

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AFFORDABLE WIRE MANAGEMENT, LLC,
Petitioner,

v.

CAMBRIA COUNTY ASSOCIATION FOR
THE BLIND AND HANDICAPPED, INC.,
Patent Owner.

IPR2024-00182
Patent 11,349,291

**PATENT OWNER'S PRELIMINARY RESPONSE TO
PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 11,349,291**

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I. INTRODUCTION

Patent Owner Cambria County Association for the Blind and Handicapped, Inc. submits its Preliminary Response to Petitioner Affordable Wire Management, LLC's ("AWM") Petition requesting *inter partes* review of claims 1-23 of U.S. Patent No. 11,349,291 (" '291 Patent") (EX1001).¹ Patent Owner also submits the Declaration of Edward C. Kern, Jr., Ph.D. (EX2001), in support of its Preliminary Response. The Board should deny Petitioner's request to institute trial because the Petition fails to show that there is a reasonable likelihood that Petitioner would prevail with respect to any challenged claim. 35 U.S.C. § 314(a).

II. BACKGROUND: SOLAR INSTALLATIONS AND THE NEED FOR CABLE MANAGEMENT

A. Early Photovoltaic ("PV") Systems

Solar PV energy generation differs from traditional generation resources (e.g., coal and nuclear power stations) in that the latter generate power at one location, whereas solar PV energy generation is a spatially distributed power generation resource. EX2001, ¶30. Before solar PV, the economies of scale favored the construction of large power plants. *Id.* Consequently, electric power systems

¹ The Petition in response to which this Preliminary Response is filed is one of two petitions filed by AWM seeking *inter partes* review of the '291 Patent. *See* Paper 17.

developed with a model of power flowing outward from large sources to distributed consumers. EX2001, ¶30. The wires in these systems could be protected by fuses and circuit breakers “upstream” of the many distributed consumers and power consuming devices. *Id.* Typically, these circuit protection devices are “opened” when current levels exceed expected values, as can happen with a short circuit or short to ground (a “ground fault”). *Id.*

In contrast, power generated by PV arrays is aggregated from smaller to larger currents. EX2001, ¶31. Lethal wiring voltages exist throughout PV arrays. *Id.* Accordingly, electrical and fire safety issues of solar PV panels and arrays have been, and remain, paramount in the minds of design engineers working in the field, and engineering standards and electrical safety codes (such as the National Fire Protection Association’s National Electrical Code (“NEC”)). *Id.* PV system designers and installers, while seeking to lower both manufacturing and construction costs, are guided and constrained by these standards and codes. *Id.*, ¶33. Accordingly, persons engaged in designing and constructing PV systems are and have been advisably cautious in designing so-called “balance of systems” in PV systems, which include mounting structures, foundations, wire and cable management and organization, electrical panels, switching gear, battery storage and other structural features of a typical solar plant. *Id.*

The unique nature of power collection and aggregation in solar PV facilities introduced novel constraints and challenges in wire and cable design, management, and organization not arising in other fields and industries. EX2001, ¶34. These unique challenges related to, for example, aggregating and collecting power in a PV array, transmitting power output to combiners and inverters in PV output (or source) circuits, and proper management of ground faults that occurred in the system. *Id.*

Early commercial markets for battery charging in remote (“off-grid”) places were DC only. *Id.*, ¶35. Most demonstration and R&D grid-tied systems from the 1970s through the 1990s also had DC only wiring in their PV arrays, and most were, in comparison to PV systems prevalent today, relatively small (in the range of 5 to 20 kW in rated power). *Id.* Early prototype tracking collectors in the 1970s and 1980s used optical light concentration, which used mirrors to focus light on cells, and which were comparatively much cheaper than the use of solar cells at that time. *Id.*, ¶36. Trackers had the benefit of capturing about 40% more solar radiation by following the sun across the sky. *Id.*

Commercial solar farm applications at ~1 MW capacity and larger, which produced electricity for bulk power markets, began appearing in the early 2000s. *Id.*, ¶37. The first large solar farms used fixed (non-tracking) arrays with DC power cables only, together with lower cost “thin film solar modules.” *Id.* These modules

were typically less efficient than standard silicon solar cell-based modules and therefore required greater land areas per unit of power produced and longer wire runs to gather the power to collection points. EX2001, ¶37.

During the 2000-2010 time period, prices for higher efficiency silicon solar cell modules dropped precipitously and brought them into the solar farm market. *Id.*, ¶38. Higher module efficiencies for these modules reduced land costs, structural support costs, and favored simple one axis tracking to improve electricity production by 20 to 25%. *Id.*. Notably, however, it also complicated array field wiring by introducing the need for control cabling requirements. *Id.*

The increased use of tracking brought with it the need for both powering the mechanical tracking devices and for signals from panel orientation, irradiance, wind speed, fault conditions such as ground faults, and temperature sensors within the array field, and for signals to the mechanical tracking devices to control their position. *Id.*, ¶39. These needs were met by the increased use of AC cables to power the devices, as well as the increased use of signal wiring, or data wiring, to monitor and communicate data from the PV solar array. *Id.*

As solar PV arrays became commercially viable in the 2000-2010 time frame and transitioned to larger multi-megawatt installations, lower voltage solar wiring gave way to the need for higher voltage cables, enabling lower cost for comparable performance. Over this period, code-allowable voltages increased from

600 to 1500 V², increasing the power that could be transported on a given wire size by a factor of 2.5 (150% gain). The increase in system voltage also increased the number of modules that the wires could service, in concert with the growing size of PV farms, and significantly increased the length of these power cables, and the need to manage them. EX2001, ¶¶39-42.

Each square meter of solar panel area will produce about 200 Watts of DC electricity in full sunlight, on a clear day, tilted toward the sun at noon. To prevent tilted panels from shading one another they need to be spaced apart, which increases the land area needed to approximately twice the total area of solar modules. Accordingly, it would be expected that there would be approximately 100 Watts of DC electricity generated for each square meter of land. Viewed another way, a 250 Megawatt solar power plant would occupy a square mile of land, and have hundreds of miles of DC power cables aggregating electricity to a single point for interconnection to the power grid. EX2001, ¶43.

² The power carried in DC electrical cables is the product of the circuit voltage and current. Electrical cables are rated at their current carrying and voltage isolation capabilities. Increasing current capacity requires increased diameters and more copper or aluminum cross sectional area and therefore larger and heavier cables. EX2001, ¶41.

DC cabling begins with module-to-module series connection of panels to form a “series string.” EX2001, ¶44. About 30 such panels, each producing 10-15 Amps, and extending over an area of about 150 square meters, are connected in series forming 1500 V series strings producing 15-20 kW. A number of strings are extended to a “string combiner” and wired in parallel to aggregate their current. For this stage, wire support systems such as buried cables or cable trays were used to support multiple DC cables. These DC cables are larger in diameter and heavier than 10 AWG in order to reduce power losses, and are required for a range of wire length runs (up to 150 meters). *Id.*

The output from multiple string combiners then needs to be combined again and converted to AC power. Output current from a typical string combiner could be 100 Amps (150 kW power at 1500 Vdc) and needs to be routed to an inverter. Significantly larger wires are needed for 100 Amps, typically 4/0 (which is about 3/4” diameter) and weighs about 1/3 pound per foot (when the conductor is aluminum). Such output wires from multiple string combiners run to second aggregation points at inverters, typically capable of converting about a megawatt of DC power to three phase AC power. At this stage, the wire runs would likely be routed 90 degrees from the direction of the rows of PV panels, and would typically be placed in trenches with risers to the string combiners. This cabling might also be protected by buried conduit. *Id.*, ¶45.

