Id.* at 3:53–54. As illustrated in Figure 2b, “the first and second solar cell series 221 and 222 within the first solar cell unit may share a first by-pass diode [201<sub>1</sub>].” *Id.* at 4:1–3. “[T]he solar cell series are connected with the by-pass diodes via cross-connectors 203.” *Id.* at 4:21–22.

#### D. Challenged Claims

Petitioner challenges claims 1–6, 11, and 13 of the '060 patent. Pet. 3. Claim 1 is the only challenged independent claim. Claim 1 is illustrative of the claimed subject matter, and we reproduce claim 1 below, adding bracketed identifiers for claim elements.

1. [1pre] A solar cell assembly comprising:
  - [1a] a first solar cell unit, comprising:
    - [1b] a first solar cell series including a plurality of half-cut solar cells connected in series; a second solar cell series, coupled in parallel with the first solar cell series, including a plurality of half-cut solar cells connected in series;
    - [1c] a first bypass diode coupled in parallel with the first solar cell series and the second solar cell series; and
    - [1d] a first junction box containing the first bypass diode; and
  - [1e] a second solar cell unit, coupled in series with the first solar cell unit, comprising:
    - [1f] a third solar cell series including a plurality of half-cut solar cells connected in series;
    - a fourth solar cell series, coupled in parallel with the third solar cell series, including a plurality of half-cut solar cells connected in series;
    - [1g] a second bypass diode coupled in parallel with the third solar cell series and the fourth solar cell series; and
    - [1h] a second junction box containing the second bypass diode.

Ex. 1001, 8:2–22; *see* Pet. 25–45 (using same identifiers).<sup>3</sup>

*E. Asserted Grounds of Unpatentability*

Petitioner asserts that the challenged claims are unpatentable based on the following grounds:

---

<sup>3</sup> We note that, at times, the parties or evidence refers to “by-pass diodes” (with a hyphen). We refer to “bypass diodes” (without a hyphen) except where providing a quote because this is the language claim 1 uses. In view of the record as a whole, we find there is no substantive distinction between “by-pass diodes” and “bypass diodes.”

Ground	Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1	1–6, 11, 13	103	Huang <sup>4</sup> , Wu <sup>5</sup>
2	1, 2, 4	102(a)(1)	Zhang <sup>6</sup>
3	3, 5, 6, 11, 13	103	Wu, Zhang

Pet. 18. The Petition and Reply are supported by the Declaration of Dr. Jonathan Kimball. Ex. 1003 (initial declaration); Ex. 1054 (Reply declaration). The Response is supported by the Declaration of Dr. Stephen P. Shea. Ex. 2040.

### III. PATENT OWNER’S MOTION TO EXCLUDE

Patent Owner’s Motion to Exclude seeks to exclude three areas of evidence. We address each in turn.

#### A. *Exclusion of JP 2010-165993A as Unauthenticated Hearsay*

Patent Owner argues that Exhibits 1010 and 1037 each purport to be JP 2010-165993 A and that Exhibits 1013 and 1038 each purport to be translations of that document. Mot. Excl. 1–2. Patent Owner argues that the four exhibits should be excluded as lacking authentication or as hearsay. *Id.* at 2–3. Patent Owner argues that authenticity and public availability is in question because Exhibit 1013 and 1038 are substantively different. *Id.* at 3–5.

Petitioner explains that Exhibit 1012 which was used to create the translation for Exhibit 1013 “was missing several paragraphs that are present in the published version of the reference.” Opp. Mot. Excl. 8; Ex. 1087, 1

---

<sup>4</sup> CN 202585481 U, published Dec. 5, 2012 (Ex. 1004). We refer to the English translation (Ex. 1005).

<sup>5</sup> CN 102044587 A, published May 4, 2011 (Ex. 1006). We refer to the English translation (Ex. 1007).

<sup>6</sup> CN 103094381 A, published May 8, 2013 (Ex. 1008). We refer to the English translation (Ex. 1009).

(e-mail where Petitioner’s counsel explains issue to Patent Owner).

Petitioner argues that the references are self-authenticating—and therefore authentic—official publications and are not hearsay because they are offered for what they describe rather than the truth. Opp. Mot. Excl. 9–10.

Petitioner’s position is persuasive. We agree that documents from the Japanese Patent Office are self-authenticating official government documents. The technical issues regarding missing pages in the originally filed version of the document do not cause us to question authenticity.

We also agree that Petitioner uses the documents to establish what the documents teach rather than establishing the truth of what the documents teach. In Reply, Patent Owner argues that Petitioner relies on the date printed on the document to prove up the truth of when the document was published. Mot. Excl. Reply 1–2. To the extent this is the case, an exception to hearsay applies because the document is a record of a public office. Fed. R. Evid. 803(8)(B) (a record of public office is an exception to the hearsay rule if the opponent does not show that the source of information or other circumstances “indicate a lack of trustworthiness”). Here, Patent Owner does not persuasively demonstrate a lack of trustworthiness; Patent Owner does not identify any substantively meaningful distinction in the missing pages of the originally filed document and does not identify any evidence to suggest that the missing pages were anything more than a harmless technical error.

For the reasons above, Patent Owner’s motion to exclude is *denied* with respect to these documents.

B. *Exclusion of Dr. Kimball’s Declarations (Exhibits 1003 and 1054)*

Patent Owner argues that “[p]ortions” of Dr. Kimball’s declarations should be excluded to the extent they include Dr. Kimball’s “assessments of the art and ungrounded conclusions.” Mot. Excl. 5–9. In particular, Patent



Owner argues that Dr. Kimball lacks expertise in the field of the '060 patent. *Id.* Patent Owner's argument dovetails with arguments in Patent Owner's Response where Patent Owner argues for a certain level of ordinary skill in the art for the '060 patent and argues that "Dr. Kimball was not a POSITA [person of ordinary skill in the art] in 2013." PO Resp. 7–13; *see* Sur-Reply 2–6.

Petitioner argues for a level of ordinary skill in the art that differs from Patent Owner's proposal. Pet. 5 (identifying level of ordinary skill in the art). Petitioner also argues that Dr. Kimball is qualified to provide expert opinion in the field. Pet. Reply 26–28 (arguing that Kimball is a person of ordinary skill in the art); Mot. Excl. Opp. 2–7 (arguing that Dr. Kimball should not be excluded as an expert). We begin our assessment of Patent Owner and Petitioner's respective arguments by determining the field of the '060 patent and determining the level of ordinary skill in the art.

We first assess field. Patent Owner argues that the relevant field is "solar module design." PO Resp. 7 (citing Ex. 1001, 1:5–6). Petitioner argues that the field is "solar cell assemblies and ... solar cell modules including such solar cell assemblies." Pet. Reply 26 (also citing Ex. 1001, 1:5–6). We determine that the '060 Patent itself adequately states the field of the invention by stating that "[t]he present invention relates to solar cell assemblies and to solar cell modules including such solar cell assemblies." Ex. 1001, 1:3–6. This matches Petitioner's proposed field, and Patent Owner does not appear to genuinely dispute this point. Sur-reply 3 (stating that Petitioner's definition of field is "co-extensive" with Patent Owner's definition).

We next determine the level of ordinary skill in the art. The level of ordinary skill in the art at the time of the invention is a factual determination

that provides a primary guarantee of objectivity in an obviousness analysis. *Al-Site Corp. v. VSI Int’l Inc.*, 174 F.3d 1308, 1324 (Fed. Cir. 1999) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991)). Factors pertinent to determining the appropriate level of skill in the art include:

- (1) the educational level of the inventor;
- (2) type of problems encountered in the art;
- (3) prior art solutions to those problems;
- (4) rapidity with which innovations are made;
- (5) sophistication of the technology;
- and (6) educational level of active workers in the field. . . . The patent’s purpose can also be informative.

*Best Medical Int’l, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022) (citations omitted). Below, we put the parties’ proposed definitions side-by-side in a table for comparison:

<b>Petitioner’s POSITA definition</b>	<b>Patent Owner’s POSITA definition</b>
A person of ordinary skill in the art (“POSITA”) at the time of the alleged invention would have had at least a bachelor’s degree in mechanical engineering or electrical engineering and 2–3 years of professional experience in solar energy, or a master’s or doctorate with experience specific to solar energy. A POSITA would have been familiar with solar module design and/or manufacturing.	A person of ordinary skill in the art (“POSITA”) at the time of filing, i.e., July 2013, “would have been someone with a bachelor’s degree in electrical engineering, applied physics, or the like, and at least three years of professional experience designing, developing, and/or researching in the field. Alternatively, that person would have had an advanced degree in electrical engineering, applied physics, or the like and at least one year of professional experience designing, developing, and/or researching in the field.

Pet. 5 (citing Ex. 1003 ¶ 31); PO Resp. 7–8 (citing Ex. 2040 ¶¶ 26–28).

Based upon the record as a whole,<sup>7</sup> we agree with Patent Owner that Petitioner’s proposal is too broad. PO Resp. 8. For example, a person who merely installs solar panels for three years (satisfying “professional experience in solar energy”) while having some familiarity with module manufacturing would not be of ordinary skill in the design aspects of the ’060 patent as, for example, reflected by the claims at issue and the ’060 patent’s text and figures. *See, e.g.*, Ex. 1001, Figs. 2a, 2b, 3a, 3b, 4a, 4b, 3:22–7:44.

On the other hand, we also determine that Patent Owner’s proposal is too narrow. A person could, for example, have ordinary skill in the art of the ’060 patent by virtue of non-professional experience (for example, academic experience). When assessing relevant experience, research work done for a university (beyond mere classroom study) would have been just as valuable as research work done for a corporation. Also, ordinary skill in the art could be demonstrated by work that requires understanding of the ’060 patent’s field even if not “designing, developing, and/or researching” in the field itself. We, thus, determine that a person of ordinary skill in the art of the ’060 patent would have been someone with a bachelor’s degree in electrical engineering, applied physics, or the like, and at least two years of

- (a) experience designing, developing, and/or researching in the field or
- (b) experience in solar energy that required an understanding of the ’060 patent’s field. Alternatively, that person would have had an advanced degree in electrical engineering, applied physics, or the like and at least one year of

- (a) experience designing, developing, and/or researching in the field or

---

<sup>7</sup> Our analysis is constrained to the extent neither party addresses the *Best Medical* factors with particularity. For example, the briefing does not address the educational level of the inventor.

(b) experience in solar energy that required an understanding of the '060 patent's field.

We next assess whether or not Dr. Kimball's testimony properly qualifies as evidence in this matter. The Federal Circuit has held that expert testimony about the perspective of a person of ordinary skill in the art (as Dr. Kimball provides here) must come from a person having at least ordinary skill in the art. *Kyocera Senco Indus. Tools, Inc. v. ITC*, 22 F.4th 1369, 1376–78 (Fed. Cir. 2022) (quoting *Sundance, Inc. v. DeMonte Fabricating Ltd.*, 550 F.3d 1356, 1362, 1364–65 (Fed. Cir. 2008)) (holding that ITC Administrative Law Judge abused discretion by admitting expert testimony of witness who lacked the experience of a person having ordinary skill in the art); see Mot. Excl. 6–7 (arguing this point). Patent Owner, however, cites no authority that expert testimony on such matters come from a person having ordinary skill in the art *at the time of the invention*. Cf. *Scentair Tech., LLC v. Prolitiec Inc.*, IPR2021-00012, Paper 22 at 61 (PTAB Apr. 22, 2022) (similarly noting a party's lack of authority on this point). Beyond needing to come from a person of ordinary skill in the art, expert testimony is admissible if the expert has the “scientific, technical, or other specialized knowledge [that] will help the trier of fact to understand the evidence or to determine a fact in issue.” Fed. R. Evid. 702. Furthermore, “[t]here is ... no requirement of a perfect match between the expert's experience and the relevant field.” USPTO, Patent Trial and Appeal Board Consolidated Trial Practice Guide, 34 (Nov. 2019).

Here, Petitioner adequately establishes that Dr. Kimball qualifies as a person of ordinary skill in the art of the '060 patent. In particular, we find the following:

1. Dr. Kimball received a doctorate in electrical and computer engineering in 2007 from the University of Illinois at Urbana-Champaign. Ex. 1003, App. A, 1.
2. From 1994 to 1995, Dr. Kimball designed solar modules for a solar powered vehicle using half cut cells. Ex. 1054 ¶ 16.
3. Dr. Kimball founded SmartSpark Energy Systems, Inc. (later named SolarBridge Technologies) and was involved in all aspects of the company including designing and constructing a custom solar panel. *Id.* ¶ 17. Dr. Kimball developed micro-inverters and that work required understanding the module and challenges of module design. *Id.* ¶ 18. Dr. Kimball’s work resulted in various related publications and patents. *Id.*
4. Dr. Kimball designed custom solar modules as part of a system marketed as ForeverPower. *Id.* ¶ 19. That work resulted in several patents and publications.
5. Dr. Kimball is a tenured professor of electrical and computer engineering at Missouri University of Science and Technology where he has researched and taught since 2008 in solar assemblies and solar module design. Ex. 1054 ¶¶ 20–26; Ex. 1003, App. A, 1.
6. Dr. Kimball was lead author on a 2009 paper entitled “System Design Approach for Unattended Solar Energy Harvesting Supply” which discusses Dr. Kimball’s solar module design research. Ex. 1054 ¶ 23.
7. Dr. Kimball has twice taught the Photovoltaic Systems course which focuses on PV system design. Ex. 1054 ¶ 25; Ex. 1003, App. A, 17.
8. Since 2015, Dr. Kimball has worked closely with students to design and fabricate solar modules. Ex. 1054 ¶ 26.

