

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,
Petitioner,

v.

RELINK US LLC,
Patent Owner.

IPR2024-00389
Patent 9,793,755 B2

Before JEFFREY W. ABRAHAM, AVELYN M. ROSS, and
JANE E. INGLESE, *Administrative Patent Judges*.

INGLESE, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Overview

Tesla, Inc. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) for *inter partes* review of claims 1–20 (the “challenged claims”) of U.S. Patent No. 9,793,755 B2 (Ex. 1001, “the ’755 patent”). Relink US LLC (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). With Board pre-authorization, Petitioner filed a Reply (Paper 7, “Reply”) and Patent Owner filed a Sur-reply (Paper 8, “Sur-reply”), limited to addressing particular issues. Ex. 1030 (e-mail correspondence with the Board).

We have authority to determine whether to institute *inter partes* review. *See* 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2023) (“The Board institutes the trial on behalf of the Director.”). *Inter partes* review may not be instituted “unless . . . the information presented in the petition . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a).

Upon consideration of the information presented in the Petition and the Preliminary Response, we determine that Petitioner has not provided sufficient information to demonstrate a reasonable likelihood that it would prevail in establishing the unpatentability of at least one challenged claim. We therefore deny institution of *inter partes* review.

B. Real Parties-in-Interest

Petitioner identifies itself, Tesla, Inc., as the real party-in-interest. Pet. 1. Patent Owner identifies itself, Relink US LLC, as the real party-in-interest. Paper 4, 2.

C. Related Matters

The parties identify the following related proceeding: *Relink US LLC v. Tesla, Inc.*, Case No. 1:23-cv-1093-DII (W.D. Tx.). Pet. 1; Paper 4, 2.

II. BACKGROUND

A. The '755 Patent (Ex. 1001)

The '755 patent relates to an uninterruptible power supply (UPS) and a method for managing power flow in a grid-tied photovoltaic system. Ex. 1001, 1:7–8, 2:18–22. The UPS provides back-up power to a load in the event of grid failure or shut down by managing power flow between a battery and one or more current source inverters connected to one or more photovoltaic panels. *Id.* at 1:18–53.

Figure 4 of the '755 patent is reproduced below:

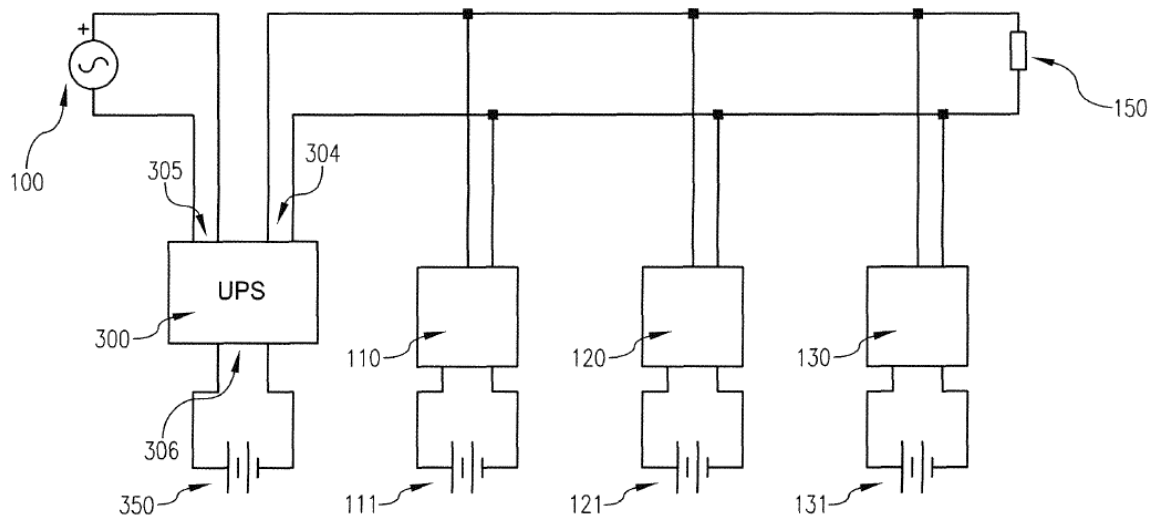


Figure 4 is a diagram of the '755 patent's grid-tied photovoltaic system. *Id.* at 4:8.

Figure 4 shows utility grid 100 that provides AC voltage; micro-inverters 110, 120, and 130, which receive DC current from photovoltaic modules 111, 121, and 131; AC load 150; uninterruptible power supply 300; and battery 350, which produces and stores DC voltage. *Id.* at 5:4–16, 6:23–25, 7:51–57.