Continuing with this example, the DC power from eight string combiners would aggregate at an inverter and be converted to three phase AC power. Inverter output power would then be wired to a transformer and boosted to a distribution level voltage, such as 13,800 volts. At larger than 1 MW scale, multiple 1 MW building blocks would be replicated, and the output wiring from each building block would be three phase AC distribution voltage. A square mile would accommodate 250 of such building blocks forming a 250 MW solar farm. EX2001, ¶46.

The increased use of trackers in PV arrays also required AC cables to power the trackers. As the size of solar farms increased, the AC cables necessary to power these trackers were integral to the solar panels in the PV array, and ran along with the DC cables. The AC cables were typically bundled together with the DC cables. *Id.*, ¶47.

B. The Need for Improved Systems for Cable Management

Wiring methods for increasingly large solar farm arrays evolved from well understood and proven methods for outdoor wiring. As the size scale, number of solar projects, and number of competitive entrants in the industry grew exponentially in the 2000-2010 time period, the high costs of materials, supply chain logistics, installation, and maintenance of using older methods of cable management (such as trenching and metal wire trays) provided an opportunity for

innovation in developing improved and more efficient cable management systems.

EX2001, ¶48.

Prior to 2014, the electrical code typically required cabling to be bundled and buried underground, with or without conduit, or placed in a metal wire tray. Trenching and direct burial of the cabling, however, present issues for increasing “capacity” as PV output circuits are added along the path to the inverter. The tradeoff between direct burial (without conduit) and laying conduit relates to site soil conditions, such as the likelihood of sharp rocks abrading the cable. Direct burial is less expensive, but more prone to failure and once in place cannot be easily replaced. *Id.*, ¶49.

Another impact of trenching is its impact on the sequence of construction events. Access within the array field for mounting and wiring individual modules or panels is required and once the structure is in place the only means of access by construction vehicles is along pathways between the rows. While a trench is open it introduces a dead-end barrier along the pathway during construction. *Id.*, ¶50.

Cable trays are an alternative to trenching, but they are expensive and cumbersome to build. They need to be designed to match the array field structure's length and repetition scales for aligning attachment points. These structural length scales are in turn dictated by PV module dimensions which are highly variable from one product to another. The required lengths, attachment points, and

“capacity” (width and depth) are in constant play complicating supply chain logistics and impacting costs. An additional consideration is that cable tray capacity requirements change along the row as additional cables are added as the tray collects additional “home run” wires along its path to the combiner box, further complicating design choices and cost considerations. EX2001, ¶51.

Further complicating issues of cable management, as the ‘291 Patent explains, prior to 2014, AC and DC cables could be bundled together, and there was no requirement to separate AC from DC cables, including in solar installations. *Id.*, ¶53 (citing EX1001, 1:32-42). In 2014, however, the NEC was changes to require that AC and DC cables be separated from each other. *Id.* Additionally, because AC and DC power cables were known to interfere with nearby signal and data wires, there was also a known need for separating AC and DC power cables from signal and data wiring. *Id.*, ¶54 (citing EX1001, 1:37-56).

Separating DC wiring from AC and signal wiring necessitated by the increased use of tracking devices is imperative for a number of reasons: (1) physical reasons of weight, stiffness, environmental exposure protection requirements, potential for electrical failure of each wire type; (2) construction sequence of installation and the skills of personal and potential mechanized equipment associated with each wire type; (3) AHJ (Authority Having Jurisdiction) inspection requirements of each wire type; (4) potential for one type of wiring to

interfere with the proper operation of another; (5) potential for catastrophic failure in one wiring system to impact another; (6) standardization for routine wire inspection and maintenance such that everywhere in the array field wire types are clearly and quickly identifiable by field personnel. EX2001, ¶55.

At the time of the '291 invention, however, there were significant challenges unique to the solar industry to developing such improved systems. Prior to 2000, there were significant industry investments in solar module and power electronics manufacturing, but little if any in solar structures and wiring. The period from 2000 leading up to the time of the '291 Patent saw some PV module industry investment in structures to support PV modules. But there was still the expectation within the industry that wire management for solar installations would simply involve selection and application of existing methods and equipment.

Some of these unique challenges are discussed in an article from an early 2013 article in a leading trade industry publication, SolarPro Magazine, entitled "PV Array Wire Management." EX1011. The article begins by stating that "designers and installers face persistent challenges to managing free-air conductors within the PV array," and that "[i]mplementing a safe, reliable and Code-compliant wire management system for exposed PV conductors is not an easy task." EX1011, 1-2. The author further states that "[w]hile securing array wiring seems like it should be a straightforward exercise, the reality is that integrators continue to face

numerous challenges.” EX1011, 2. One of the most significant challenges is the extreme environments in which PV arrays are installed. As the SolarPro article states, “[c]oupled with the harsh environmental conditions that PV array conductors are exposed to – UV radiation, high winds and extreme ambient temperatures, and ice, snow and other debris – wire management continues to be the Achilles heel of the majority of PV installations.” *Id.* The requirement introduced in the 2014 NEC to separate DC and AC power cables only further complicated the unique challenges of cable management in the solar industry, and increased the need for innovative solutions. EX2001, ¶63.

III. SUMMARY OF THE ‘291 PATENT AND ITS PROSECUTION HISTORY

A. The ‘291 Patent

The ‘291 Patent, “Locking cable hanger and method of using,” issued May 31, 2022, to inventors Allen Garrett Smith, Frank Edward Hodge, David James Prasko, and Timothy Joseph Wedding, and is assigned to Patent Owner. EX1001. The ‘291 Patent is one of a number of patents that claim priority from U.S. Patent Application No. 14/556,117 (the “ ‘117 Application”), filed November 29, 2014. *Id.* Although the ‘291 Patent discusses cable hangers, methods of using cable hangers, and systems utilizing cable hangers in organizing electrical cables extending from solar panels, the claims of the ‘291 Patent focus on the latter of such concepts. EX1001, 10:24-13:8.

Independent claims 1 and 14 are representative.

1. A system for organizing a plurality of electrical cables extending from a plurality of solar panels, the system comprising:
 - a messenger wire structured to be supported a distance above the ground; and
 - a plurality of cable hangers structured to be disposed along, and suspended from, the messenger wire, each cable hanger having a plurality of cable carrying surfaces, each cable carrying surface being structured to support at least one electrical cable of the plurality of electrical cables,
 - wherein adjacent cable carrying surfaces of the plurality of cable carrying surfaces are separated by a cable carrier divider.