Based on Dr. Kimball’s cumulative experience, we determine that Dr. Kimball is a person having ordinary skill in the art of the ’060 patent and

further determine that Dr. Kimball was a person of ordinary skill in the art of the '060 patent as of the '060 patent's priority date. We also determine that Dr. Kimball's testimony is helpful to understand the evidence or determine facts in issue. For example, Dr. Kimball provides helpful explanations of the prior art's teachings. *See* Ex. 1003; Ex. 1054. We, thus, *deny* Patent Owner's motion to exclude Dr. Kimball's testimony. When considering Dr. Kimball's testimony, we weigh the testimony based, in part, on considering the totality of Dr. Kimball's relevant experience.

C. *Exclusion of Exhibits 1060–1068 and 1070–1077*

Patent Owner argues that Exhibits 1060–1068 and 1070–1077 should be excluded because, for example, the exhibits are not cited by Petitioner directly and, for many of the exhibits, the exhibits are addressed by Dr. Kimball in only a cursory fashion. Mot. Excl. 10–11. Petitioner argues that each of the exhibits are relevant to issues Patent Owner raised in opposition or were submitted to provide the full scope of documents Dr. Kimball considered. Opp. Mot. Excl. 10–13. For the reasons well explained by Petitioner, we agree that Exhibits 1060, 1065, 1067, 1073, and 1074–1077 are relevant, and we decline to exclude these exhibits. We note, however, that we do not consider Petitioner arguments not made in the Petition or not properly presented in Petitioner's Reply.

With respect to Exhibits 1061–1064, 1066, 1068, and 1070–1072, we consider those documents only to the extent to which they are evidence of Dr. Kimball's diligence in forming his opinions. We do not consider the substance of those documents to the extent Petitioner does not address their substance in its Petition and Reply.

For the reasons above, we *deny* Patent Owner's motion to exclude.

#### IV. OTHER PRELIMINARY MATTERS

##### A. *Level of Ordinary Skill in the Art*

We address the level of ordinary skill in the art in the context of Patent Owner’s motion to exclude testimony of Dr. Kimball. *See* Section III(B), *supra*.

##### B. *Claim Interpretation*

We interpret claims using the same standard applied in a civil action under 35 U.S.C. § 282(b), “including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b) (2020). Under that standard, we interpret the claim language as it would be understood by one of ordinary skill in the art in light of the specification. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005)) (“The ordinary and customary meaning ‘is the meaning that the term would have to a person of ordinary skill in the art in question.’”). We construe only terms in controversy and then only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

The Petition argues that all claim terms should be given their plain and ordinary meaning. Pet. 17. Patent Owner, for the most part, does not dispute this. *See generally* PO Resp. 13.

Patent Owner argues, however, that where claim 4 recites “the first and second solar cell series are coupled with the bypass diode of the first solar cell unit via **a first cross-connector**, and the third and fourth solar series are coupled with the bypass diode of the second solar cell unit via **a second cross-connector**,” the word “a” means “one.” PO Resp. 13–14. In particular, Patent Owner argues that a person of ordinary skill in the art

would appreciate that each bypass diode of claim 1 is “necessarily coupled via one or more cross-connectors” and that “a” meaning “one” in claim 4 is necessary for claim 4 to further limit claim 1. *Id.*

Petitioner argues that “a” means “one or more.” Pet. Reply 2–4. We agree with Petitioner. The ’040 patent explicitly defines “a” consistently with Petitioner’s position by stating that “it should be noted that the term ‘comprising’ does not exclude other elements or steps and the ‘a’ or ‘an’ does not exclude a plurality.” Ex. 1001, 7:62–63. The ’040 patent’s explicit definition is consistent with typical usage of “a” in this patent law context. *See, e.g., KCJ Corp. v. Kinetic Concepts, Inc.*, 223 F.3d 1351, 1356 (Fed. Cir. 2000) (explaining that “a” in patent parlance means “one or more” for open-ended claims reciting the transitional phrase “comprising”). Patent Owner’s argument regarding claim construction is unpersuasive because Claim 4 further limits claim 1 by explicitly requiring first and second cross-connectors; claim 1 does not recite a “cross-connector.” Ex. 1001, 8:2–22. Thus, we construe “a” in this context as meaning “one or more.”

Additionally, the parties’ arguments regarding Petitioner’s second ground (anticipation by Zhang) implicate the meaning of “in parallel” in the context of claim 1’s recited “second bypass diode coupled in parallel with the third solar cell series and the fourth solar cell series.” PO Resp. 34–42; Pet. Reply 5–10. We address the meaning of “in parallel” below in the context of addressing Petitioner’s grounds. *See* Section V(B), *infra*.

Aside from the above, we determine that no claim term requires express construction for purposes of this Final Written Decision. *Nidec Motor Corp.*, 868 F.3d at 1017 (“[W]e need only construe terms that are in controversy, and only to the extent necessary to resolve the controversy.” (internal quotes and citation omitted)).



C. *Overview of the Principal Prior Art References*

The challenges rest on three principal prior art references—Huang, Wu, and Zhang. Patent Owner does not challenge the prior art status of these references but addresses the merits of Petitioner’s challenges as if they qualify as prior art. *See generally* PO Resp. We provide an overview of each of the three references below.

1. *Overview of Huang (Ex. 1005)*

Huang is a Chinese patent publication that relates to a solar cell assembly. Ex. 1005, (10), (57). The solar cell assembly comprises a plurality of cell strings, where the cell strings are distributed on a light receiving surface of a back panel and form a plurality of unit groups mutually connected in series. *Id.* at (57). Each unit group comprises two cell strings mutually connected in parallel. *Id.* Each cell string is composed of a plurality of cell units connected in series. *Id.* The cell unit includes at least two sub-cells formed through equal cutting, having the same size, and mutually connected in series. *Id.*

Below, we reproduce Huang Figures 1(A) and (B).

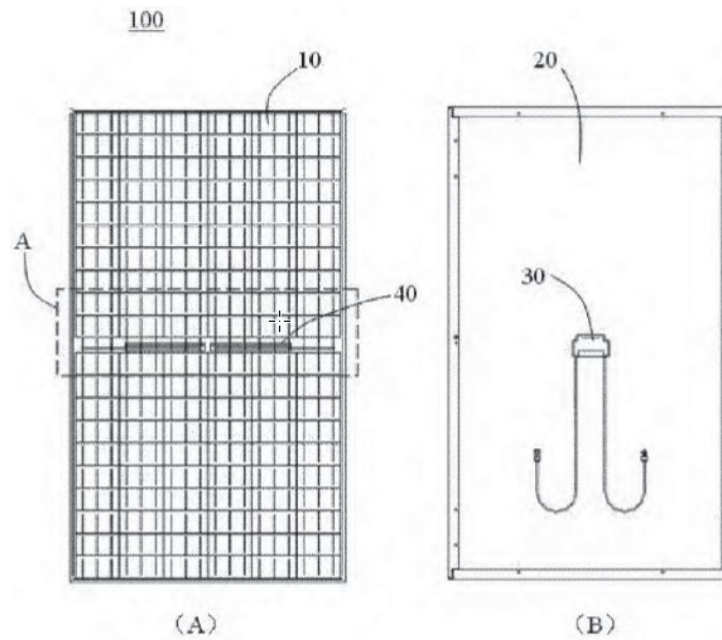


FIG. 1

“F[igures] 1(A) and 1(B) are schematic diagrams of a solar cell assembly.”  
*Id.* ¶ 12. “[A] solar cell assembly 100 compris[es] a plurality of cell units 10, a back panel 20 for carrying the cell units, a junction box 30 mounted at a central position of the back panel 20, and a bus bar assembly 40 connecting the cell units 10 and the junction box 30.” *Id.* ¶ 16.

Below, we reproduce Huang Figure 2.

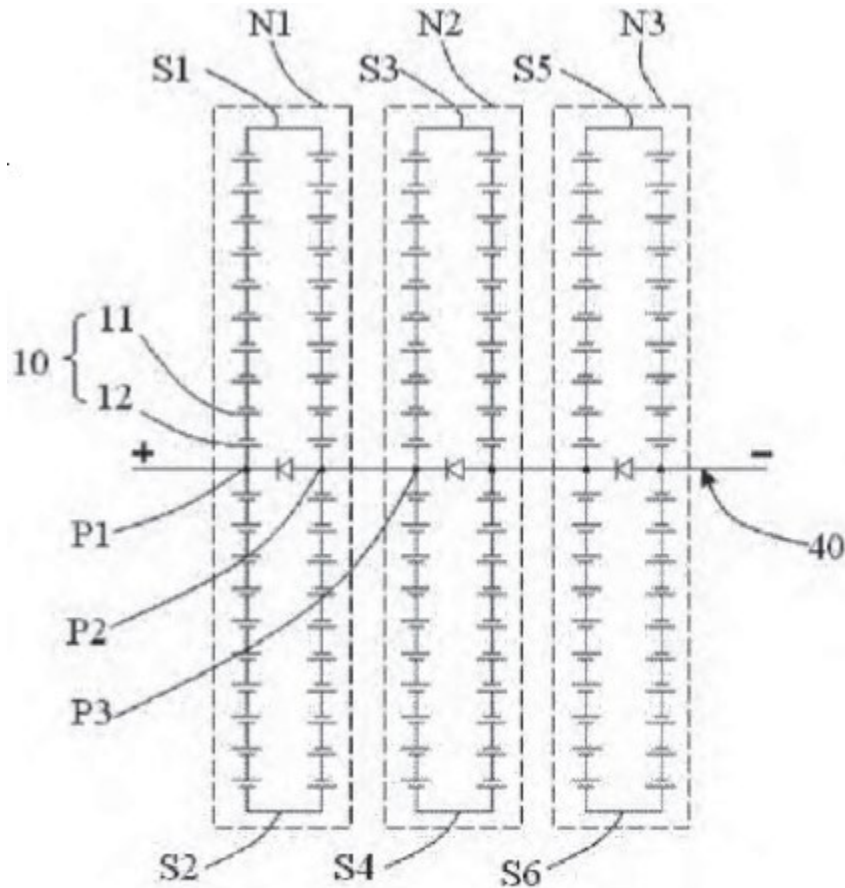


FIG. 2

“F[igure] 2 is a schematic diagram of a circuit principle of the solar cell assembly.” *Id.* ¶ 13. “As shown in F[igure] 2, the cell units 10 are arranged in a matrix to form a plurality of columns of cell strings S1–S6, where[] all cell units 10 in each cell string are mutually connected in series, and the head and tail of the cell string go out through the bus bar assembly 40 and are connected into the junction box 30.” *Id.* ¶ 17. “[T]he first string S1 and the second string S2 are distributed on the top and on the bottom and connected in parallel to form a first unit group N1.” *Id.* ¶ 18. “[T]he third string S3 and fourth string S4 are distributed on the top and on the bottom and connected in parallel to form a second unit group N2.” *Id.* “[T]he fifth string S5 and the sixth string S6 are also distributed on the top and on the

bottom and connected in parallel to form a third unit group N3.” *Id.* “[T]he first unit group N1, the second unit group N2, and the third unit group N3 are connected in series, and positive and negative poles go out from two ends.” *Id.* In a preferred implementation, the cell unit 10 comprises two sub-cells 11, 12 of the same size and connected in series that are formed through cutting in two equal parts, and the size of the sub-cells is one half of the conventional cells. *Id.* ¶ 19.

Below, we reproduce Huang Figure 3.