Figure 3 of the '755 patent is reproduced below:

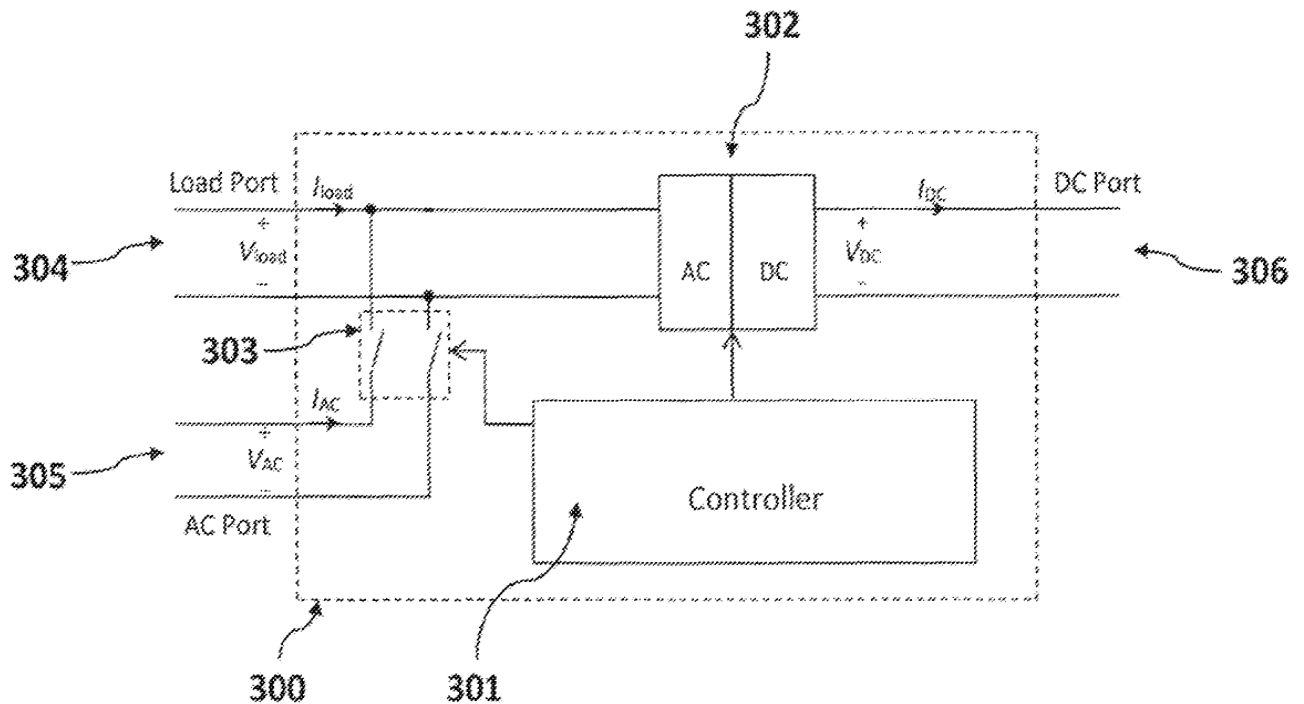


Figure 3 is a diagram of UPS 300. *Id.* at 4:8.

UPS 300 includes controller 301 that controls switch 303 and power converter 302 to manage power flow in the photovoltaic system of Fig. 4. *Id.* at 6:45–46, 7:35–36. UPS 300 further includes DC port 306 connected to battery 350 (Fig. 4), AC port 305 connected to utility grid 100 (Fig. 4), and load port 304, connected to both AC load 150 and micro-inverters 110, 120, 130 (Fig. 4). *Id.* at 6:38–45.

When utility grid 100 (AC voltage source) shuts down, controller 301 disconnects grid 100 from load 150 and microinverters 110, 120, 130 by opening switch 303 to AC port 305. *Id.* at 2:38–45, 8:44–52, Fig. 6. Photovoltaic modules 111, 121, 131 generate power (DC current), and microinverters 110, 120, 130 route the power (AC current) to power

converter 302. *Id.* at 5:67–6:12, 6:55–57, 7:35–46, Fig. 5C. Controller 301 causes power converter 302 to function as an AC voltage source to provide power to load 150. *Id.* at 2:45–46, 8:52–54, Fig. 5C, Fig. 6. If photovoltaic modules 111, 121, 131 generate more power than is needed to supply load 150, power converter 302 (alternating current voltage source) provides the excess power to battery 350 to charge it. *Id.* at 8:11–15, 8:54–60, Fig. 5C. Controller 301 monitors the charge state of battery 350, and when battery 350 is fully charged, controller 301 causes power converter 302 (alternating current voltage source) to adjust the frequency of the voltage on load port 304 and across micro-inverters 110, 120, 130, causing micro-inverters 110, 120, 130 to reduce their output power. *Id.* at 3:9–12, 6:65–7:2, 7:46–48, 8:18–21, 54–63, Fig. 6. In particular, micro-inverters 110, 120, 130 are configured to adjust their output power as a function of the frequency of power converter 302 (alternating current voltage source). *Id.* at 3:7–9, 6:5–7.

B. Challenged Claims

Petitioner challenges claims 1–20 of the '755 patent. Pet. 1. Claims 1, 18, and 20 are independent, claims 2–17 depend directly or indirectly from claim 1, and claim 19 depends directly from claim 18. Ex. 1001, 9:47–12:35.