* * *

14. A solar plant comprising:
 - a plurality of solar panels;
 - a plurality of electrical cables extending from the plurality of solar panels; and
 - a system for organizing the plurality of electrical cables, the system comprising:
 - a messenger wire supported a distance above the ground adjacent the solar panels; and
 - a plurality of cable hangers disposed along, and suspended from the messenger wire, each cable hanger having a plurality of cable carrying surfaces, each cable carrying surface being structured to support at least one electrical cable of the plurality of electrical cables,

wherein adjacent cable carrying surfaces of the plurality of cable carrying surfaces are separated by a cable carrier divider.

EX1001, 10:24-37; 11:29-45.

The specification discusses the solar industry's "need for electrical cables to extend from a power or signal source to a location of application." *Id.*, 1:20-22. In describing the types of electrical cables and other wires utilized in solar plant installations, the specification explains that

In solar plants, direct current wires attach first to the solar panels and then run to combiner boxes before extending further to power inverters. In addition, alternating current power cables are used to power the motors that control the trackers, devices that rotate the solar panels to follow the sun in order to obtain maximum power during daylight hours.

Id., 1:25-31. The specification also states that in solar power plants "there are various sized wires and bundles of wires with an almost unlimited variety of wire bundle sizes" *Id.*, 1:57-59. The solar industry's adoption of tracker systems is also addressed in the specification. *Id.*, 2:1-3 ("In a solar plant there is a recent move to tracker systems which utilize more wiring than previously fixed in place systems."). The specification also identifies some of the harsh environmental conditions to which solar plants are subject, stating that the "stifling heat of the

desert where solar power plants are usually located [can reach 120 degrees F].” *Id.*, 2:37, 49-50.

Prior to the priority date of the ‘291 Patent, cable management of electrical cables in solar installations extending from the solar panels to the combiner boxes and power inverters utilized direct burial cables, cables in conduit, or metal wire trays, without any separation of AC cables from DC cables. EX2001, ¶70. These methods are discussed in the ‘291 Patent:

Prior to 2014, AC and DC cables could be bundled immediately adjacent to, and touching, one another in a wire management system for the solar panels. In the new National Electric Code of 2014, the AC and DC cables must not be immediately adjacent to one another, but must have a degree of separation from one another. Power carrying cables have a tendency to induce errors or interfere with the signal wires that are located in close proximity to them. This new requirement also applies to other applications outside the solar power industry, such as the mining and electrical industries.

Id., 1:32-42. The ‘291 Patent further explains:

Because of the increased use of trackers in solar power plants, there is increased use of category five cables and other data wiring. This type of control wiring is used to give power plant operators feedback from the solar power plant array on what angles the panels are stationed, and what the proper angle should be to maximize power output from the sun. This data and information is constantly monitored to obtain maximum power output from the thousands of solar panels in the

solar power plant. The type of wiring used in collecting data is sensitive to cables used for AC and DC power and because of that sensitivity, data wiring cannot be bundled with power cables and must be supported by a separate carrier that is at least one inch away from all power cables.

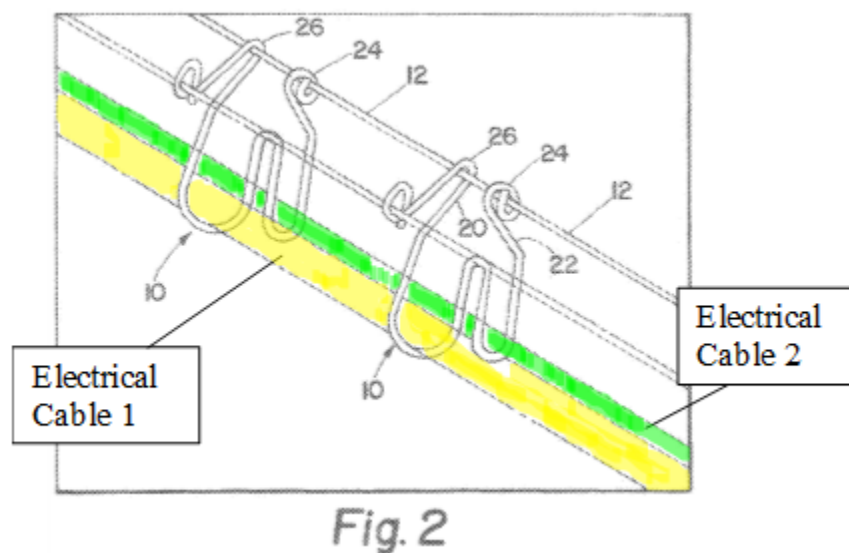
Id., 1:43-56. The specification states, as Dr. Kern also describes, that “[b]ecause of [the] changes [to the NEC], the wire management systems are much more complex, especially given the vast number of wires involved in a utility scale solar power plant.” *Id.*, 2:6-9; EX2001, ¶73.

In view of the recognized deficiencies of existing solutions for managing and organizing electrical cables in solar installations at the time, as well as the new requirements of the 2014 NEC Code, the ‘291 Patent is directed to several improvements over the prior art, such as:

- providing a new multiple electrical cable hanger system for the solar industry that is safe, more efficient and that reduces installation labor time;
- providing a more “organized system to support cables” in the solar industry;
- providing an electrical cable support system that offers safe, secure, strong, and “effective separation of cables and wires so as to protect the electrical performance of cables” in solar applications; and
- providing a safer cable management system for control and electrical cables in the solar industry.

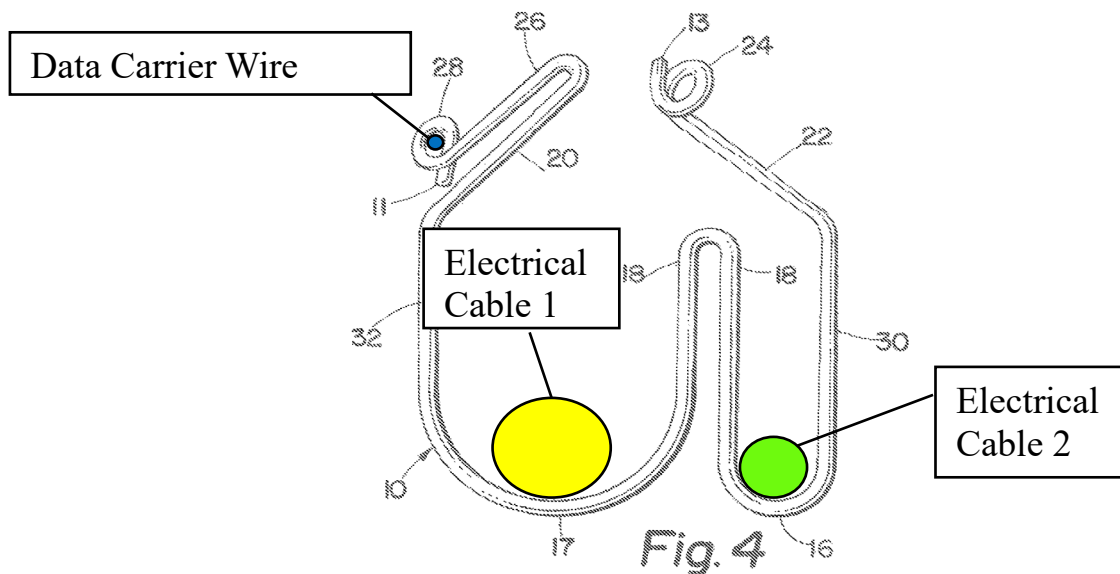
See id., 4:52-5:11.