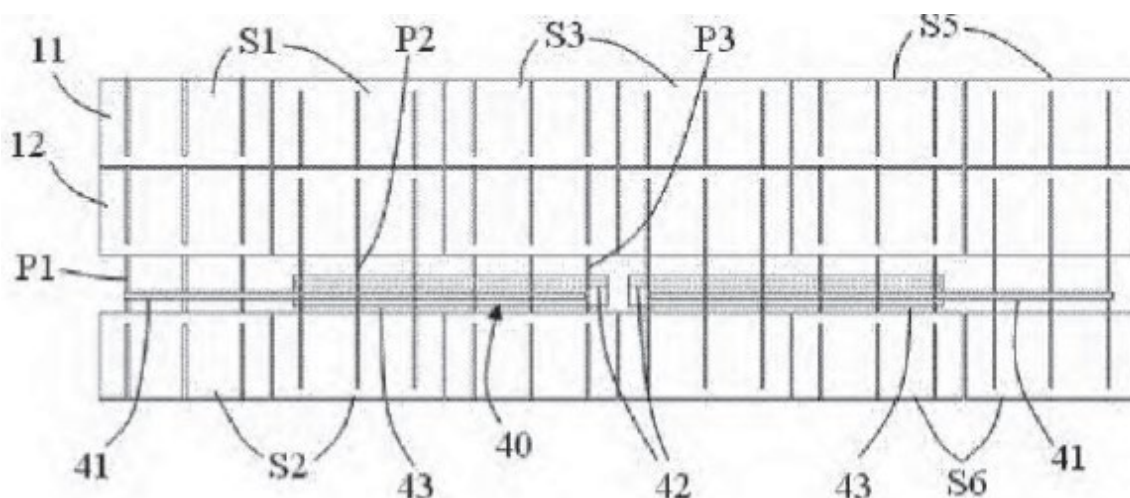


FIG. 3

“F[igure] 3 is a partially enlarged view of part A in the solar cell assembly shown in F[igure] 1.” *Id.* ¶ 14. “[T]he bus bar assembly 40 is located at a central position of the back panel 20 and divides the back panel 20 into two regions for placing cells[:] one upper region and one lower region.” *Id.* ¶ 20. The first, third, and fifth cell strings S1, S3, S5 are located in the upper region, while the second, fourth, and sixth cell strings S2, S4, S6 are located in the lower region. *Id.* “The bus bar assembly 40 comprises two first bus bars 41, two second bus bars 42, and an insulative layer 43 for insulative isolation of the first bus bars and the second bus bars.” *Id.*

2. Overview of Wu (Ex. 1007)

Wu is a Chinese patent publication that relates to a solar module. Ex. 1007, (10), (57). “[T]he module consist[s] of two circuits, where[ ] the two circuits are respectively disposed on two sides of the solar module and respectively converged to a junction box, and the junction box is disposed in the middle of the solar module.” *Id.* at (57). “[T]he two circuits respectively comprise at least one branch circuit formed by connecting a plurality of solar cells and diodes in parallel.” *Id.*

Below, we reproduce Wu Figure 3.

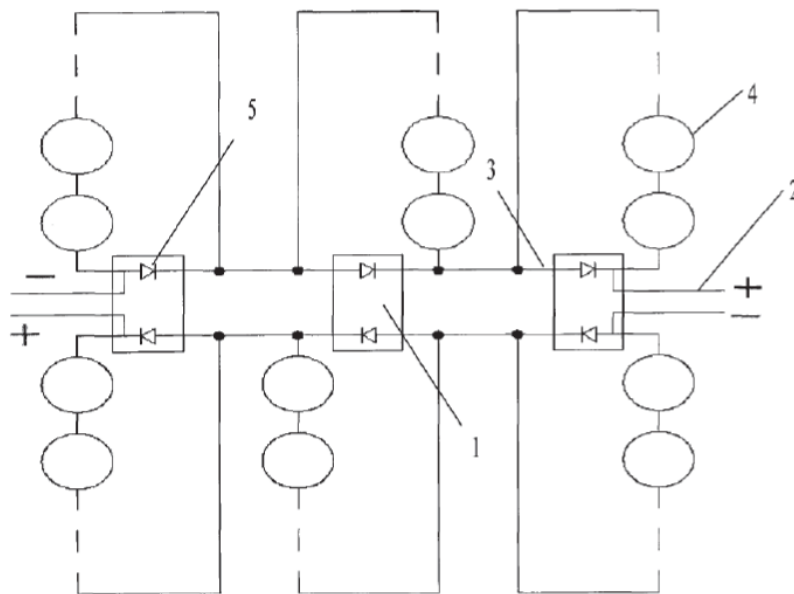


FIG. 3

Figure 3 is a schematic diagram of a circuit of a solar module. *Id.* ¶ 17. As shown in Figure 3, the solar module 6 “consists of two circuits, the two circuits are respectively disposed on two sides of the solar module and respectively converged to a junction box 1, and the junction box 1 is disposed in the middle of the solar module.” *Id.* ¶ 21. “Each junction box 1 comprises two mutually independent bypass diodes 5.” *Id.* ¶ 22.

Below, we reproduce Wu Figure 4.

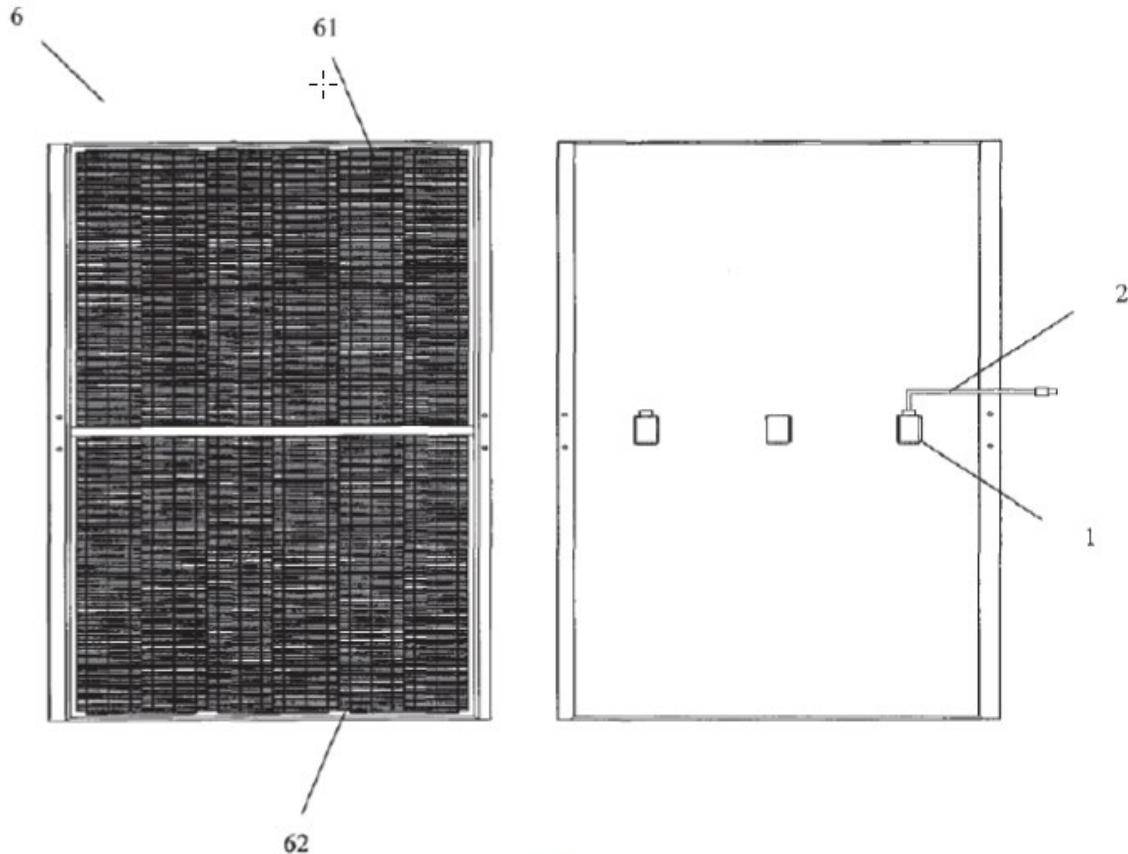


FIG. 4

Figure 4 is another schematic diagram of a solar module. *Id.* ¶ 18. As illustrated in Figure 4, “solar module 6 ... comprises 72 solar cells ... divided into two solar sub-modules 61 and 62 of 36 solar cells in series connection.” *Id.* ¶ 22. “[T]he two solar sub-modules 61 and 62 are not electrically connected inside the solar module 6, and the two circuits are respectively converged to the junction box 1.” *Id.* The “two mutually independent bypass diodes 5 [(previously described in relation to Figure 3; not shown in Figure 4)] are respectively connected with the two solar sub-modules 61 and 62 on two sides in parallel.” *Id.*

3. *Overview of Zhang (Ex. 1009)*

Zhang is a Chinese patent publication that relates to a solar battery assembly structure. Ex. 1009, (10), (57). The “solar battery assembly comprises a plurality of solar battery strings packaged through a packaging structure.” *Id.* at (57). “[S]olar cells are formed by cutting a complete solar cell into solar cells of the same specifications.” *Id.* “[S]olar battery strings in each solar battery string group are connected with each other in parallel.” *Id.* “[S]olar battery string groups are connected in series.” *Id.* “[E]ach solar battery ... has the same number of solar cells, the solar battery strings groups have the same number of solar battery strings, and the number of solar battery strings in each solar battery string group is the reciprocal of a cell cutting ratio.” *Id.*

We reproduce below Zhang Figure 3.

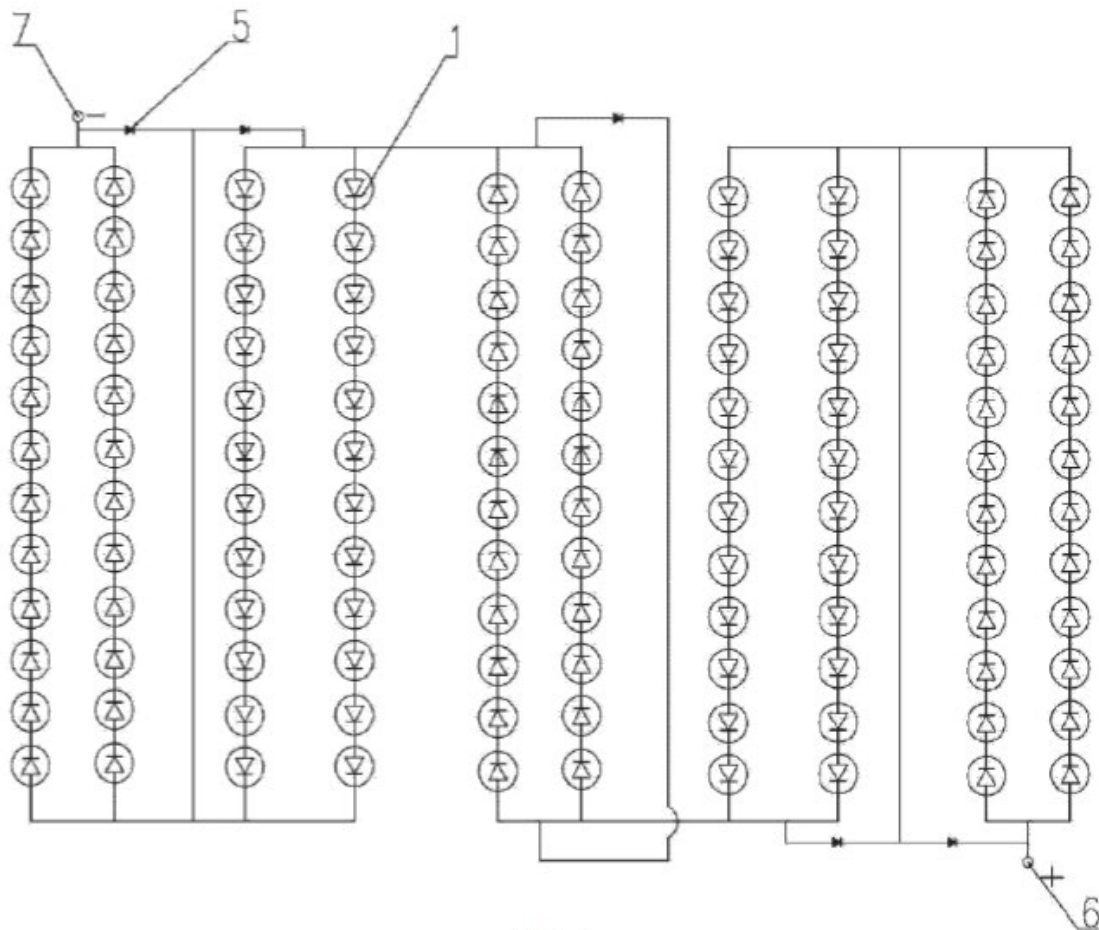


FIG. 3

Figure 3 illustrates a wiring diagram of cells inside a conventional solar assembly. *Id.* ¶ 13. “As shown in F[igure] 3, a solar battery assembly comprises a plurality of solar battery strings packaged through a packaging structure, where[] the solar battery strings are formed by connecting a plurality of solar cells 1 in series.” *Id.* ¶ 19. “The solar cells 1 are formed by cutting a complete solar cell into solar cells of the same specifications using a cell cutting process.” *Id.* “[T]wo or more adjacent solar battery strings form one group, solar battery strings in each solar battery string group are connected with each other in parallel, and solar battery string groups are connected sequentially in series.” *Id.* “[E]ach solar battery string has the



same number of solar cells 1, the solar battery string groups have the same number of solar battery strings, and the number of solar battery strings in each solar battery string group is the reciprocal of a cell cutting ratio.” *Id.*

Below, we reproduce Zhang Figure 6.