Independent claim 1 is representative of the claimed subject matter, and reads as follows:

1. An uninterruptible power supply comprising:
a bi-directional converter configured to operate as an alternating current voltage source;

- a direct current power port configured to be coupled to a battery;
- a first alternating current power port coupled to the bi-directional converter and configured to be coupled to a current-source inverter, wherein the current-source inverter is configured to adjust an output power as a function of a frequency of the alternating current voltage source; and
- a controller configured to regulate a power flow of the current-source inverter by adjusting a frequency of the alternating current voltage source.

Ex. 1001, 9:47–60. Like claim 1, independent claims 18 and 20 both recite an uninterruptible power supply comprising, in part, a current-source inverter configured to adjust an output power as a function of a frequency of an alternating current voltage source, and a controller configured to regulate a power flow of the current-source inverter by adjusting a frequency of the alternating current voltage source. *Id.* at 10:62–11:22, 11:34–12:36.

C. Asserted Grounds of Unpatentability

Petitioner asserts that the challenged claims are unpatentable on the following grounds (Pet. 10–11):

Ground	Challenged Claim(s)	35 U.S.C. §	Reference(s)
1	1–7, 13, 18	102	Serban, ¹
2	1–7, 13–18	103	Serban, Matan ²
3	8–12, 19, 20	103	Serban, Matan, Wilhelm ³

¹ US 2011/0043160 A1, published February 24, 2011 (Ex. 1005, “Serban”).

² US 2010/0208501 A1, published August 19, 2010 (Ex. 1006, “Matan”).

³ US 5,500,561, issued March 19, 1996 (Ex. 1009, “Wilhelm”).

4	7, 13, 18–20	103	Servan, Matan, Wilhelm, PVI ⁴
5	1–3, 5–7, 13, 18	102	Somani ⁵
6	1–13, 15–20	103	Somani, Matan, Wilhelm
7	14	103	Serban, Wu ⁶
8	14	103	Somani, Wu

The Petition is supported by the Declaration of Edward R. Collins, Jr., Ph.D. (Ex. 1003). Patent Owner relies on the Declaration of Dr. David S. Ricketts (Ex. 2001).

III. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art “would have held at least a bachelor’s degree and a master’s degree in electrical engineering or a related degree, as well as possessing at least two years of experience with grid-tied power supplies having electric energy sources including photovoltaic and battery systems.” Pet. 15 (citing Ex. 1003 ¶ 23). Petitioner further asserts that a “POSA [person of ordinary skill in the art] would have been familiar with the admitted prior-art systems of Figures 1 and 2 [of the ’755 patent] and associated descriptions of those systems.” *Id.* (citing Ex. 1001, 1:28–36, 1:66–2:2, 5:42–47).

⁴ “Solectria PVI 6500, PVI 7500 Installation and Operation Manual,” Solectria Renewables, LLC, 2012 (Ex. 1010, “PVI”).

⁵ US 2017/0005473 A1, published January 5, 2017 (Ex. 1007, “Somani”).

⁶ US 7,787,267 B2, issued August 31, 2010 (Ex. 1013, “Wu”).

Patent Owner asserts a person of ordinary skill in the art “would include someone who had a bachelor’s or graduate degree in electrical engineering or related degree, with knowledge of uninterruptible power supply systems and approximately two years of industry experience with uninterruptible power supply systems, including those having power sources and converter[s].” Prelim. Resp. 6 (citing Ex. 2001 ¶ 33).

We find, at this stage, that the asserted prior art itself is sufficient to demonstrate the level of ordinary skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (prior art itself can reflect the appropriate level of ordinary skill in the art). To the extent a more precise definition is required, we apply Petitioner’s definition for purposes of determining whether to institute review, because it is consistent, on this record, with the disclosures of the asserted prior art references.

B. Claim Interpretation

We interpret claims “using the same claim construction standard that would be used to construe the claims in a civil action held under 35 U.S.C. § 282(b).” 37 C.F.R. § 42.100(b). Under this standard, claim terms generally are given their plain and ordinary meaning as would have been understood by the ordinarily skilled artisan at the time of the invention when read in the context of the specification and prosecution history. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). We construe terms in controversy 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) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner states that it “applied plain and ordinary meanings to all claim terms and no express constructions are required here.” Pet. 15 (citing Ex. 1003 ¶ 101). Patent Owner does not address claim construction. *See generally* Prelim. Resp.

Taking into consideration the arguments and information Petitioner and Patent Owner present, we determine that none of the claim terms requires express construction for purposes of deciding whether to institute review.

C. Principles of Law

“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”)); *see also* 37 C.F.R. § 42.104(b) (requiring a petition for *inter partes* review to identify how the challenged claim is to be construed and where each element of the claim is found in the prior art patents or printed publications relied upon).