The '291 Patent claims a system for organizing electrical cables and data wires in a solar plant as shown in an exemplary embodiment depicted in Figure 2 (an annotated version of which is reproduced below identifying a plurality of electrical cables extending from a plurality of solar panels as claimed in claim 1). The exemplary system shown in Figure 2 includes a messenger wire **12** and a plurality (e.g., two) of cable hangers **10** suspended from the messenger wire **12**. *Id.*, 6:50-54.



Id., FIG. 2 (annotated). While Figure 2 above shows only one electrical cable in each of two cable carrying surfaces, the '291 Patent also claims cable hangers with at least three, four, and five cable carrying surfaces, each surface structured to support at least one electrical cable. *Id.*, 10:38-46; *see also* FIG. 23.

As shown in Figure 4 (an annotated version of which is reproduced below), the hanger **10** includes electrical cable carrier formations **16** and **17** with a cable carrier divider **18** separating cable carrier formations **16** and **17**. *Id.*, 6:27-32. Figure 4 further shows the hanger **10** further includes a data carrier loop **28** for carrying a data information wire along the same path as the messenger wire **10**. *Id.*, 6:38-41.



Id., FIG. 4 (annotated). The ‘291 Patent teaches that “[w]hat is important is that the hanger **10** provides a sufficient separation between both cable carrier formations **16**, **17** and a further sufficient separation between the two carriers formations **16**, **17**, and the data carrier loop **28**” *Id.*, 7:14-17. The ‘291 Patent’s claimed systems and methods, therefore, provide for AC and DC cables extending from solar panels to be separated from each other and from data carrying wires.

B. Prosecution History

U.S. Patent Application Ser. No. 17/349,447 (the application that led to the '291 Patent) was filed on June 16, 2021. The '291 Patent is a continuation of U.S. Application No. 17/199,992, filed on March 12, 2021. The '291 Patent is also a continuation of U.S. Application No. 15/662,474, filed on July 28, 2017, now issued as U.S. Patent No. 10,978,861, which is a continuation of U.S. Application No. 14/556,117, filed on November 29, 2014, now issued as U.S. Patent No. 9,722,405. EX1001, Cover.

During prosecution of the '291 Patent, the Examiner rejected the claims, in part, based upon what the Examiner initially understood to constitute Applicant's own admitted prior art disclosed in the specification, in combination with *Carr*, U.S. Patent No. 2,384,440 (EX. 1005, relied upon by Petitioner in Ground 3 of the Petition). EX1015, 149-163. The Examiner specifically stated in his rejection that "Applicant discloses that the prior discloses a system for organizing a plurality of electrical cables extending from a plurality of solar panels; a messenger wire structured to be supported a distance above ground; and a plurality of cable hangers structured to be disposed along, and suspended from, the messenger wire (see pages 2 and 3 of the specification)." *Id.*, 152.

The Applicant overcame the Examiner's rejection by submitting a declaration from one of the inventors, Allen Garrett Smith, explaining that the

Examiner had misunderstood the disclosures in the specification, and that any references in the specification to “any use of known/existing cable hanger systems (i.e., systems utilizing a messenger wire suspended therefrom) . . . were to arrangements and/or components thereof used in the mining and/or electrical . . . industries,” whereas “any references to the use of arrangements or portions thereof in regard to the solar industry were not to any publicly known/available arrangement by any other(s) as none existed at such time.” *Id.*, 202. Mr. Smith went on to explain that any such references to any systems or components of systems in the solar industry “were to CAB’s own testing/development which were undertaken non-publicly/confidentially and/or within one year from the filing date of the patent application from which the present application claims priority.” *Id.*

Responsive to the submitted declaration, a Notice of Allowance was issued that included “reasons for allowance” providing the Examiner’s view of the patentable elements of the claims. *Id.*, 206-213. Specifically, the Examiner stated the following reasons for allowance:

The prior art does not disclose or suggest a system for organizing a plurality of electrical cables extending from a plurality of solar panels, with a plurality of cable hangers disposed along a messenger wire, with cable carrying surfaces structured to support at least one cable and separated by a cable carrier divider.

Id., 211, 253-258.

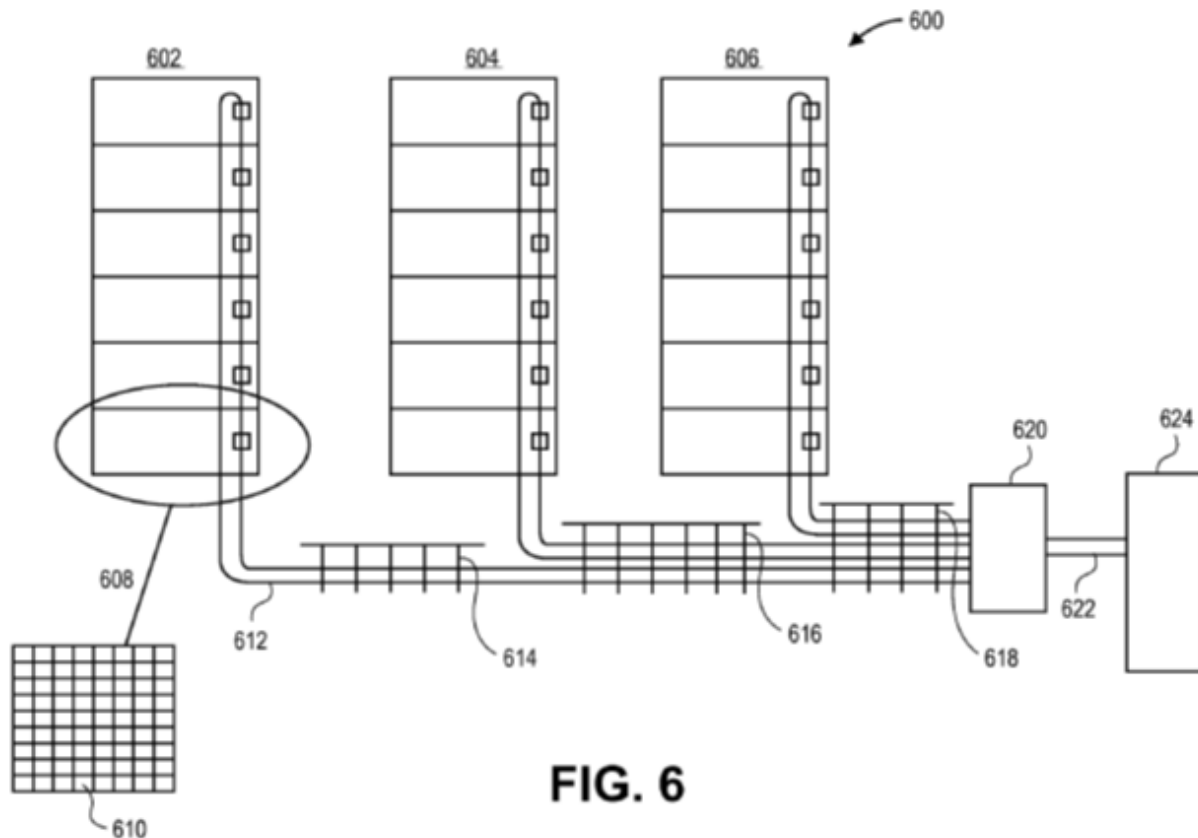
IV. PETITIONER'S ASSERTED PRIOR ART**A. CAB Catalog**