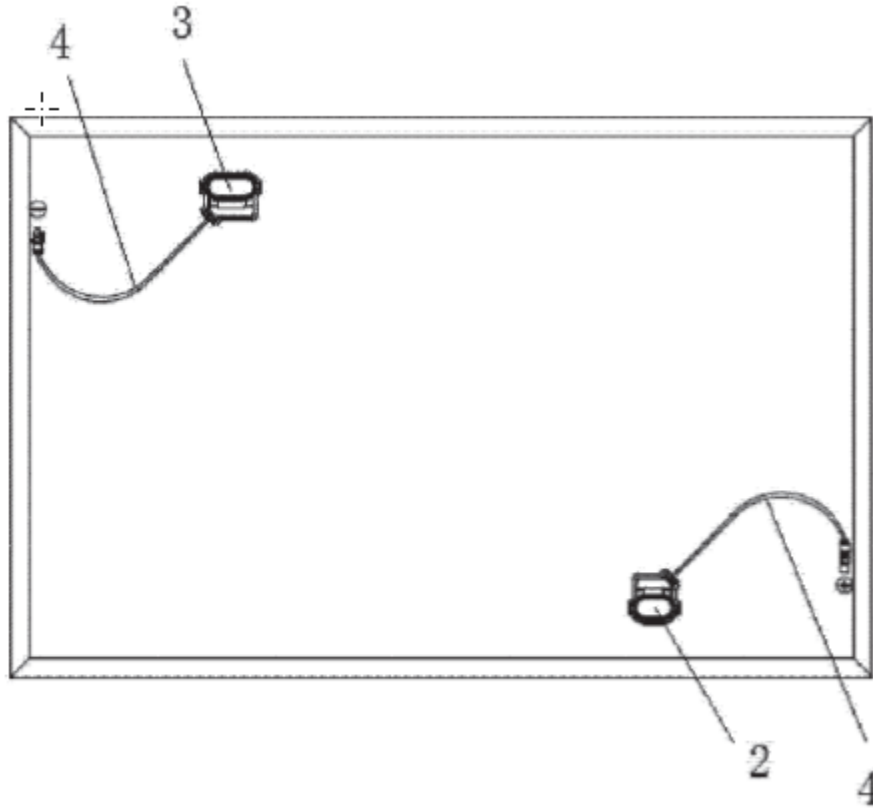


FIG. 6

Figure 6 illustrates “a schematic diagram of a back structure of [a] solar assembly.” *Id.* ¶ 16. As shown in “Fig[ure] 6, the assembly has two junction boxes, which are a positive junction box 2 and a negative junction box 3, respectively.” *Id.* ¶ 19. The “positive junction box 2 and the negative junction box 3 are located on the back of the assembly, respectively, and are arranged in a mis-aligned manner.” *Id.*

## V. ANALYSIS OF THE CHALLENGES

Below, we address each of Petitioner’s three grounds in the order the Petition presents them.

A. *Ground One: Obviousness Based on Huang and Wu*

Petitioner asserts that claims 1–6, 11, and 13 would have been obvious over Huang in view of Wu. Pet. 18–52. Petitioner relies on Huang as teaching or suggesting most of the recitations of, for example, claim 1. *Id.* at 18–22 (Huang overview), 25–45 (mapping to claim 1). Petitioner argues that Wu teaches or suggests, in combination with Huang, claim 1’s first and second junction boxes. *Id.* at 22–25 (Wu overview), 31–39 (first junction box); 43–45 (second junction box). Because Petitioner’s ground one requires combining the teachings of Huang and Wu, we first address motivation to combine. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring “articulated reasoning with some rational underpinning to support the legal conclusion as to obviousness”)).

Petitioner argues that Huang teaches a first junction box. *Id.* at 31–32 (citing Ex. 1005 ¶ 16 (Huang referring to “junction box 30 mounted at a central position of the back panel 20, and a bus bar assembly 40 connecting the cell units 10 and the junction box 30”)). Petitioner argues that Wu teaches multiple junction boxes each having a bypass diode. *Id.* at 33; *see id.* at 23 (citing Ex. 1007 ¶ 22 (Wu describing “[e]ach junction box 1 comprises two mutually independent bypass diodes 5 that are respectively connected with the two solar sub-modules 61 and 62 on two sides in parallel”)).

Petitioner argues that a person of skill in the art would have been motivated to modify Huang to implement Wu’s three separate junction boxes each containing a bypass diode. Pet. 33, 43; *see* Pet. Reply 16–19. In particular, Petitioner argues that Huang and Wu belong to the same field and both seek to solve problems “relating to resistive losses and improving power output of the solar cell assembly.” Pet. 33. Dr. Kimball’s testimony as

well as the text of Huang and Wu support this point. Ex. 1003 ¶¶ 75–85; Ex. 1005, (57) (Huang abstract describes solar cell assembly “which can significantly reduce losses on a line inside the assembly” and achieve “better efficiency[,] consistency[,] and matching”); Ex. 1007, (57) (Wu abstract describes solar module that reduces “overall series resistance of the solar module”).

Petitioner argues that Wu teaches the advantage of housing bypass diodes in separate junction boxes. Pet. 35, 43–45. Wu teaches that housing bypass diodes in separate junction boxes “can shorten the length of the bus bar 3, reduce the series resistance, and improve the overall output performance of the solar module.” Ex. 1007 ¶ 22. Wu also teaches that placing junction boxes near the edges of the solar assembly “can shorten the length of connection cables between the solar modules, thereby reducing the resistance of the system formed by the solar modules, improving the output performance of the system, and lowering the system cost.” *Id.* ¶ 25.

Petitioner annotates Huang’s Figure 3 to illustrate how a person of ordinary skill in the art would have modified Huang to obtain the advantages of Wu’s diodes in multiple junction boxes. Pet. 37. Petitioner’s explanation for the modification is supported by Dr. Kimball’s testimony. Ex. 1003 ¶¶ 81, 90. In view of the references’ teachings as discussed herein, we find that Dr. Kimball’s testimony is credible as to combining the teachings of Huang and Wu.

The evidence also supports that a person of ordinary skill in the art would have had a reasonable expectation of success in predictably combining the teachings of Huang and Wu as Petitioner suggests. Pet. 38. Again, Dr. Kimball’s testimony supports this point. Ex. 1003 ¶¶ 82, 91.

Wu's express suggestions to place diodes in multiple junction boxes to achieve Wu's advantages also support this point. Ex. 1007 ¶¶ 22, 25.

Patent Owner argues that a person of ordinary skill in the art would not have modified Huang in view of Wu because the two references have "incompatible design philosophies." PO Resp. 20 (removing bold and capitalization). Patent Owner emphasizes that Huang emphasizes its dual-row, overlapping cross connectors to avoid sapping efficiency due to differences among cells in a cell string. *Id.* at 21. Patent also emphasizes that Wu addresses power output in a different manner by splitting its assembly into independent circuits, and that Wu teaches embodiments having only one junction box. *Id.* at 21–22 (quoting Ex. 1007 ¶ 22 (Wu stating "the two circuits are not connected inside the solar module")).

Patent Owner further argues that a person of ordinary skill in the art would have appreciated that Huang's single junction box has advantages over multiple junction boxes. PO Resp. 23–27; *see* Sur-reply 11–13. Patent Owner presents evidence that, for example, multiple junction boxes require more holes in the module that require more sealing and more potential failure points. PO Resp. 24 (citing Ex. 1031 ¶ 41 (Pinarbasi patent explaining downside of holes in junction boxes)). Patent Owner further argues that, in some orientations, multiple junction boxes would result in longer cables. *Id.* at 24–26 (citing Ex. 2040 ¶ 63 (Dr. Shea illustrating this point)).

Patent Owner also argues that a person of ordinary skill in the art would have, if anything, implemented Wu's split circuit design into Huang in order to achieve better shading performance. *Id.* at 27 (citing Ex. 2040 ¶ 66 (Dr. Shea providing evidence)). Patent Owner argues that Wu makes

more complicated design selections in order to secure other benefits. *Id.* at 27–30 (citing Ex. 1003, Ex. 2040).

In assessing these arguments, we consider all of the evidence cited by the parties and consider the references as a whole. On balance, we find that the preponderance of the evidence supports Petitioner’s argument that a person of ordinary skill in the art would have had reason to combine Wu’s multiple junctions with Huang and would have had a reasonable expectation of predictably doing so successfully. In particular, we are persuaded by Wu’s express teachings that multiple junction boxes may have advantages. Ex. 1007 ¶¶ 22, 25.

Although Patent Owner persuasively argues (*see, e.g.*, PO Resp. 24) that multiple junction boxes could incur disadvantages (such as added complexity and more holes that must be sealed against moisture), a person having ordinary skill in the art would have been able to make a design choice weighing these disadvantages against potential advantages. *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (“a given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine”). And while Patent Owner persuasively argues that multiple junction boxes could increase cable length in some orientations (*see* PO Resp. 24–26), Petitioner persuasively counters that this disadvantage can be avoided by using a portrait orientation or rotating certain modules. Pet. Reply 18–19 (citing Ex. 1054 ¶ 116 (Dr. Kimball providing evidence)). A person of ordinary skill in the art would have recognized that Wu’s multiple junction boxes could offer advantages to Huang’s design in the same way it improves Wu. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

Patent Owner’s arguments contrasting Huang’s design with Wu’s split circuit design (*see, e.g.*, PO Resp. 21–22) do not sufficiently detract from Petitioner’s persuasive evidence supporting reason to combine the references because a person of ordinary skill in the art would not have had to incorporate *all* of Wu’s teachings into Huang. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . .”). Rather, as we explain above, Petitioner persuasively establishes by a preponderance of the evidence that a person of ordinary skill in the art would have incorporated Wu’s teachings regarding diodes within multiple junction boxes into Huang.

Having addressed reason to combine, we next address the challenged claims’ recitations.

Claim 1 first recites, “[a] solar cell assembly comprising.” As Petitioner argues, the preponderance of the evidence supports that Huang teaches or suggests a solar cell assembly. Pet. 25–26; Ex. 1005 ¶ 1 (Huang teaching “[t]he present utility model relates to . . . a solar cell assembly”). Patent Owner does not dispute this recitation.

Claim 1 next recites, “a first solar cell unit, comprising.” As Petitioner argues, the preponderance of the evidence supports that Huang teaches or suggests a first solar cell unit. Pet. 26–27; Ex. 1005 ¶¶ 1, 4, 6, 18, Fig. 2; Ex. 1003 ¶ 65. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a first solar cell series including a plurality of half-cut solar cells connected in series; a second solar cell series, coupled in parallel with the first solar cell series, including a plurality of half-cut solar cells connected in series.” As Petitioner argues, the preponderance of the evidence supports that Huang teaches or suggests this recitation. Pet. 28–30;

Ex. 1005 ¶¶ 18–20, 22; Ex. 1003 ¶ 68–70. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a first bypass diode coupled in parallel with the first solar cell series and the second solar cell series.” As Petitioner argues, the preponderance of the evidence supports that Huang teaches this recitation. Pet. 30–31; Ex. 1005 Fig. 2; Ex. 1003 ¶¶ 71–72. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a first junction box containing the first bypass diode.” Petitioner argues that Huang teaches or suggests a single junction box housing all three bypass diodes. Pet. 31–33; Pet. Reply 13–16. Patent Owner argues that Huang does *not* teach or suggest that its diodes are in a junction box. PO Resp. 15–20; Surreply 8–11.

We find that Huang is unclear as to whether or not its junction box contains its diodes. Huang teaches, for example, “a junction box disposed on the back panel, and a bus bar assembly connecting the cell strings and the junction box,” but it is not clear whether or not the bus bar assembly is within the junction box. Ex. 1005, Abstr. Similarly, Huang teaches that “the head and tail of the cell string go out through the bus bar assembly 40 and are connected into the junction box 30,” but this passage is again unclear. *Id.* ¶ 17; *see id.* ¶¶ 20, 21 (discussing bus bar assembly positioning but not clearly stating whether bus bar is in the junction box).