D. Petitioner’s Serban-led Grounds

Petitioner asserts that claims 1–7, 13, and 18 are anticipated by Serban (Ground 1); claims 1–7, 13, and 18 would have been obvious over Serban and Matan (Ground 2); claims 8–12, 19, and 20 would have been obvious

over Serban, Matan, and Wilhelm (Ground 3); claims 7, 13, and 18–20 would have been obvious over Serban, Matan, Wilhelm, and PVI (Ground 4); and claim 14 would have been obvious over Serban and Wu (Ground 7). Pet. 15–69, 93–96. Patent Owner opposes. Prelim. Resp. 34–44.

Our analysis of Petitioner’s Serban-led grounds focuses on the requirement shared by independent claims 1, 18, and 20 that the recited uninterruptible power supply comprises a current-source inverter configured to adjust an output power as a function of a frequency of an alternating current voltage source, and a controller configured to regulate a power flow of the current-source inverter by adjusting a frequency of the alternating current voltage source. We begin our analysis with an overview of Serban.

1. Serban (Ex. 1005)

Serban discloses a control strategy for distributed power generation modules of a power system that operates in grid-tied or islanded mode. Ex. 1005, code (57), ¶ 17.

Figure 1 of Serban illustrates power system or microgrid 100:

with machine-readable instructions for carrying out pattern detection algorithm 128. *Id.* ¶ 20. Implementation of the pattern generation and pattern detection algorithms serves as a means of communication between hybrid converter 102 and PV inverter 104, as discussed below. *Id.* ¶ 29.

When microgrid 100 is operating in islanded mode (disconnected from grid 110 and genset 108), hybrid converter 102 operates in voltage-controlled source mode (operates as an alternating-current voltage source). *Id.* ¶ 27. PV inverter 104 harvests DC solar energy from PV array 112. *Id.* Energy for AC loads 114 can be sourced from either or both of PV array 112 and battery 106. *Id.* If the solar energy generated by PV array 112 is greater than that needed to power AC loads 114, the surplus power flows from PV inverter 104 through PCC 116 to hybrid converter 102, and through hybrid converter 102 to battery 106 in order to charge battery 106. *Id.* ¶¶ 27, 28. Hybrid converter 102 monitors and applies the correct charging profile to battery 106. *Id.* ¶ 28.

Under normal operating conditions when battery 106 is being charged, pattern generation algorithm 124 of controller 122 of hybrid converter 102 maintains a “constant” frequency on AC line 138 in which the frequency varies by ± 0.2 Hz from the nominal or fundamental (normal) frequency of the line. *Id.* ¶ 28. If the DC voltage or current of battery 106 exceeds the charging limit, such that the battery is being overcharged, pattern generation algorithm 124 increases or decreases the frequency on AC line 138 from its nominal or fundamental (normal) value according to a predetermined pattern. *Id.* ¶¶ 28, 30, 31. The predetermined pattern preferably varies the

frequency within ± 0.4 Hz of the fundamental or nominal frequency of AC line 138, which Serban indicates has a “negligible effect” on the line’s frequency. *Id.* ¶¶ 37, 55.

Pattern detection algorithm 128 of controller 126 of PV inverter 104 senses the specific frequency change pattern, and in response, adjusts the AC current it outputs onto AC line 138. *Id.* ¶¶ 4, 20, 28, 43.

Varying the frequency on AC line 138 according to a predetermined pattern thus functions “as a means for communicating between the hybrid converter 102 and the PV inverter 104,” eliminating the need for additional wiring between the two modules for communication purposes, and allowing the modules to be “positioned far away from each other.” *Id.* ¶ 29.

2. Overview of Serban-led grounds

Petitioner asserts that Serban discloses an uninterruptible power supply including a controller that causes a hybrid (bi-directional) converter (alternating current voltage source) to modify the frequency at its AC port according to a predetermined pattern, and in response to the modified frequency, a PV inverter (current source inverter) changes its power output. Pet. 22–25.

Patent Owner contends that Serban’s system implements a control functionality that differs drastically from that claimed in the ’755 patent. Prelim. Resp. 34–35. Patent Owner contends that Serban’s system uses a specific pattern of frequency variation as a means of communication between a hybrid converter and a PV inverter. *Id.* at 36–37. Patent Owner contends that the frequency variation does not result in any specific

corresponding change to the power output of the PV inverter, and Serban's system, therefore, does not control the power output of the inverter as a function of a frequency of the hybrid converter. *Id.* at 35–40.

After considering the parties' arguments and evidence, we determine that Petitioner does not provide a sufficient showing to establish that Serban discloses a current-source inverter and a controller, each configured as required by the challenged independent claims. Our reasoning is two-fold. First, Petitioner does not directly address the claim requirement that the current-source inverter is configured to adjust an output power as *a function of a frequency* of the alternating current voltage source. Second, Petitioner's characterization of select disclosures from Serban is inconsistent with Serban's disclosure as a whole. We address these shortcomings below.

a. Serban's PV inverter

Petitioner asserts that Serban teaches a current-source inverter configured to adjust an output power as a function of a frequency of an alternating current voltage source as recited in the independent claims of the '755 patent. Pet. 21. Patent Owner disagrees. Prelim. Resp. 37–43. Our analysis of the parties' arguments and evidence follows.