The “CAB Hooks, Hangers & Mine Safety Products” catalog (“CAB Catalog”), describes purported product offerings related to hooks, hangers and safety products, predominantly for use in underground mines. EX1006, 2-23; EX2001, ¶80. The CAB catalog contains no disclosure or suggestion that any of the offerings are intended or suitable for use in solar applications. Moreover, the hangers disclosed in the CAB Catalog are not disclosed as being used for separating DC power cables from AC power cables, or for separating power cables from data carrier cabling. *See generally* EX1006; EX2001, ¶81.

B. Almy (U.S. Pub. No. 2010/0139731)

Almy, “Wire-Based Hanging Wire-Way for Photovoltaic Modules or Module Groups,” published on June 10, 2010. *Almy* describes a “[w]ire-based hanging wire-way for photovoltaic modules or module groups.” *Id.*, at 1 (Abstract). *Almy* states that “[g]round based power distribution networks require significant cabling between photovoltaic modules or discrete groups of modules” *Id.*, at 8, [0004]. *Almy* further states that “[t]o meet electrical code, the cabling is usually placed in a metal wire tray or conduit,” but that “metal wire trays or conduits can be both expensive and cumbersome to build.” *Id.* Thus, “additional improvements are needed in the evolution of photovoltaic systems which include arrays of photovoltaic modules and ground based power distribution networks.” *Id.*

Almy's wire-based hanging wire-way only supports bundles of DC power cables. As explained in *Almy's* specification and shown in Figure 6 (reproduced below), bundles of electrical cables extending from each of photovoltaic module groups **602**, **604** and **606** (e.g., bundle of electrical cables **612** extending from photovoltaic module group **602**) are all connected to combiner box **620**, which is coupled to inverter **624**. *Id.*, at 11, [0034]. Inverter **624** “combines lines from several combiner boxes and converts DC current to AC current.” *Id.*



EX. 1004, FIG. 6. Further discussing Figure 6, *Almy* states that “the size of each wire-based hanging wire-way expands with each successively larger bundle of electrical cables.” EX. 1004, [0034].

**V. PETITIONER HAS NOT DEMONSTRATED A REASONABLE
LIKELIHOOD OF SUCCESS IN SHOWING THE CHALLENGED
CLAIMS TO BE UNPATENTABLE SO AS TO WARRANT
INSTITUTION**

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to the Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

The ultimate determination of obviousness under 35 U.S.C. § 103 is a question of law based on underlying factual findings. *In re Baxter Int’l, Inc.*, 678 F.3d 1357, 1362 (Fed. Cir. 2012) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1996)). Petitioners must support their obviousness contentions with articulated reasoning and based on rational, factual underpinnings; conclusory statements of obviousness will not suffice. *KSR*, 550 U.S. at 418. Similarly, any expert testimony must explain in detail how specific references could be combined, which combinations of elements in specific references would yield a predictable result, and how any specific combination would operate or read on the asserted claims. *ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312,

1327 (Fed. Cir. 2012); *see also* *Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380–81 (Fed. Cir. 2016) (“To satisfy its burden of proving obviousness, a petitioner cannot employ merely conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.”). “[A] patent can be obvious in light of a single prior art reference if it would have been obvious to modify that reference to arrive at the patented invention.” *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1361 (Fed. Cir. 2016). However, Courts have repeatedly warned that references to “common sense”—whether to supply a motivation to combine or a limitation missing from the prior art references specified—cannot be used as a wholesale substitute for reasoned analysis and evidentiary support, especially when the missing limitation play a major role in the subject matter claimed.” *Arendi S.A.R.L.*, 832 F.3d at 1361–62.

A. Ground 1: CAB Catalog In View Of The Knowledge Of A POSITA Does Not Render Obvious Claims 1-13

1. Petitioner Fails To Demonstrate The CAB Catalog Is A Printed Publication

The burden is on Petitioner to prove that a purported prior art reference is a printed publication. *See Acceleration Bay, LLC v. Activision Blizzard, Inc.*, 908 F.3d 765, 772 (Fed. Cir. 2018); *see also* 35 U.S.C. § 311(b); *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 (P.T.A.B. Dec. 20, 2019).

Petitioner has not met its burden with respect to the CAB Catalog. Dr. Beik states that the CAB Catalog was “publicly available on CAB’s website at least as early as August 11, 2011.” EX1002, ¶43. Petitioner says it was available “at least as early as March 14, 2011.” Pet., 8. The only support for either statement is that the CAB Catalog “bears a copyright date of 2010.” EX1002, ¶43.

Petitioner never explains the provenance of the document it submitted as EX1006, and there is no evidence that EX1006 is related in any way to EX1024. Petitioner does not identify which link on EX1024 is the CAB Catalog and, in fact, the links that appear on EX1024 are not active. Even if EX1006 was available on Patent Owner’s website in 2011 as Petitioner contends, that fact alone still does not demonstrate public accessibility. *See First Solar, Inc. v. Rovshan Sade*, IPR2023-00827, Paper 13, at 14 (Nov. 16, 2023) (petitioner failed to show document was publicly available notwithstanding copy of document existed on Internet Archive). In a related proceeding, Petitioner attempted to show a document was publicly available by submitting an affidavit from a Records Request Processor at the Internet Archive. *See AWM v. CAB*, IPR2024-00139, EX1026. Curiously, Petitioner does not do so here with respect to EX1006.

2. CAB Catalog Does Not Disclose or Render Obvious the Claimed “A System for Organizing a Plurality of Electrical Cables Extending from a Plurality of Solar Panels” of Independent Claims 1 and 6 (and Dependent Claims 2-5, 7-13)

Dr. Beik states that “a cable hanger for suspending multiple conductors was well-known in the prior art” (EX1002, ¶49), and that the prior art “discloses *precisely* the systems and methods claimed in the independent claims of the ‘291 Patent.” *Id.* (emphasis added); *see also* EX2001, ¶93. Petitioner’s characterization of the claimed invention is inaccurate. The ‘291 Patent does not claim a system to a cable hanger that supports “conductors” from a messenger wire. Rather, the system claimed in the ‘291 Patent is specifically directed to “*organizing*” a plurality of *electrical cables extending from a plurality of solar panels*, i.e., separating DC power cables from AC power cables. EX2001, ¶94.