We also find, however, that the option of putting diodes into a junction box was well known. *See, e.g.*, Ex. 1054 ¶¶ 98–107 (Dr. Kimball explaining “that bypass diodes were routinely placed in a junction box in solar modules”); Ex. 1002, 927 (Patent Owner stating that “[prior art patent] Pinarbasi, like the conventional modules, discloses using a junction box to house the bypass diodes”); Ex. 1053, 41:16–19 (Dr. Shea agreeing that

bypass diodes were housed in junction boxes on solar panels before 2013). Because Huang did not explicitly teach anything to the contrary, a person of ordinary skill in the art, reading Huang, therefore would have had reason to consider placing Huang's diodes in a junction box, as was conventional in the art at the time of the invention.

Moreover, although the parties spill much ink on whether or not Huang teaches a diode in a junction box, the point is ultimately not critical to this asserted ground. The Petition alleges that this recitation is obvious in view of Huang combined with Wu's teachings. Pet. 31–39. There is no dispute that Wu teaches putting diodes in multiple junction boxes. Ex. 1007 ¶¶ 4, 22. And, as we explain above, it would have been obvious to combine this teaching of Wu with Huang. A person of ordinary skill in the art would have known, based on Wu's teachings, that putting diodes within multiple junction boxes was a good design option and would have had good reason to implement this teaching into Huang. The preponderance of the evidence, thus, supports that a person of ordinary skill in the art would have reached this recitation.

Claim 1 next recites, “a second solar cell unit, coupled in series with the first solar cell unit, comprising.” As Petitioner argues, the preponderance of the evidence supports that Huang teaches or suggests this recitation. Pet. 39–40; Ex. 1005, Fig. 2, ¶¶ 6, 18; Ex. 1003 ¶ 85. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a third solar cell series including a plurality of half-cut solar cells connected in series; a fourth solar cell series, coupled in parallel with the third solar cell series, including a plurality of half-cut solar cells connected in series.” As Petitioner argues, the preponderance of the evidence supports that Huang teaches or suggests this recitation. Pet. 40–42;



Ex. 1005, Fig. 2, ¶¶ 18–19; Ex. 1003 ¶¶ 85–87. Petitioner illustrates Huang’s teachings by annotating Huang Figure 2. Pet. 42. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a second bypass diode coupled in parallel with the third solar cell series and the fourth solar cell series.” As Petitioner argues, the preponderance of the evidence supports that Huang teaches or suggests this recitation. Pet. 42–43; Ex. 1005, Fig. 2, ¶¶ 6, 18; Ex. 1003 ¶ 88. Petitioner illustrates Huang’s teachings by annotating Huang Figure 2. Pet. 43. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a second junction box containing the second bypass diode.” As with claim 1’s first junction box, Petitioner argues that the combination of Huang and Wu discloses this recitation. Pet. 43–45. For the reasons explained above, we agree that Wu teaches or suggests multiple diodes in separate junction boxes and that the preponderance of the evidence supports that a person having ordinary skill in the art would have combined this teaching of Wu with Huang’s teachings in the manner Petitioner explains.

Claim 2 recites, “[t]he solar cell assembly of claim 1 wherein the first solar cell series has substantially the same open circuit voltage,  $V_{oc}$ , as the second solar cell series in the solar cell unit.” As Petitioner argues, the preponderance of the evidence supports that Huang teaches or suggests this recitation. Pet. 45–46; Ex. 1005 ¶ 19; Ex. 1003 ¶¶ 92–93. Patent Owner does not dispute this recitation.

Claim 3 recites, “[t]he solar cell assembly of claim 1, wherein the first and second solar cell series are mirror images of each other with respect to the bypass diode of the first solar cell unit, and the third and fourth solar cell series are mirror images of each other with respect to the bypass diode of the

second solar cell unit.” As Petitioner argues, the preponderance of the evidence supports that Huang teaches or suggests this recitation. Pet. 46–47; Ex. 1005, Fig. 2; Ex. 1003 ¶¶ 94–95. Petitioner illustrates Huang Figure 2 to illustrate this point. Pet. 47. Patent Owner does not dispute this recitation.

Claim 4 recites, “[t]he solar cell assembly of claim 1, wherein the first and second solar cell series are coupled with the bypass diode of the first solar cell unit via a first cross-connector, and the third and fourth solar cell series are coupled with the bypass diode of the second solar cell unit via a second cross-connector.” As Petitioner argues, the preponderance of the evidence supports that a person having ordinary skill in the art would have combined the teachings of Huang and Wu to reach this recitation. Pet. 48–49; Ex. 1003 ¶ 96; Ex. 1007 ¶ 22. A person having ordinary skill in the art would have simplified Huang’s assembly by using multiple junction boxes and arriving at a simplified bus bar structure. Ex. 1003 ¶ 97. Petitioner annotates Huang Figure 3 to illustrate this point. Pet. 49; Ex. 1005, Fig. 3. Patent Owner does not dispute this recitation.

Claim 5 recites, “[t]he solar cell assembly of claim 4, further comprising a central cross-connector assembly combining the first cross-connector and the second cross-connector as a single assembly.”

Petitioner argues that the combination of Huang and Wu would result in a single assembly. Pet. 49–50. Petitioner supports this position with Dr. Kimball’s Declaration. Ex. 1003 ¶ 98. Petitioner illustrates the combination by modifying Huang Figure 3. Pet. 50 (depicting modified Ex. 1005, Fig. 3).

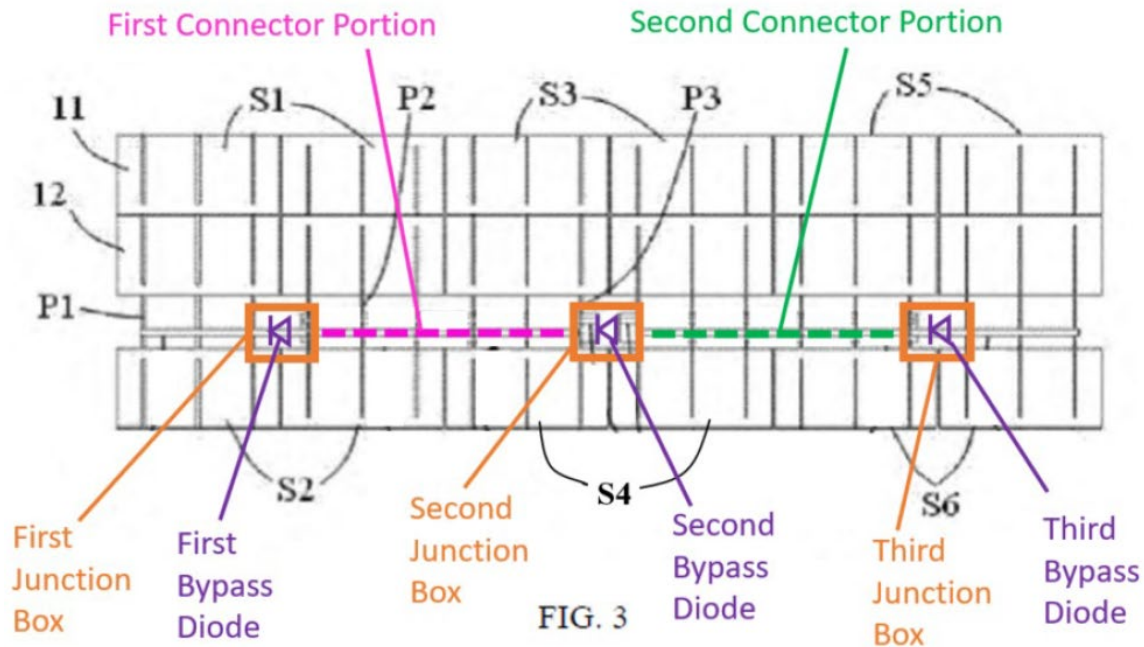
Patent Owner argues that “[n]either Huang nor Wu discloses a central cross-connector assembly as a single assembly, as required by claims 5, 6, and 13.” PO Resp. 30–31. Petitioner does not dispute this point but rather emphasizes that a person of ordinary skill in the art would have reached a

single assembly based on the combined teachings of Huang and Wu. Pet. Reply 19.

Patent Owner further argues that Petitioner does not adequately explain why Huang or Wu would have motivated a person having ordinary skill in the art to create a single assembly as claim 5 recites. PO Resp. 31; Sur-reply 14. We disagree. Petitioner's expert, Dr. Kimball, explains why a person having ordinary skill in the art combining Wu's teachings with Huang would reach modified Huang Figure 3 and would, because of this modified configuration, employ a single assembly. Ex. 1003 ¶ 98; *see* Ex. 1054 ¶¶ 119–120. Patent Owner's expert, Dr. Shea, however, opines that both Huang and Wu isolate bus bars and explains why a person having ordinary skill in the art would not have departed from this teaching of Huang and Wu. Ex. 2040 ¶¶ 72–74.

Considering the record as a whole, the preponderance of the evidence best supports the Petitioner's arguments. As we address above, Petitioner and Dr. Kimball persuasively explain why a person of ordinary skill in the art would have combined Wu's multiple junction boxes with Huang's teachings. Petitioner and Dr. Kimball also explain why combining the teachings of Wu with Huang would result in the apparatus of modified Figure 3 as Petitioners depicts. Pet. 50; Ex. 1003 ¶ 98. We reproduce

Petitioner's modified Huang Figure 3 below.



Huang Figure 3 depicts “a partially enlarged view of part A” of Huang’s solar cell assembly as labeled in Huang Figure 1. Ex. 1005 ¶ 14. Petitioner labels a first connector portion and colors it pink. Ex. 1003 ¶ 98. Petitioner labels the second connector portion and colors it green. *Id.* Once multiple junction boxes are introduced to Huang, the illustrated pink and green cross-connectors terminate at a single bypass diode. *Id.* Dr. Kimball credibly opines that, because of this configuration (cross-connectors next to each other and connected to a single bypass diode), a person of ordinary skill in the art would have chosen to fabricate these cross-connectors as a single assembly. *Id.*

Patent Owner does not identify sufficient evidence to detract from the merits of Dr. Kimball’s persuasive position. Rather, Patent Owner emphasizes that Huang and Wu do not teach a central cross-connector assembly as a single assembly and argues that Petitioner fails to explain what would have motivated a person of ordinary skill in the art to reach such

an assembly. PO Resp. 31; Ex. 2040 ¶¶ 72–74 (Dr. Shea supporting Patent Owner’s points). As explained above, however, Petitioner provides evidence (in the form of Dr. Kimball’s testimony) that based on the configuration a person of ordinary skill would have arrived at by combining the teachings of Huang and Wu, a person of ordinary skill in the art would also reach a single assembly. 1003 ¶ 98; *see* Pet. Reply 19; Ex. 1054 ¶¶ 119–120 (Dr. Kimball reemphasizing his position in sur-reply). Even if neither reference explicitly teaches a cross-connector assembly as a single assembly, Petitioner persuasively argues that a single assembly is the natural result of combining the references teachings. *KSR*, 550 U.S. at 421 (“A person of ordinary skill is also a person of ordinary creativity, not an automaton”). We thus determine that, as Petitioner argues, the preponderance of the evidence supports that the combination of Huang and Wu teaches or suggests this recitation.

Claim 6 recites “[t]he solar assembly of claim 5 wherein the central cross-connector assembly is placed substantially in a center line of the solar cell assembly.” As Petitioner argues, the preponderance of the evidence supports that it would have been obvious for a person of ordinary skill in the art to reach this recitation in view of Huang and Wu. Pet. 50–51. Wu’s bypass diodes are in separate junction boxes located along a center line of the module. Ex. 1007 ¶¶ 21–22. A person of ordinary skill in the art would have recognized advantages of this configuration and incorporated this configuration into Huang. Ex. 1003 ¶ 99. Patent Owner does not dispute this recitation.

Claim 11 recites “[t]he solar cell assembly of claim 1, wherein the first and second junction boxes are placed substantially in a centerline of the solar cell assembly.” As Petitioner argues, the preponderance of the

evidence supports that this recitation would have been obvious in view of the combination of Huang and Wu. Pet. 52–53; Ex. 1005, Fig. 3; Ex. 1003 ¶ 100. Petitioner illustrates Huang Figure 3 to illustrate this point. Pet. 52. Patent Owner does not dispute this recitation.

Claim 13 recites “[t]he solar cell assembly of claim 1, wherein the first solar cell series and the second solar cell series are coupled in parallel with the first bypass diode a [sic] via first cross-connector, the third solar cell series and the fourth solar cell series are coupled in parallel with the second by pass [sic] diode via a second cross-connector, and the first and second cross-connectors are combined as one central cross-connector assembly placed substantially in a centerline of the solar cell assembly.” As Petitioner argues, the preponderance of the evidence supports that this recitation would have been obvious in view of the combination of Huang and Wu as Petitioner explains when addressing claims 1, 4, 5, and 6. Pet. 53; Ex. 1003 ¶¶ 101–104. Patent Owner does not dispute this recitation.