Petitioner asserts that Serban discloses that hybrid converter 102 (alternating current voltage source) “produces a modified output at a first AC output 130c that varies the characteristic (e.g., frequency or voltage) of the AC line [138] according to a first predetermined pattern.” Pet. 22 (quoting Ex. 1005 ¶ 17). According to Petitioner, this disclosure indicates that “Serban's hybrid converter 102 [alternating current voltage source]

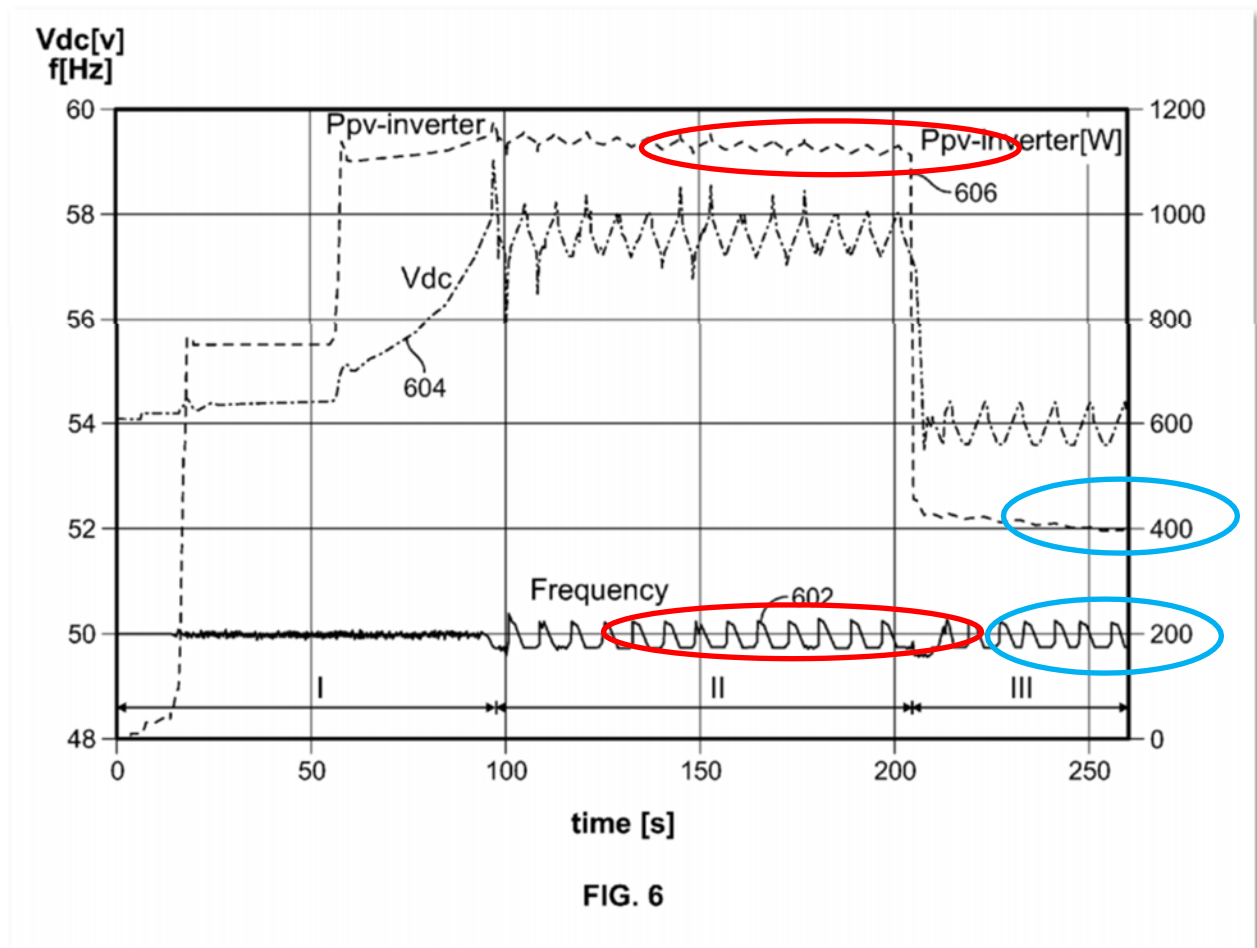
changes the frequency of V_{ac} , *i.e.*, at its AC port 130c,” corresponding to “adjusting a frequency of an alternating current voltage source” as recited in the independent claims. *Id.*

Petitioner asserts that Serban discloses that PV inverter 104 detects the “modified output” produced by hybrid converter 102, and in response, causes the current or voltage applied to battery 106 to change via hybrid converter 102. Pet. 23 (citing Ex. 1005 ¶¶ 20, 28). Petitioner asserts that Serban discloses that PV inverter 104 “may disconnect because the AC line 138 frequency would exceed its frequency range limits or may reduce its current produced from the PV array 112 if a specific control is implemented by monitoring the AC line frequency.” *Id.* (citing Ex. 1005 ¶ 28).