In the context of the ‘291 Patent, a POSITA would understand that “electrical cables” are current-carrying cables that provide power, i.e., “power cables.” EX2001, ¶95. The ‘291 Patent’s specification describes how the 2014 NEC introduced a new requirement that DC and AC cables “must have a degree of separation from one another.” EX. 1001, 1:35-37 (emphasis added); *see also* EX2001, ¶95. The specification further explains that “[p]ower carrying cables have a tendency to induce errors or interfere with the signal wires that are located in close proximity to them.” *Id.*, 1:37-39 (emphasis added); *see also* EX2001, ¶95.

The specification makes clear that the “signal wires,” or “control wiring,” refers to category 5 cabling or other wiring necessitated by “the increased use of trackers in solar power plants,” so as to “give power plant operators feedback from the solar power plant array on what angles the panels are stationed, and what the proper angle should be to maximize power output from the sun.” *Id.*, 1:43-51. The specification continues on to explain that this “type of wiring used in collecting data is sensitive to cables used for *AC and DC power* and because of that sensitivity, data wiring cannot be bundled with *power cables* and must be supported by a separate carrier that is at least one inch away from all *power cables*.” *Id.*, 1:51-56 (emphases added); *see also* EX2001, ¶95

Dr. Beik acknowledges that the ‘291 Patent describes its system for organizing electrical cables extending from solar panels as separating AC and DC power cables, in accordance with the 2014 NEC requirements. *See* EX. 1002, ¶¶32, 41-42. In the same way, a POSITA would understand the ‘291 Patent’s system for organizing electrical cables extending from solar panels to be a system for separating DC and AC power cables in order to comply with the NEC, and further for separating power cables from data carriers. EX2001, ¶96.

The CAB products shown in the CAB Catalog do not organize electrical power cables in an outdoor solar installation. Instead, they are predominantly for bundling various kinds of cables in underground mines. *See, e.g.*, EX1006, at 3, 5;

see also, EX1002, ¶51 (quoting from the CAB Catalog that “CAB Bosserman Clips are widely respected for their superior ability to safely suspend electrical cables and wiring in a variety of *underground* applications. . . .”) (emphasis added); EX2001, ¶97. To the extent the CAB Catalog depicts the use of any of its hangers for above-ground outdoor applications—for example the “plant” that Dr. Beik identifies on p. 14 of the CAB Catalog—they are hangers with a single carrying surface that appear at most to be supporting a single cable or bundle of cables from one point to another, but certainly not extending from solar panels. EX1002, ¶53; EX1006, 14; EX2001, ¶97. Furthermore, the cables Dr. Beik includes in his declaration are referred to as “aerial cables,” without specifying what type of aerial cables they are. EX1006, 14.

There is no support for Dr. Beik’s conclusion that a POSITA would understand the image Dr. Beik reproduces to show hangers that could be used to organize a plurality of electrical cables extending from a plurality of solar panels in a solar installation. EX1002, ¶53; EX2001, ¶98. Notably, Dr. Beik relies on portions of the CAB Catalog to specifically disclose hangers used for “electrical cables.” EX. 1002, ¶54 (citing EX1006, 9); EX2001, ¶99. The J-Hooks to which Dr. Beik refers, however, are disclosed for use in underground mines, not in outdoor above-ground solar applications. EX. 1006, 9 (referring to the various types of J-Hooks as being for “sidewall applications,” “supporting pipe and cables

from roof, side or structure, ” “hanging multiple cables from roof,” “hanging from roof or other structure”); EX2001, ¶99. Neither Petitioner nor Dr. Beik have identified any system for organizing current-carrying power cables extending from solar panels in an outdoor solar installation prior to the invention of the ‘291 Patent. EX2001, ¶100.

To support his proposition that cable management issues existed long before solar power systems, Dr. Beik points to standards and practices for cable installation in substations, generating stations and industrial facilities, specifically referencing the “proper installation of wire and cable systems in commercial, governmental and public facilities when the *same or similar wire or cable types and raceways are used.*” EX1002, ¶52 (emphasis added); EX2001, ¶101.

According to Dr. Beik, a POSITA looking to manage cables in the solar industry would look to cable management in other electrical industries. *Id.* But none of the references Dr. Beik cites discuss separation of *different* types of cables, such as DC from AC power cables, or separation of DC and AC power cables from data carriers, which is “precisely” the “system for organizing a plurality of electrical cables extending from a plurality of solar panels” that the ‘291 Patent claims. Solutions for cable management in substations, generating stations and industrial facilities, just like cable management solutions used in underground mines, do not translate into solutions suitable for organizing electrical cables extending from

solar panels in outdoor solar installations. There is no support for Dr. Beik's conclusory opinions to the contrary. EX2001, ¶101.

Petitioner's and Dr. Beik's analysis ignores the unique challenges to cable management in outdoor solar installations. As discussed above (p. 10-11), Petitioner's own exhibit (EX1011) identifies those unique challenges, including harsh environmental conditions, including high winds, extreme temperatures, ice, snow and other debris, in which PV arrays are installed, as well as concerns with NEC compliance. EX1011, 2-4, 7-8; EX2001, ¶102. Petitioner and Dr. Beik point to the '291 Patent's specification's statement that the locking cable hanger system is "for use in the solar, mining and electrical industries." EX1002, ¶52; Pet., 22 (citing EX1001, 1:18-22). That the claimed invention can be used in the mining and electrical industries, however, does not mean that prior art solutions from the mining and electrical industries can be used in the solar industry. EX2001, ¶103.

Petitioner and Dr. Beik also contend that using hangers from the CAB Catalog to organize cables extending from solar panels "would have yielded predictable results and reasonable expectation of success." EX1002, ¶¶55; Pet., 23. The Petition goes further, stating that the use of the hangers disclosed in the CAB Catalog "would have involved routine implementation, would have posed no technical risk, and would have achieved predicable [*sic*] benefits of improving wire runs in solar installations." Pet., 21. In support of their assertions that a POSITA

would have had a reasonable expectation of success in using the hangers disclosed in the CAB Catalog to organize cables extending from solar panels, Dr. Beik states that “(i) the CAB Catalog offers a hanger and support system that is spaced apart . . ., (ii) it would have been obvious to a POSITA to modify the *CAB Catalog* hangers where there was a need for multiple sets of cables when paralleling solar panels, and (iii) solar power systems use cables that are common in the electrical power distribution industry.” EX1002, ¶55. Those reasons are essential to Dr. Beik’s analysis, but they are divorced from and ignore the known challenges unique to cable management in solar installations. EX1011, 2-4, 7-8.

Petitioner asserts that EX1007, a 1984 report prepared by Underwriters’ Laboratoros (“UL”) for Jet Propulsion Laboratory (“JPL”) to support an “express motivation” to use the hangers disclosed in the CAB Catalog in the solar industry.

Pet., 22. But Petitioner misleadingly quotes the report to state that it

explained that “a messenger with rings and saddles for conductor support” *is a* “practical PV [photovoltaic] application ... for terrestrial arrays located away from the building.