In summary, Petitioner persuasively establishes by a preponderance of the evidence that the subject matter of claims 1–6, 11, and 13 would have been obvious in view of Huang and Wu.<sup>8</sup>

#### B. *Ground Two: Anticipation by Zhang*

Petitioner argues that Zhang anticipates claims 1, 2, and 4 of the ’060 patent. As a threshold matter, we address Patent Owner’s argument that the Petition cannot establish anticipation because it “relies on the suspect assumption that Figure 3 and Figure 6 of Zhang describe the same embodiment.” PO Resp. 31–33. We disagree with Patent Owner’s argument

---

<sup>8</sup> We discuss objective indicia of non-obviousness *infra*. Each obviousness determination in this decision is made only after consideration of all four *Graham* factors.

because, as we explain below, the preponderance of the evidence supports that a person of ordinary skill in the art would have understood that Figure 3 and Figure 6 of Zhang describe one embodiment of the Zhang invention. Pet. Reply 4–5 (Petitioner arguing this point).

To address Petitioner’s argument, we must consider the entirety of Zhang while directing our attention to how Zhang describes its figures. At paragraph 2, Zhang provides a “Description of Related Art” and, as part of this description, refers to its Figures 1 and 2. Ex. 1009 ¶ 2. Starting at paragraph 3, Zhang describes its “Summary of the Invention.” *Id.* ¶ 3. Thus, based on the main text of Zhang, a person of skill in the art would have understood that Figures 1 and 2 depict related (prior) art whereas the later text describes Zhang’s invention.

At paragraph 19, Zhang begins its “Detailed Description of the Invention.” *Id.* ¶ 19. At this point, Zhang references Figure 3 for the first time. Thus, it appears that Figure 3 describes “the Invention”—in other words, the Zhang invention. In the same paragraph, Zhang refers to Figures 4 and 6. Figure 3 provides a wiring diagram for the Zhang invention whereas Figure 6 provides a schematic diagram of the Zhang invention’s back structure. *Id.* at Fig. 3, Fig. 6, ¶¶ 13, 16.

Patent Owner’s argument is based on paragraph 13 of Zhang which states that “F[igure] 3 is a wiring diagram of cells inside a solar assembly *according to the prior art.*” *Id.* ¶ 13 (emphasis added); PO Resp. 32–33. Given the remainder of the text of Zhang, the most probable explanation for paragraph 13 describing Figure 3 as prior art is a simple typographical error. It is clear from, for example, Zhang paragraph 19 that Figure 3 is part of the Zhang invention. Moreover, even Zhang paragraph 13 accurately describes Zhang Figure 3, this does not negate that Zhang paragraph 19 indicates that

Figures 3 and Figure 6 both depict one embodiment of the Zhang invention. Ex. 1054 ¶¶ 57–64 (Dr. Kimball testimony supporting this reading of Zhang). As such, we agree with Petitioner that Figure 3 in combination with Figure 6 describe one apparatus and that Petitioner may use the two figures, in combination, for anticipation.

We next address each recitation of the '060 patent claims that Petitioner challenges as anticipated by Zhang. Claim 1 first recites, “[a] solar cell assembly comprising.” As Petitioner argues, the preponderance of the evidence supports that Zhang discloses a solar cell assembly. Pet. 57–58; Ex. 1009 ¶ 1 (Zhang teaching “[t]he present invention relates to the technical field of solar battery assembly structures”). Patent Owner does not dispute this recitation.

Claim 1 next recites, “a first solar cell unit, comprising.” As Petitioner argues, the preponderance of the evidence supports that Zhang discloses “a solar cell assembly.” Pet. 58–59; Ex. 1009 ¶¶ 4, 19, Fig. 3; Ex. 1003 ¶¶ 112–115. Petitioner annotates Figure 3 of Zhang to illustrate this recitation. Pet. 59. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a first solar cell series including a plurality of half-cut solar cells connected in series; a second solar cell series, coupled in parallel with the first solar cell series, including a plurality of half-cut solar cells connected in series.” As Petitioner argues, the preponderance of the evidence supports that Zhang discloses this recitation. Pet. 59–61; Ex. 1009 ¶¶ 7, 19–22, Fig. 3; Ex. 1003 ¶¶ 116–117. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a first bypass diode coupled in parallel with the first solar cell series and the second solar cell series.” As Petitioner argues, the preponderance of the evidence supports that Zhang discloses this



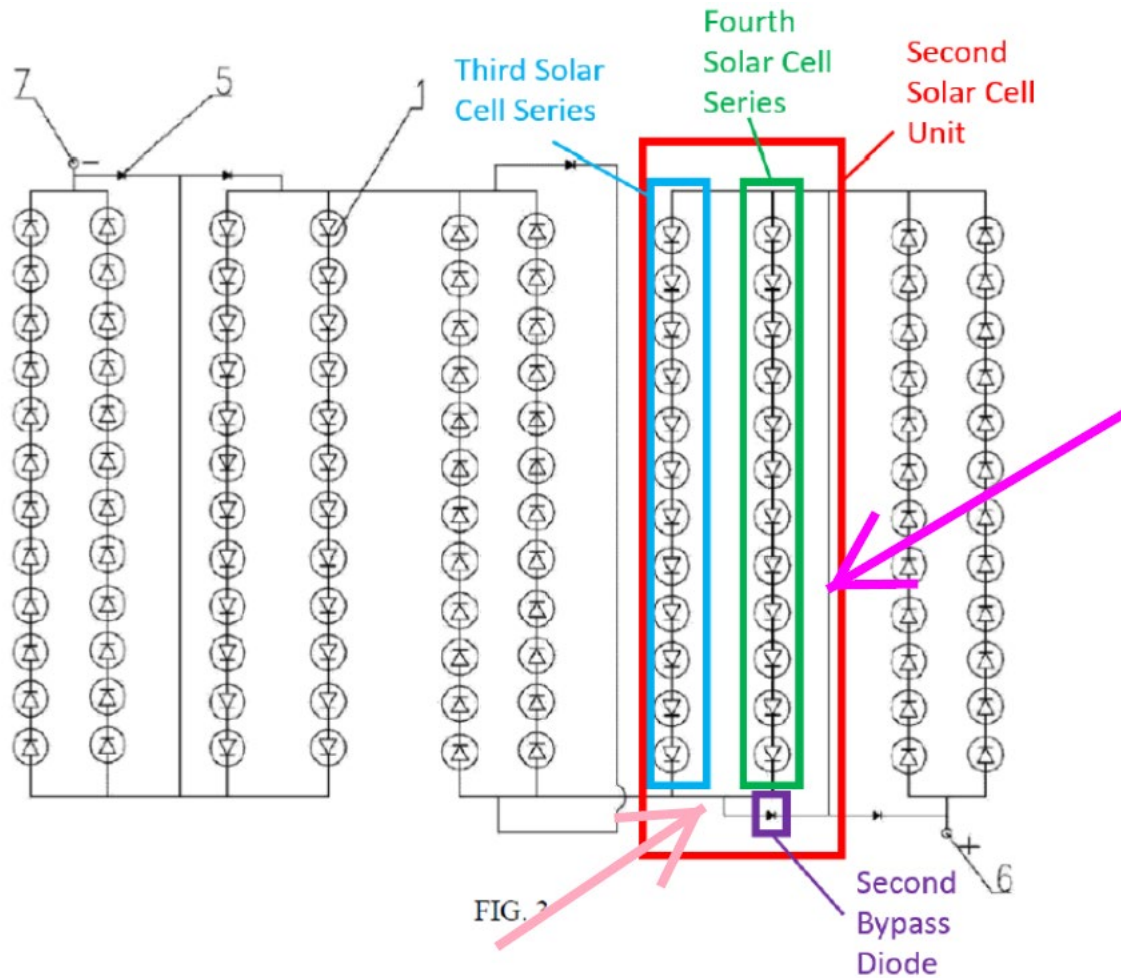
recitation. Pet. 61–62; Ex. 1009, Fig. 3; Ex. 1003 ¶¶ 118–119. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a first junction box containing the first bypass diode.” As Petitioner argues, the preponderance of the evidence supports that Zhang discloses this recitation. Pet. 63–64; Ex. 1009, Fig. 3, ¶¶ 19, 24; Ex. 1003 ¶¶ 120–121. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a second solar cell unit, coupled in series with the first solar cell unit, comprising.” As Petitioner argues, the preponderance of the evidence supports that Zhang discloses this recitation. Pet. 64–65; Ex. 1009, Fig. 3, ¶ 19; Ex. 1003 ¶ 122. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a third solar cell series including a plurality of half-cut solar cells connected in series; a fourth solar cell series, coupled in parallel with the third solar cell series, including a plurality of half-cut solar cells connected in series.” As Petitioner argues, the preponderance of the evidence supports that Zhang discloses this recitation. Pet. 65–67; Ex. 1009, Fig. 3, ¶¶ 18–19; Ex. 1003 ¶ 125. Petitioner illustrates Zhang’s teachings by annotating Zhang Figure 3. Pet. 66. Patent Owner does not dispute this recitation.

Claim 1 next recites, “a second bypass diode coupled in parallel with the third solar cell series and the fourth solar cell series.” Petitioner annotates Zhang Figure 3 to argue that Zhang teaches this recitation. Pet. 68. We reproduce that Petitioner’s annotated figure below while adding one additional annotation.



Pet. 68. Zhang Figure 3 depicts Zhang’s solar battery assembly comprising a plurality of solar battery strings packaged through a packaging structure.

Ex. 1009 ¶ 19. Petitioner annotates Figure 3 by providing a blue box identifying a third solar cell series, a green box identifying a fourth solar cell series, a violet box identifying a second bypass diode, and a red box identifying a second solar cell unit and encompassing the third solar cell series, the fourth solar series, and the second bypass diode. Figure 3 illustrates that the second bypass diode is connected to the bottommost (bottom relative to the figure’s orientation) side of the third solar cell series and fourth solar cell series, and we add a pink arrow to indicate this connection. A wire to the right of the second bypass diode connects the

second bypass diode to the topmost side of the third solar cell series and fourth solar cell series, and we add a magenta arrow to indicate this cross-connector.

Patent Owner argues that the second bypass diode (identified with a violet square above) is not coupled in parallel with the third solar cell series and fourth solar cell series because the cross-connector we identify with a magenta arrow is a “long cross-connector ... that spans the panel’s width.” PO Resp. 34. Patent Owner argues that the cross-connector will generate resistance because all wires generate resistance. PO Resp. 37–42. Patent Owner further argues that the cross-connector’s resistance will be “meaningful” and be “comparable to a bridge circuit” because of its length. PO Resp. 41 (citing Ex. 2019 (an exemplary illustration of a bridge circuit diagram); Ex. 2022, 44:5–19 (Dr. Kimball testifying that Ex. 2019 is a bridge circuit and that he would not describe any of the elements as “being directly in series with or directly in parallel with each other”); Ex. 2040 ¶ 87 (Dr. Shea testifying that because of the cross-connector’s “meaningful resistance” this portion of the solar assembly is comparable to a bridge circuit)); *see* PO Resp. 38–39 (explaining that the ’060 patent identifies the power loss drawback of a long connector ribbon) (quoting Ex. 1001 2:25–32). Patent Owner argues that because the second bypass diode shares nodes with the solar battery string and with the cross-connector, it is not in parallel with the two solar cell series. Pet. 40–41; *see* Ex. 2018 § 2.7 (text book providing examples of circuits that are neither parallel nor in series).

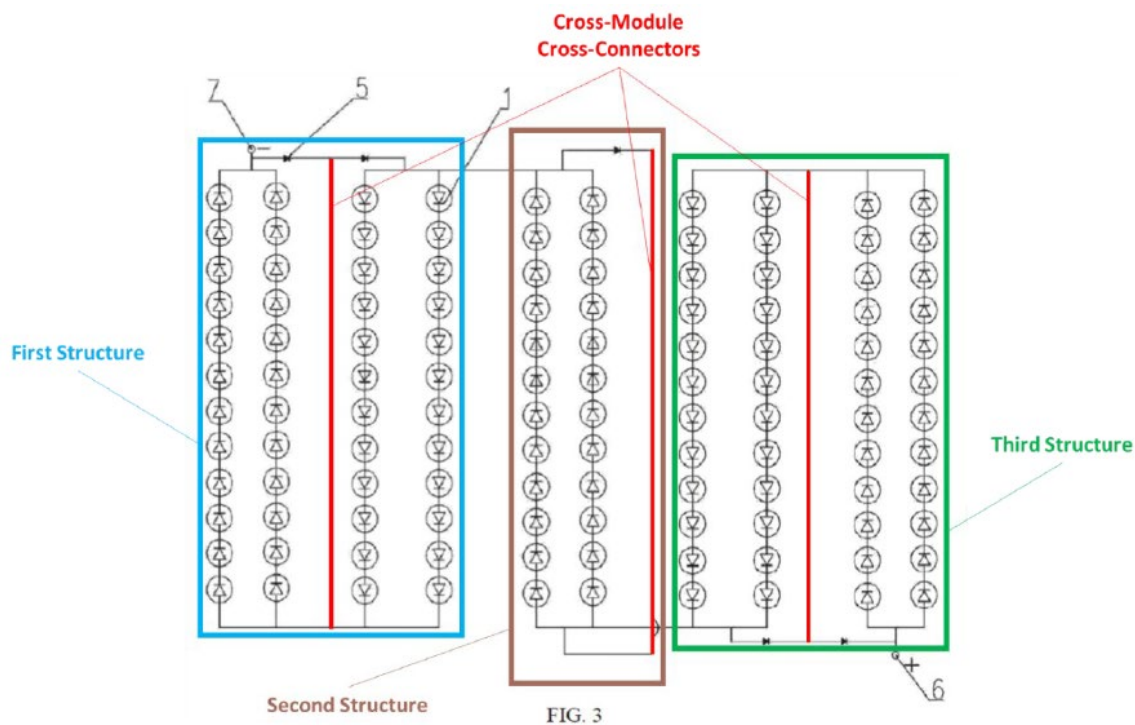
Petitioner contests Patent Owner’s arguments by arguing that the second bypass diode is, indeed, coupled in parallel with the third solar cell series and the fourth solar cell series. Pet. Reply 5–10.