According to Petitioner, these disclosures indicate that “Serban’s PV inverter 104 detects the frequency changes and adjusts its output accordingly.” *Id.* at 23–24 (citing Ex. 1003 ¶¶ 131–136).

Patent Owner disagrees that Serban discloses a PV inverter configured as claimed. Prelim. Resp. 37–43. In particular, Patent Owner contends that a current-source inverter configured to adjust an output as a function of the frequency of an AC voltage source as recited in the challenged claims requires the output power to “correspondingly adjust[] as the frequency adjusts.” *Id.* at 40–41 (citing Ex. 2001 ¶ 57). According to Patent Owner, this is because “[e]very frequency results in in one specific output power,” which is what “allow[s] for a regulation of power flow via an adjustment of frequency.” *Id.* (citing Ex. 2001 ¶ 57). Patent Owner contends that Serban’s PV inverter does not adjust an output power as a function of frequency

because the output power of Serban's PV inverter "cannot be expressed as a function of frequency." *Id.* at 41–42 (citing Ex. 2001 ¶¶ 92–95, 97). Patent Owner provides the following annotated version of Serban's Figure 6 to illustrate this point (*Id.* at 39):



Serban's Figure 6 "is a chart illustrating three curves demonstrating the power response of the PV inverter in response to detecting a linear pattern change in the line frequency and the associated DC response of a three-stage charging profile of the battery." Ex. 1005 ¶ 14. Curve 602 shown in Figure

6 corresponds to the frequency on AC line 138, curve 604 corresponds to the voltage of battery 106, and curve 606 corresponds to the power output of PV inverter 104, each as a function of time in seconds. *Id.* ¶ 55.

Patent Owner contends that although the frequency (602) remains unchanged before and after the 50 second mark in time period I, the power output of the PV inverter (606) ramps up significantly during this time period. Prelim. Resp. 38 (citing Ex. 2001 ¶ 72). Patent Owner also contends that although the frequency (602) is identical during time periods II and III, the power output of the PV inverter (606) is dramatically different during these time periods. *Id.* Patent Owner further contends that the red circles in Figure 6 above show that “the frequency is often exactly at 50 Hz, and the power is near 1200W,” while the blue circles show that “the frequency is likewise exactly at 50 Hz many times, but the power is near 400W.” *Id.* at 39. Patent Owner contends that the power output of Serban’s PV inverter, therefore, is not adjusted as a function of frequency because “one frequency can, and does, map to any number of different power outputs.” *Id.* at 38–40 (citing Ex. 2001 ¶ 72).

We begin our analysis by pointing out that Petitioner’s arguments and evidence do not directly address the claim requirement that the current source inverter must be configured to adjust an output power *as a function of* a frequency of an alternating current voltage source. Rather, Petitioner asserts that “PV inverter 104 modifies its output power, such as by disconnecting or reducing current, in response to frequency changes.” Pet. 23–24 (citing Ex. 1003 ¶¶ 131–136). This assertion does not explain

how and why adjusting output power “in response to frequency changes” constitutes adjusting output power as *a function of a frequency* of hybrid converter 102 (alternating current voltage source).

Neither Petitioner nor Petitioner’s witness identifies any specific disclosure in Serban indicating that PV inverter 104 adjusts its output power as a function of a frequency on AC line 138 (output by hybrid converter 102). Rather, as discussed above, Serban discloses that pattern detection algorithm 128 of controller 126 of PV inverter 104 detects a predetermined *specific frequency change pattern* on AC line 138, and in response, adjusts the AC current it outputs onto AC line 138. Ex. 1005 ¶¶ 4, 20, 28, 43. Petitioner does not explain how and why a specific, predetermined pattern of change in the frequency on AC line 138 corresponds to *a frequency* on AC line 138 (as discussed more fully below). In other words, Petitioner does not explain why a particular pattern of change in the frequency on the AC line constitutes “a frequency” on the line. Nor does Petitioner identify any disclosure in Serban indicating that the adjusted current output by PV inverter 104 *is a function of* a frequency on AC line 138.

Serban discloses that when battery 106 is being charged, pattern generation algorithm 124 of hybrid converter 102 maintains a “constant” frequency on AC line 138 that varies by ± 0.2 Hz from the nominal frequency. Ex. 1005 ¶ 28. But if battery 106 is being overcharged, pattern generation algorithm 124 varies the frequency on AC line 138 from its nominal value according to a predetermined pattern, preferably within ± 0.4 Hz of the nominal value. *Id.* ¶¶ 28, 30, 31, 37. Pattern detection algorithm

128 of controller 126 of PV inverter 104 detects the specific pattern of frequency change, and in response, adjusts the AC current it outputs onto AC line 138. *Id.* ¶¶ 4, 20, 28, 43.