Pet., 2 (quoting EX1007, 39) (emphasis added); *see also* EX1002, ¶31. What the report actually states is that “A practical PV application of messenger supported wiring *may be* for terrestrial arrays located away from the building.” EX1007, 29 (emphasis added). Petitioner’s distortion is not trivial—it alters the report’s

speculation to create, according to Petitioner, an “express teaching.” *See also*

EX2001, ¶109 (“[A] POSITA at the time of the ‘291 invention would have viewed this report as an outdated catalog of equally outdated wiring methods, not motivation for product development in solar installations as they had developed leading the ‘291 patent.”).

Similarly, Petitioner and Dr. Beik misdescribe EX1008 as comprising a plurality of “‘spaced apart hangers’ designed to be suspended from a messenger wire for use in solar installations.” EX1002, ¶31 (citing EX1008); Pet., 22-23. The SnakeTray product identified on EX1008 is a cable tray system, not a plurality of “‘spaced apart hangers.” *See* EX1008; EX2001, ¶110.

3. CAB Catalog Does Not Disclose the Claimed Messenger Wire of Independent Claims 1 and 6 (and Dependent Claims 2-5, 7-13)

Petitioner states that the CAB Catalog “explicitly discloses the use of a messenger wire to support cable hangers, rings, saddles and clips suspended from a messenger wire.” Pet., 23; EX1002, ¶57. Dr. Beik relies upon various images from the CAB Catalog that he includes in his declaration. *Id.* Based on these cited pages and images, Dr. Beik concludes that the “*CAB Catalog* discloses ‘a messenger wire structured to be supported a distance above the ground.’” *Id.*, ¶58; *See* EX2001, ¶111.

None of the citations and images on which Dr. Beik relies disclose a messenger wire “structured to be supported *a distance above the ground*.” First, Dr. Beik cites a page of the CAB Catalog that refers to “messenger wire,” but ignores the text at the top of that page that expressly states the CAB Bosserman Clips are for “*underground applications*.” EX1006, 5. That is, the CAB Catalog expressly states that the product on which Dr. Beik relies is not a messenger wire suspended a distance above the ground. EX2001, ¶112. Moreover, the hanger designed to be suspended from the referenced messenger wire is a plastic CAB Telewire Hook. A POSITA would understand in the context of the overall disclosures of the CAB Catalog that “telewire” is run underground in the mine.

The second reference in the CAB Catalog to a “messenger wire” that Dr. Beik notes (EX1002, ¶57) does not indicate that the messenger is suspended a distance above the ground. EX2001, ¶113 Similarly, none of other references to “messenger wire” in the CAB Catalog specify whether the messenger wire, or the hangers suspended the messenger wire, are for above-ground or underground application. Contrary to Dr. Dr. Beik’s assertion, therefore, the cited references and images in the CAB Catalog do not disclose a messenger wire structured to be supported a distance above the ground. EX2001, ¶114

The claims of the ‘291 Patent require that the messenger wire not only be supported a distance above the ground, but also that the messenger wire support a

plurality of hangers having a plurality of cable-carrying surfaces, each cable-carrying surface structured to support a plurality of electrical cables extending from a plurality of solar panels. EX2001, ¶115. With one exception, all of the hangers depicted in the CAB Catalog on which Dr. Beik relies for the “messenger wire” limitation of the claims are hangers with a single cable carrying surface. *See* EX1006, 5, 14. The one exception is the “CAB 905 Plastic Telewire” which, as its name suggests, is made of plastic. That product is appropriate only for supporting lighter weight telewires. It is not one of a plurality of cable hangers having a plurality of cable carrying surfaces structured to support a plurality of much heavier electrical power cables extending from a plurality of solar panels. EX2001, ¶116. As Dr. Beik has acknowledged, referring to “electrical cables,” “[a] POSITA would have recognized that higher voltage and heavier load applications exist in the solar power context.” EX1002, ¶54; *see also id.*, ¶29 (acknowledging that current-carrying cables are heavier, and that large bundles of current-carrying cables, if not supported, will deflect under load).

4. CAB Catalog Does Not Disclose the Claimed or Render Obvious the Claimed Plurality of Cable Hangers of Independent Claims 1 and 6 (and Dependent Claims 2-5, 7-13)

With one exception, the images and text from the CAB Catalog on which Dr. Beik relies to disclose the claimed “a plurality of cable hangers structured to be disposed along, and suspended from, the messenger wire, each cable hanger having

a plurality of cable carrying surfaces, each cable carrying surface being structured to support at least one electrical cable of the plurality of electrical cables” have or refer to a single cable carrying surface. EX1002, ¶59; EX2001, ¶117. The one exception, the “CAB 905 Plastic Telewire”, is appropriate only for supporting lightweight telewires. EX2001, ¶117

Dr. Beik also relies on images of hangers that have a plurality of cable carrying surfaces (EX1001, ¶60), but with one exception, those hangers are structured to be disposed along and suspended from a messenger wire. EX2001, ¶119. The Double J-Hook (EX1006, 9) is described as hanging from a roof. The CAB Longwall Hanger is described as having an extension hook for “higher roof areas,” and is nowhere described as being suspended from a messenger wire. *Id.*, 10. With respect to the 4 Carrier Bullhorn Hangers, the CAB Catalog states that custom sizes of these hangers are available for “high roof areas.” *Id.*, at 11; *see also* EX2001, ¶119

As discussed above, the only hanger disclosed in the CAB Catalog that has a plurality of cable carrying surfaces, and that is suspended from a messenger wire, is the CAB 905 Plastic Telewire Hook (EX1006, 8), which is for for suspending telewires. *Id.*, at 8. Dr. Beik fails to explain how this disclosure is sufficient to meet the claim requirement that the claimed cable hanger have a plurality of cable

carrying surfaces structured to support heavier electrical power cables extending from solar panels in a solar installation. EX2001, ¶120

The CAB hangers referenced in ¶61 of Dr. Beik's Declaration also fail to meet this claim limitation. The CAB Bosserman Clip has a single cable carrying surface, as do the CAB Cable Rings and Saddles. EX1006, 5, 14. The CAB J-Hooks are appropriate for sidewall and roof applications. *Id.*, 9; EX2001, ¶121

Dr. Dr. Beik states that “a POSITA would have found it obvious to modify CAB's cable clips, rings, and saddles to have a plurality of cable carrying surfaces” because these products' “simple design” would “*allow*” the modification. EX1002, ¶62 (emphasis added). Dr. Dr. Beik offers no details of the specific design of these cable clips, rings and saddles, or how they are made, and apparently bases his assertion that their design is “simple” based on their appearance alone. He also states that, based on the “possible variety” of the hangers' size and configuration options, it would have been obvious to a POSITA to modify the hangers “to allow for larger, smaller, or a plurality of cables to fit into the disclosed hangers.” *Id.* Recognizing that such a modification would not add to the number of cable carrying surfaces, Dr. Beik asserts that “a POSITA would know that this same hanger *can be* modified . . . to include extra bends in the hanger to provide separate and divided areas for each of the cables to occupy.” *Id.* (emphasis added). EX2001, ¶122. That a prior art reference *could* be modified does not also mean that

a POSITA *would* make the modification. Petitioner does not demonstrate that a POSITA would have been motivated to modify any of CAB's cable clips, rings, and saddles to include a plurality of cable carrying surfaces.