We begin our assessment of the parties' positions by addressing the meaning of "coupled in parallel" in the context of claim 1's recitation of "a second bypass diode coupled in parallel with the third solar cell series and the fourth solar cell series." We first make two observations about the language of claim 1 itself. First, the recitation at issue refers to how the second bypass diode is "*coupled in parallel*" (emphasis added) to the third solar cell series and second solar series. The recitation is not "a second bypass diode in parallel"—instead the word "coupled" intervenes. Thus, the claim language suggests that it relates to describing the "coupling" of the second bypass diode "in parallel" rather than the nature of the second bypass diode being "in parallel." Coupling in parallel suggests that the diode is positionally "in parallel" as opposed to the diode itself having an attribute that can be described as "in parallel."

Second, we note that the "coupled in parallel" phrase appears in claim 1 four times. The claim refers to "a second solar cell series, *coupled in parallel* with the first solar cell series," "a first bypass diode *coupled in parallel* with the first solar cell series and second solar cell series," "a fourth solar cell series, *coupled in parallel* with the third solar cell series," and finally "a second bypass diode *coupled in parallel* with the third solar cell series." *Id.* (emphases added). Generally, the same word within the same claim is to be given the same meaning. *Paragon Sols., LLC v. Timex Corp.*, 566 F.3d 1075, 1087 (Fed. Cir. 2009) ("We apply a presumption that the same terms appearing in different portions of the claims should be given the same meaning unless it is clear from the specification and prosecution history that the terms have different meanings at different portions of the claims." (internal quotation marks omitted) (citations omitted)); *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1334 (Fed. Cir. 2003) ("[W]e

presume, unless otherwise compelled, that the same claim term in the same patent or related patents carries the same construed meaning.”).

Patent Owner’s position regarding what “coupled in parallel” means is undermined by Patent Owner’s witness, Dr. Shea. In particular, Dr. Shea, does not dispute that Zhang’s first bypass diode is coupled in parallel with the first and second solar strings. Ex. 1053, 129:14–130:14 (Dr. Shea not disputing that the “cross-module cross-...connector in the second structure couples the solar strings to bypass diode in parallel”); Ex. 1054 ¶ 68. Dr. Shea annotates Figure 3 of Zhang to illustrate Zhang’s various cross-module cross-connectors. Ex. 2040 ¶ 77; *see* Ex. 1054 ¶¶ 67–68 (Dr. Kimball addressing Dr. Shea’s analysis). We reproduce that version of an annotated Zhang Figure 3 below.



Ex. 2040 ¶ 77. The figure above again depicts Zhang’s solar battery assembly comprising a plurality of solar battery strings packaged through a packaging structure. Ex. 1009 ¶ 19. Here, Dr. Shea annotates the Figure by

indicating three “long cross-connectors” in red. Ex. 2040 ¶ 77 (“[e]ach structure requires a long cross-connector (in red below) that spans the width of the panel”). Dr. Shea indicates a first solar cell structure by putting a blue box around it, a second structure with a brown box, and the third structure with a green box.

Dr. Shea does not dispute that the leftmost long cross-connector couples a diode (labeled with a “5” (*see* Ex. 1009 ¶ 24 (referring to its design having “a total of 5 diodes 5”)) in parallel to the first and second solar strings. Ex. 1053, 129:14–130:14. Dr. Shea’s position, in this regard, undermines his position that the length of the rightmost long cross-connector makes it function as a resistor so that its respective diode is not coupled in parallel to the solar strings. Pet. Reply 6–7; Ex. 1054 ¶ 68 (Dr. Kimball addressing this analysis). With respect to at least the leftmost long cross-connector, the parties seem to agree that “coupled in parallel” does not have meaning such that resistance of the leftmost long cross-connector affects whether or not diode 5 is coupled in parallel with the first and second solar strings.

We continue our claim construction analysis of “coupled in parallel” by considering how the ’060 patent specification uses the phrase. When discussing the admitted prior art of Figure 1a, the ’060 patent identifies “so-called by-pass diodes 101” as being “connected in parallel with a certain number of solar cells.” Ex. 1001, Fig. 1a (labeled “Prior Art”), 1:10–37 (addressing Figure 1a and its diodes). Patent Owner emphasizes that the ’060 patent, when discussing prior art, identifies that a long connector ribbon may result in power loss. PO Resp. 38–39 (quoting Ex. 1001, 2:25–32). The quoted passage, however, is in the context of the ’060 patent disparaging the prior art while also admitting that the prior art included diodes “connected in

parallel.” Ex. 1001, 1:35–37. Although the Specification’s explanation of the prior art’s bypass diodes 101 is somewhat unclear, the ’060 patent’s discussion of prior art, as a whole, suggests that diodes “connected in parallel” may nonetheless be plagued by the kinds of inefficiencies the ’060 patent seeks to avoid. In other words, the discussion suggests that inefficiency (such as resistance from a long connector ribbon), by itself, does not preclude diodes “connected in parallel.”

Petitioner’s explanation of, for example, Figure 2b of the ’060 patent illustrates how some ’060 patent embodiments place a bypass diode close to two solar cell series to avoid longer cross-connects. Pet. 13–15 (explaining and annotating Ex. 1001, Fig 2b). The Specification does not, however, indicate that this efficiency is necessary for elements “connected in parallel.”

Finally, we consider general usage of the term “connected in parallel” by persons of ordinary skill in the art as of the ’060 patent’s priority date. The 2000 edition of the “The Authoritative Dictionary of IEEE [Institute of Electrical Electronics Engineers<sup>9</sup>] Standards Terms” defines parallel, in relevant part, as elements requiring common nodes: “To terminal elements are connected in parallel when they are connected between the same pair of nodes.” Ex. 3001, 791. Nodes are a “point or connection between two or more” single elements such as a voltage source or a resistor. Ex. 2018, 35 (defining a “node” and a “branch”). Notably, this definition explicitly explains “connected in parallel” (which is similar to the phrase “coupled in parallel” at issue here) and does not impose an equal voltage requirement on what it means for electrical elements to be connected in parallel. Similarly,

---

<sup>9</sup> See Meaning of I-E-E-E, *available at* <https://www.ieee.org/about/ieee-history.html> (accessed Oct. 31, 2022), Ex. 3002.

the 2001 edition of the Illustrated Dictionary of Electronics defines “parallel circuit” as “[a] circuit in which the components are connected across each other (i.e., so that the circuit segment could be drawn showing component leads bridging common conductors as rungs would across a ladder).” Ex. 3003, 513.

Other external sources, however, define “parallel” somewhat differently. The 1999 edition of the Newnes Dictionary of Electronics defines “parallel connection” as “[a] method of connecting components or circuits so that they share the same voltage, the current dividing between the circuits depending on their impedance.” Ex. 3004, 227. Similarly, Patent Owner cites to a 2007 Fundamentals of Electric Circuits textbook which states that, “[t]wo or more elements are in parallel if they are connected to the same two nodes and consequently have the same voltage across them.” Ex. 2018, 36.

Considering the record as a whole, we determine that “coupled in parallel” in the context of claim 1 refers to elements being connected between the same pair of nodes. This claim interpretation considers the language of claim 1 which is linguistically directed to, in relevant part, how elements are “coupled” rather than the nature (for example the voltage or other characteristics) of the elements. This claim interpretation is also consistent with usage of persons of ordinary skill in the art as evidenced by, for example, the Authoritative Dictionary of IEEE Standards Terms. Ex. 3001, 791.

As to other sources indicating equal voltage is important, we understand, for example, Fundamentals of Electric Circuits as primarily defining “parallel” as elements sharing common nodes. Ex. 2018, 36. When Fundamentals of Electric Circuits also states that such elements will



consequently share a voltage across them, it does so in the context of a text book that is teaching students to calculate currents and voltages; in this context, wires (signified with a line in the Fundamentals of Electric Circuits diagrams) are assumed to have negligible or zero resistance. *See, e.g., id.* at 40–43 (providing typical text book electrical circuit problems and providing solutions that assume zero line resistance). Fundamentals of Electric Circuits does not concern itself in these particular passages with real world examples where *every* wire will necessarily have some resistance. *See* PO Resp. 37 (citing Ex. 2018, 30 (explaining how to calculate resistance and listing various non-zero resistivities for material options such as silver, copper, and gold)). Where wires have zero resistance, elements in parallel will share a voltage as the text states; but this is not a real world scenario.

In view of the construction above, we agree with Petitioner that Zhang teaches a second bypass diode coupled in parallel with the third solar cell series and the fourth solar cell series. As depicted in the annotated versions of Zhang Figure 3 that we reproduce above, Petitioner identifies a second diode which shares common nodes with a third solar cell series and fourth solar cell series. Pet. 68; Ex. 1009, Fig. 3, ¶ 19; *see* Pet. Reply 8 (illustrating coupling at common nodes); Ex. 1054 ¶¶ 69–76, 82 (Dr. Kimball testifying regarding the diode being coupled in parallel due to parallel nodes).

We also find that Zhang teaches this element even if Zhang’s long cross-connector has some resistance or even if “coupled in parallel” were construed to mean that elements must have substantially the same voltage. In real world circuits, wires always have some resistance. Ex. 2018, 30 (demonstrating that real world materials like copper, silver, and gold have some resistance). For example, the ’060 patent makes use of “copper, aluminum, silver or alloys thereof,” and all of these materials have some

resistance. Ex. 1001, 4:21–27. The '060 patent nonetheless describes various elements connected by such materials as being “coupled in parallel” as claim 1 recites. Thus, the '060 patent allows elements to be “coupled in parallel” even where the wires between the elements have some resistance thus making the elements’ voltage unequal.

Patent Owner argues that Zhang’s cross-connector will have “meaningful” resistance such that Zhang’s second diode is not coupled in parallel to Zhang’s third and fourth solar strings. PO Resp. 40. This argument attempts to distinguish Zhang’s configuration from other real-world configurations that couple elements together via real wires that always have at least some resistance. In this context, however, “meaningful” has no concrete bounds that would clearly define the scope of claim 1. The vagueness of “meaningful” resistance is illustrated, for example, by the inconsistent testimony of Patent Owner’s witness, Dr. Shea, regarding whether different cross-connectors prevent various elements from being in parallel or not. Ex. 1054 ¶¶ 68–69. We decline to construe claim 1 in such a way that plain wires can prevent elements from being “coupled in parallel” based on an arbitrary value for how resistive those wires are.<sup>10</sup> The claim language and record, as explained above does not support such a construction.

Thus, based on all of the record as a whole and all of the considerations explained above, a preponderance of the evidence supports

---

<sup>10</sup> Construing “coupled in parallel” to arbitrarily exclude some situations where wires provide resistance and not others could potentially raise validity issues pursuant to the definiteness requirement of 35 U.S.C. § 112. This concern, however, does not heavily influence claim construction here. *See Phillips*, 415 F.3d at 1327 (explaining that construing claims to preserve validity is not “a regular component of claim construction”).

that Zhang discloses “a second bypass diode coupled in parallel with the third solar cell series and the fourth solar cell series.”

Claim 1 next recites, “a second junction box containing the second bypass diode.” As Petitioner argues, the preponderance of the evidence supports that Zhang discloses this recitation. Pet. 68–69; Ex. 1009 ¶¶ 19, 24; Ex. 1003 ¶ 126. Patent Owner does not dispute this recitation.