Serban discloses that such a specific pattern of frequency change on AC line 138 can be a change from varying the frequency by ± 0.2 Hz from the nominal value to varying the frequency according to a particular pattern within ± 0.4 Hz of the nominal value. Ex. 1005 ¶¶ 28, 37, 55. Petitioner does not explain sufficiently how and why PV inverter 104's detection of such a specific change in the pattern of the frequency on AC line 138, and adjustment of its output current in response to detection of the pattern change, constitutes adjusting an output power *as a function of a frequency* of AC line 138.

Patent Owner identifies specific disclosures in Serban (Figure 6) that demonstrate that PV inverter 104 does not adjust its output power as a function of a frequency on AC line 138. Prelim. Resp. 39. As Patent Owner persuasively explains, Figure 6 shows that the output power of PV inverter 104 changes significantly over time while the frequency on AC line 138 remains the same. *Id.* at 38–41. We agree with Patent Owner that Figure 6 shows that the power output by PV inverter 104 does not change as a function of a frequency on AC line 138. Petitioner's arguments and evidence do not address Serban's Figure 6 and the corresponding disclosures in Serban's specification (¶ 55), or explain why, despite these disclosures, Serban nonetheless teaches that the output power of PV inverter 104 is adjusted as a function of a frequency on AC line 138.

Petitioner, therefore, does not provide sufficient information to show that Serban discloses a current-source inverter configured to adjust an output power as a function of a frequency of an alternating current voltage source, as recited in the independent claims of the '755 patent.

b. Serban's control functionality

Petitioner asserts that Serban discloses a controller configured to regulate a power flow of a current source inverter by adjusting a frequency of an alternating current voltage source. Pet. 22–25. Patent Owner disagrees. Prelim. Resp. 43–44. Our analysis of the parties' arguments and evidence follows.

Petitioner asserts that “[f]requency changes, which regulate power flow for Serban’s PV inverter, are done through controller 122 because it modifies the frequency of the hybrid converter 102.” Pet. 24. In particular, Petitioner asserts that “Serban’s hybrid converter 102 ‘includes a first controller 122 programmed with machine-readable instructions for carrying out the generator pattern algorithm 124,’ which is used to ‘produce[] a modified output at a first AC output 130c that varies the . . . frequency . . . of the AC line [138].’” Pet. 24 (citing Ex. 1005 ¶ 17). Petitioner asserts that controller 126 of PV inverter 104 “detects, via a pattern detection algorithm 128 [], the modified output produced by the . . . [hybrid converter] 102, and, in response . . . causes the current or voltage applied to the battery 106 for charging . . . to be changed via the . . . [hybrid converter] 102.” *Id.* at 25 (citing Ex. 1005 ¶¶ 20, 55).

Petitioner asserts that these teachings in Serban constitute disclosure of a controller configured to regulate a power flow of a current source inverter by adjusting a frequency of an alternating current voltage source, as required by the independent claims of the '755 patent. Pet. 25–26 (citing Ex. 1003 ¶¶ 292–294).

Patent Owner counters that, in Serban, “[t]here is no ‘adjustment’ of the voltage source for control, as any pattern wavelet in the AC line does not adjust the system frequency of the voltage source [hybrid converter 102].” Prelim. Resp. 43 (citing Ex. 2001 ¶ 98). Patent Owner contends that in Serban “the same two frequencies may result in different output powers, meaning that the control is not due to an adjustment in frequency of the source, but instead to short communication patterns within the source” as shown in Serban’s Figure 6. *Id.* (citing Ex. 2001 ¶¶ 93–94).

Petitioner does not provide sufficient information to show that Serban discloses a controller configured to regulate a power flow of a current source inverter by adjusting a frequency of an alternating current voltage source.

In particular, Petitioner’s assertions are based on the implicit position that varying the frequency on AC line 138 according to a predetermined pattern constitutes adjusting the frequency on AC line 138. In other words, Petitioner equates varying the frequency of Serban’s AC line according to a specific predetermined pattern with adjusting the frequency on the line. Serban’s disclosures as a whole indicate otherwise, however.

Serban discloses that the predetermined pattern of frequency variation on AC line 138 preferably varies the frequency within ± 0.4 Hz of the

fundamental or nominal frequency, and Serban explicitly indicates that such frequency variation has a “negligible effect” on the AC line’s frequency. Ex. 1005 ¶¶ 37, 55. This disclosure contradicts Petitioner’s implicit position that varying the frequency of Serban’s AC line according to a specific predetermined pattern is the same as adjusting (or changing) the frequency on the AC line. Rather, this disclosure indicates that varying the frequency on AC line 138 according to a particular predetermined pattern does not change—or adjust—the frequency on AC line 138 because such variation has a *negligible* effect on the line’s frequency. Petitioner does not provide any showing to establish that “adjusting a frequency” as recited in the independent claims is properly interpreted as encompassing any such negligible effect on frequency.

Petitioner and Petitioner’s witness do not address this disclosure in Serban or explain how and why, despite this disclosure, Serban teaches that varying the frequency on AC line 138 according to a particular predetermined pattern corresponds to adjusting the frequency on AC line 138 as claimed.