Petitioner has not shown that the CAB Catalog renders obvious independent claims 1 or 6 obvious. Because dependent claims 2-5 and 8-13 depend directly or indirectly from claim 1, and dependent claim 7 depends from claim 6, Petitioner has not shown how the CAB Catalog renders these claims obvious. EX2001, ¶126.

B. GROUND 2 - CLAIMS 14-23 OF THE '291 PATENT WOULD NOT HAVE BEEN OBVIOUS OVER CAB CATALOG AND ALMY IN VIEW OF THE KNOWLEDGE OF A POSITA

Petitioner and Dr. Beik purport to combine the CAB Catalog with *Almy* to challenge claims 14-23, but they actually combine nothing at all. Dr. Beik relies on *Almy* to disclose the limitations “a solar plant,” “a plurality of solar panels” and “a plurality of electrical cables extending from the plurality of solar panels” recited in claim 14. EX1002, ¶¶104-109; *see also* EX2001, ¶130. For the limitations in claim 14 that recite “a system for organizing the plurality of electrical cables [extending from the plurality of solar panels,” Dr. Beik purports to rely on the CAB Catalog and *Almy*, together or individually, to show these claim limitations. EX2001, ¶¶110; *see also* EX2001, ¶130. Dr. Beik's analysis, however, relies only on his analysis for claim limitation 1[a], which is based solely on the CAB Catalog. EX1002, citing Section XI.A.1.a., ¶¶51-56; *see also* EX2001, ¶130. For all other

limitations of claim 14, Dr. Beik also relies solely on the CAB Catalog. *EX1002*, ¶¶111-113; *see also* *EX2001*, ¶130. For independent claim 19, Dr. Beik only relies on Almy to disclose the limitations “a solar plant,” “a plurality of solar panels” and “a plurality of electrical cables extending from the plurality of solar panels” recited in claim 19. *EX1002*, ¶¶114-116; *see also* *EX2001*, ¶131. For all other limitations of claim 19, Dr. Beik relies only on the CAB Catalog. *EX1002*, ¶¶117-121; *see also* *EX2001*, ¶131.

1. CAB Catalog Does Not Disclose or Render Obvious the Claimed “A System for Organizing a Plurality of Electrical Cables Extending from a Plurality of Solar Panels” of Independent Claims 14 and 19 (and Dependent Claims 15-18, 20-23)

For the reasons set forth *supra*, Section V.A.2., Petitioner has not shown that the CAB Catalog discloses the limitation of independent claims 14 and 19 “A system for organizing a plurality of electrical cables extending from a plurality of solar panels.” *See* *EX2001*, ¶132.

2. CAB Catalog Does Not Disclose the Claimed Messenger Wire of Independent Claims 14 and 19 (and Dependent Claims 15-18, 20-23)

For the reasons set forth *supra*, Section V.A.3., Petitioner has not shown that the CAB Catalog discloses the limitation of independent claims 14 and 19 “a messenger wire supported a distance above the ground adjacent the solar panels.” *See* *EX2001*, ¶133.

3. CAB Catalog Does Not Disclose the Claimed or Render Obvious the Claimed Plurality of Cable Hangers of Independent Claims 14 and 19 (and Dependent Claims 15-18, 20-23)

For the reasons set forth *supra*, Section V.A.4., Petitioner has not shown that the CAB Catalog discloses the limitation of independent claims 14 and 19 “a plurality of cable hangers disposed along, and suspended from the messenger wire, each cable hanger having a plurality of cable carrying surfaces, each cable carrying surface being structured to support at least one electrical cable of the plurality of electrical cables.” *See* EX2001, ¶134.

Because dependent claims 15-18, 20-23 depend directly from independent claim 14, Petitioner has not shown that the CAB Catalog discloses or renders these dependent claims obvious. *See* EX2001, ¶135.

C. Secondary Considerations Support A Finding That The ‘291 Patent’s Claims Are Not Obvious

The ‘291 Patent’s prosecution history that was submitted by Petitioner in this proceeding contains important evidence supporting non-obviousness. In response to the Examiner’s rejection under 35 U.S.C. § 103, Patent Owner submitted the declaration of inventor Allen Smith, who attested to the significant investments and expenditures Patent Owner had made to develop the invention and overcome industry skepticism. *See* EX1015, 201-203; *see also* EX2001, ¶138-39. Mr. Smith’s Declaration also included evidence of the invention’s commercial

success. Specifically, Mr. Smith stated that CAB had no sales in the solar industry prior to 2014, but by fiscal year 2020/2021, had sold over \$37 million in product to the solar industry, with even greater sales projections for fiscal year 2021/2022.

EX1015 at 202-03.

Other evidence of non-obviousness is contained in Petitioner's SolarPro article, EX1011. The article tells of the industry's long felt need for improved cable management systems, the "challenges to managing free-air conductors with the PV array," the challenges presented by the extreme environmental conditions in which PV arrays are installed, and the overall challenges of challenges of "implementing a safe, reliable and *Code*-compliant wire management system for exposed PV conductors." EX1011, 1-2.

Dr. Beik states that he is not aware of any secondary considerations in support of non-obviousness. EX1002, ¶¶129-130. That the evidence on which Patent Owner relies is contained in Petitioner's exhibits suggests that Dr. Beik did not carefully read at least some of the documents on which his opinions are based. Not only does Dr. Beik fail to identify secondary indicia of non-obviousness contained in the record that Petitioner created, but he appears unwilling to consider any such evidence inasmuch as he opines, "Even if evidence of secondary considerations existed, in my opinion, it would be insufficient to overcome the clear obviousness of the challenged claims." Dr. Beik's predetermined conclusion

about the strength of evidence he has not seen calls into question the reliability of his other opinions.

VI. CONCLUSION

The Petition should be denied because the asserted prior art references, alone or in combination, explicitly and implicitly, fail to disclose all limitations of the challenged claims. The Petition also fails to explain why a POSITA would have combined or, in the case of Petitioner's single-reference obviousness ground, modified the asserted reference, and fails to explain why a POSITA would have had a reasonable expectation of success. Alternatively, the Board should exercise its discretion to deny the Petition.

Dated: February 15, 2024

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CERTIFICATE OF COMPLIANCE WITH WORD COUNT LIMITATION

Patent Owner certifies that its Preliminary Response complies with the word count limitations of 37 C.F.R. §42.24(a)(1)(i). Based on Microsoft Word's "Word Count" feature, Patent Owner's Preliminary Response contains 8,853 words, excluding the cover page, signature block, and the parts of the Patent Owner's Preliminary Response exempted by 37 C.F.R. § 42.24(b)(1).

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), I certify that on this 15th day of February, 2024, a true and correct copy of the foregoing **PATENT OWNER'S PRELIMINARY RESPONSE TO PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 11,349,291** was served by electronic mail on Petitioner's lead and backup counsel at the following email addresses:

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