Claim 2 recites “[t]he solar cell assembly of claim 1 wherein the first solar cell series has substantially the same open circuit voltage, Voc, as the second solar cell series in the solar cell unit.” As Petitioner argues, the preponderance of the evidence supports that Zhang discloses this recitation. Pet. 69–70; Ex. 1009 ¶ 19; Ex. 1003 ¶¶ 127–129. Patent Owner does not dispute this recitation.

Claim 4 recites “[t]he solar cell assembly of claim 1, wherein the first and second solar cell series are coupled with the bypass diode of the first solar cell unit via a first cross-connector, and the third and fourth solar cell series are coupled with the bypass diode of the second solar cell unit via a second cross-connector.” As Petitioner argues, the preponderance of the evidence supports that Zhang discloses this recitation. Pet. 70–71; Ex. 1009, Fig. 3; Ex. 1003 ¶ 130.

Patent Owner argues that Zhang does not disclose this recitation because claim 4 requires a *single* first cross-connector and *single* second-cross connector. PO Resp. 42–44. This argument is unpersuasive because, as we explain above, we do not agree with Patent Owner that “a” as claim 4 recites in the context of “a first cross-connector” and “a second cross-connector” forbids more than one of each recited cross-connector.

In summary, Petitioner persuasively establishes by a preponderance of the evidence that Zhang anticipates claims 1, 2, and 4.

C. *Ground Three: Obviousness over Wu in view of Zhang*

Petitioner asserts that claims 3, 5, 6, 11, and 13 are obvious over Wu in view of Zhang. Pet. 71–91. Because Petitioner’s ground requires combining the teachings of Wu and Zhang, we first address motivation to combine with rational underpinning. In particular, Petitioner argues that a person of ordinary skill in the art would have been “motivated to modify the sub-module configuration of Wu to implement the half[-]solar cells and solar battery string groups of Zhang.” Pet. 71–77. Patent Owner argues that a person of ordinary skill in the art would not have “abandoned” Wu’s design by implementing these teachings of Zhang. PO Resp. 46–51.

Petitioner argues that Wu and Zhang are both from the field of solar cell assembly design and argues both want to improve efficiency. *Id.* The preponderance of the evidence supports these two points. Ex. 1007 ¶ 6; Ex. 1009 ¶ 9. Petitioner also argues that Zhang teaches implementation of half-cut cells and teaches the benefits of such cells such as increased power generation. Pet. 72–74 (*citing, e.g.,* Ex. 1009, Fig. 3, ¶¶ 9, 19, 23; Ex. 1003 ¶¶ 133–135). Petitioner further argues that applying Zhang’s implementation would simplify Wu. Pet. 74–76 (*citing, e.g.,* Ex. 1003 ¶ 136–137). Petitioner argues that the simplification would lower manufacturing cost and lower failure rate. Pet. 75–76.

Patent Owner argues that a person of ordinary skill in the art would not have compressed Wu’s split-circuit design into a single circuit because, by doing so, Wu would lose its purpose of guaranteeing that bypass diodes and cells are not damaged by overheating. PO Resp. 46–51. Patent Owner argues that Wu emphasizes the benefits of its split-circuit design. *Id.* at 46–48 (*citing, e.g.,* Ex. 1007, Fig. 3, ¶¶ 6–7, 14, 22, 25; Ex. 2040 ¶ 101–106). Patent Owner argues that Wu recognized prior art designs with fewer diodes

and connections but nonetheless decided to incorporate additional elements to reach the advantages of split circuit design. PO Resp. 48–51 (*citing, e.g.*, Ex. 1007 ¶¶ 3, 6–7, 15, 17; Ex. 2040 ¶¶ 107–111).

On balance, with respect to this ground, the preponderance of the evidence support’s Patent Owner’s position. Patent Owner’s witness, Dr. Shea, persuasively explains that Petitioner’s approach makes numerous modifications to reach a hypothetical module that is not indicative of either references’ teachings. Ex. 2040 ¶ 100. Most critically, we agree with Patent Owner and Dr. Shea that a person of skill in the art would not have had sufficient reason to abandon Wu’s split-circuit design. *Id.* ¶¶ 101–111. Wu identifies the problem of high temperatures causing a solar module to become too hot and burn out (Ex. 1007 ¶ 3), and Wu seeks to solve the problem by providing a two-circuit design (*id.* ¶¶ 6–7). *See, e.g.*, Sur-reply 20–24. With respect to this particular ground, Petitioner’s evidence suggesting reasons why a person of ordinary skill in the art would have modified Wu’s design does not outweigh Dr. Shea’s persuasive testimony as to why a person of ordinary skill in the art would not have eliminated Wu’s split circuit design.

Moreover, we are not persuaded that a person of skill in the art would have had reason to modify Wu in a manner to arrive at the “modified Wu” that Petitioner relies on. PO Resp. 52–55. Dr. Shea credibly explains how Petitioner’s “modified Wu” includes features of the ’060 patent claims without adequate explanation. Ex. 2040 ¶¶ 112–117. Rather, Petitioner’s assessment of reasons to combine and how the references would have been combined appears to be based on hindsight rather than what the references reasonably suggest.

Because Petitioner does not persuasively establish by a preponderance of the evidence that a person of ordinary skill in the art would have had reason to modify Wu in view of Zhang to reach “modified Wu,” Petitioner does not meet its burden to show the unpatentability of claims 3, 5, 6, 11, and 13 over Wu in view of Zhang.

D. *Secondary Considerations*

Patent Owner argues that secondary considerations must be considered with respect to Petitioner’s obviousness grounds. PO Resp. 57–66. In particular, Patent Owner argues that patentability is supported by industry praise and by licensing. *Id.* Petitioner argues that the secondary considerations “[a]re [u]navailing.” Pet. Reply 23–26 (bold removed).

With respect to industry praise, Patent Owner cites its 2015 Intersolar Award. PO Resp. 58–64. REC launched its TwinPeak solar module series in 2014 and exhibited it at the world’s largest solar industry trade show, Intersolar, in 2015. *Id.* at 58–59. The TwinPeak solar modules won the 2015 Intersolar Award in the category of “Photovoltaics.” *Id.*; see Ex. 2014 (REC press release regarding award); Ex. 2015 (Intersolar award announcement); Ex. 2016 (news article regarding award). Patent Owner argues that the TwinPeak modules “embodied each and every one of the claimed features [of the ’060 patent] and were coextensive with those claimed features.” PO Resp. 60–64 (citing Ex. 2040 ¶¶ 122–142 (Dr. Shea supporting this point)).

Petitioner argues that the 2015 Intersolar Award is irrelevant because the Intersolar Award committee evaluated a variety of criteria that have nothing to do with technological innovation and cannot be attributed to the ’060 patent. Pet. Reply 25 (citing Ex. 2014 (REC press release); Ex. 2025 (Intersolar material explaining criteria for award)). Petitioner also argues that TwinPeak included significant unclaimed features that alter its

functioning, and that, of four features evaluated by Intersolar, only two features are addressed by the '060 patent claims. Pet. 25–26.

We agree with Petitioner that the 2015 Intersolar Award does not heavily weigh against obviousness. The 2015 questionnaire for Intersolar exhibitors indicates that the Intersolar Award is based on criteria other than the criteria reflected by '060 patent claims. Ex. 1058. Here, Intersolar indicates that the award considers the following: safety including safety certificates (15%), economic benefits including cost benefit compared to other solutions, selling price, demand, and “marketing and distribution concept” (20%), and quality of presentation (5%).<sup>11</sup>

Also, as Petitioner argues, REC highlighted four technical advantages of the TwinPeak modules. Pet. Reply 25–26; *see* Ex. 1054 ¶¶ 141–149 (Dr. Kimball explaining this point). For example, a REC press release announcing TwinPeak winning the 2015 Intersolar Award states that TwinPeak combines “four enablers harmoniously” and identifies half-cut cells, four busbars, passivated emitted rear cell (“PERC”) technology, and a split junction box as four enablers. Ex. 2014, 1–2 (REC press release regarding 2015 Intersolar Award); *see* Ex. 2015, 1 (2015 Intersolar Award

---

<sup>11</sup> Although of less relevance because of its late date, a 2021 Intersolar document similarly explains that its award is based on a variety of factors, and many of these factors do not directly relate to the technology of the '060 patent claims. Ex. 2025 at 3. “Technological innovation” is only 30% of the award’s criteria. *Id.* The award also considers economic benefits such as “[d]emand, markets, and marketing strategy” (20%), proof of innovation including “proof of functionality and ingenuity, test results, certifications, patents, references (10%), and presentation (5%).” *Id.* If the award is based, in part, on “patents,” it would be circular for the award to weigh in favor of the validity of the same patents. *Id.*

announcement similarly identifying these enablers). The '060 patent claims reflect half-cut cells and two junction boxes, but the claims do not recite the PERC technology or four busbars. As such, the relationship between the '060 patent claims and the 2015 Intersolar Award is loose at best.

With respect to licensing, Patent Owner argues that in the summer of 2021, a competitor of Patent Owner, CS Wismar GmbH, entered a partnership with Patent Owner rather than dispute the validity of REC's European Patent EP3017520, which Patent Owner characterizes as a "counterpart" patent. PO Resp. 64–66. Patent Owner argues that the subject matter of claim 1 of the EP counterpart is substantially identical to subject matter of the '060 patent claims. *Id.* (citing Ex. 2033 (withdrawing opposition against EP 3017520 B1); Ex. 2034 (REC press release explaining "planned cooperation"); Ex. 2026 (news article explaining memorandum of understanding). Patent Owner admits that the agreement relates to a "future license" which is "linked to the EP counterpart of the '060 patent." *Id.*

Petitioner argues that the '060 patent has never been licensed. Pet. Reply 24. Rather, Petitioner emphasizes that Patent Owner only references a potential future license, that the future license would not be to the '060 patent, and that the license was entered into to avoid litigation. Pet. Reply 23–26; *see, e.g., Bosch Auto. Serv. Sols., LLC v. Matal*, 878 F.3d 1027, 1038 (Fed. Cir. 2017), as amended on reh'g in part (Mar. 15, 2018) (holding that Board properly afforded licenses "less credit" where licenses were entered to settle litigation).

We agree with Petitioner that the prospective licensing of the European counterpart patent does not heavily weigh against obviousness. Patent Owner raises only a future possibility of a license, not a license. PO Resp. 66. REC's explanation of the agreement indicates that the cooperation



memorandum “will also avoid any disputes relating to REC’s EP 3 017 520 patent.” Ex. 2034, 1. Under these circumstances, the future license weighs, at most, very weakly against obviousness.

In sum, the evidence of secondary considerations here is, at best, weak and, therefore, has little influence on our obviousness conclusions in either direction. All of our obviousness determinations, as we discuss *supra*, are made after considering all evidence in the record, including all evidence relating to secondary considerations.

## VI. CONCLUSION<sup>12</sup>

For the above reasons, we determine that Petitioner establishes, by a preponderance of the evidence, that

(a) claims 1–6, 11, and 13 of U.S. Patent No. 10,749,060 B2 are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Huang and Wu; and

(b) claims 1, 2, and 4 of U.S. Patent No. 10,749,060 B2 are unpatentable under 35 U.S.C. § 102(a)(1) as anticipated by Zhang.

We determine that Petitioner does *not* establish by a preponderance of the evidence that claims 3, 5, 6, 11, and 13 of U.S. Patent No. 10,749,060 B2 are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Wu and Zhang.

---

<sup>12</sup> Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

In summary:

<b>Claims</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Claims Shown Unpatentable</b>	<b>Claims Not shown Unpatentable</b>
1–6, 11, 13	103	Huang, Wu	1–6, 11, 13	
1, 2, 4	102(a)(1)	Zhang	1, 2, 4	
3, 5, 6, 11, 13	103	Wu, Zhang		3, 5, 6, 11, 13
<b>Overall Outcome</b>			1–6, 11, 13	

## VII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner establishes by a preponderance of the evidence that claims 1–6, 11, and 13 of U.S. Patent No. 10,749,060 B2 are unpatentable;

FURTHER ORDERED that Patent Owner’s Motion to Exclude is *denied*; and

FURTHER ORDERED that, because this is a Final Written Decision, the parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.

IPR2021-00988  
Patent 10,749,060 B2

FOR PETITIONER:

David Cavanaugh  
Jason Kipnis  
Mark D. Selwyn  
WILMER CUTLER PICKERING HALE AND DORR LLP  
david.cavanaugh@wilmerhale.com  
jason.kipnis@wilmerhale.com  
mark.selwyn@wilmerhale.com

FOR PATENT OWNER:

James Barney  
Mareesa Frederick  
Anthony Hartmann  
Forrest Jones  
FINNEGAN, HENDERSON, FARABOW, BARRETT & DUNNER, LLP  
james.barney@finnegan.com  
mareesa.frederick@finnegan.com  
hartmana@finnegan.com  
forrest.jones@finnegan.com