Furthermore, as Patent Owner points out and as discussed above, Serban discloses and illustrates in Figure 6 that the same two frequencies on AC line 138 can occur when the power output by PV inverter 104 is significantly different. Prelim. Resp. 39. The output power of PV inverter 104 thus does not adjust based on the frequency on AC line 138. It follows that controller 122 of hybrid converter 102 does not adjust the frequency on AC line 138 as a means of regulating the power flow of Serban’s PV

inverter 104. Rather, as Serban explicitly indicates, Serban's hybrid converter 102 varies the frequency on AC line 138 according to a predetermined pattern—rather than changing the frequency on the line—as a means for communicating between the hybrid converter 102 and the PV inverter 104. Ex. 1005 ¶¶ 28, 30, 31.

Petitioner's arguments and evidence rely on select disclosures of Serban, and do not take into consideration Serban's disclosures as a whole. Petitioner, therefore, does not provide sufficient information to persuasively show that Serban discloses a system in which a controller is configured to regulate a power flow of a current source inverter by adjusting a frequency of an alternating current voltage source.

As a consequence, Petitioner does not provide sufficient information to establish, for purposes of institution, that Serban anticipates independent claims 1 and 18, and claims 2–7, and 13, which depend from claim 1. Because Petitioner relies solely on Serban for disclosing a current-source inverter and a controller configured as recited in independent claims 1, 18, and 20 (Pet. 21–26, 41, 48, 65–66, 69, 93–95, 102–103) and because Petitioner does not rely on Matan, Wilhelm, PVI, or Wu for any disclosure that remedies the deficiencies of Petitioner's reliance on Serban (Pet. 41–69, 93–95), Petitioner does not provide sufficient information to establish that claims 1–20 would have been obvious over Serban and the asserted combinations of the additional references.

Petitioner's assertions, therefore, are not sufficient to support institution on Grounds 1–4 and 7 because Petitioner does not demonstrate a

reasonable likelihood of prevailing in its challenge to the patentability of at least one of the claims challenged in these grounds.

E. Petitioner's Somani-led grounds

Petitioner asserts that claims 1–3, 5–7, 13, and 18 are anticipated by Somani (Ground 5); claims 1–13, 15–17, and 18–20 would have been obvious over Somani, Matan, and Wilhelm (Ground 6); and claim 14 would have been obvious over Somani and Wu (Ground 8).

Our analysis of Petitioner's Somani-led grounds focuses on the requirement shared by independent claims 1, 18, and 20 that the recited uninterruptible power supply comprises a current-source inverter configured to adjust an output power as a function of a frequency of an alternating current voltage source, and a controller configured to regulate a power flow of the current source inverter by adjusting a frequency of the alternating current voltage source. We begin our analysis with an overview of Somani.

1. Somani (Ex. 1007)

Somani discloses a microgrid that uses solar array 190 and battery 110 to power load 170 when the microgrid is disconnected (islanded) from utility grid 150. Ex. 1007 ¶¶ 3, 10, 35, 36, 58, 70, 77. Figure 1B illustrates Somani's microgrid:

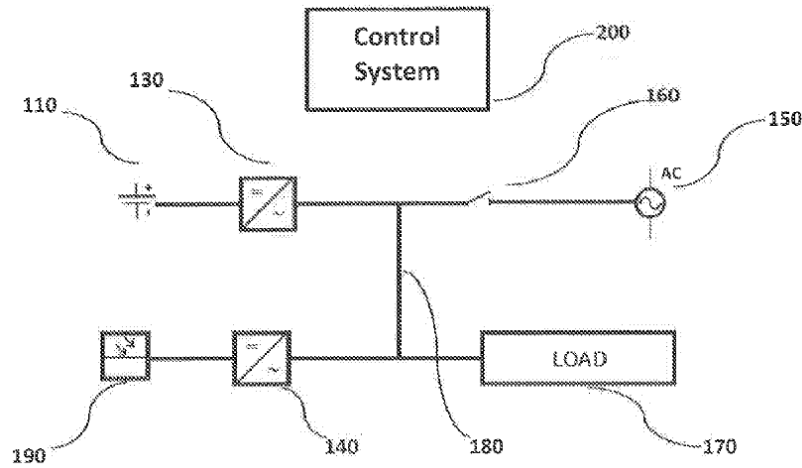


Figure 1B shows a microgrid that includes energy storage inverter 130 (bi-directional converter), solar power inverter 140 (current-source inverter), and load 170 coupled to AC bus 180, a point of common coupling. *Id.*

¶¶ 62, 67, 71, 73.

Upon failure of utility grid 150, control system 200 commands switch 160 to open, disconnecting (islanding) the microgrid from utility grid 150. *Id.* ¶¶ 72, 76. When the microgrid is so islanded, energy storage inverter 130 (bi-directional converter) operates in voltage source mode and provides energy from or to battery 110. *Id.* ¶ 72. Solar power inverter 140 (current-source inverter) converts DC energy from solar array 190 to AC energy suitable for load 170. *Id.*

The frequency of power output by energy storage inverter 130 (bi-directional converter) and solar power inverter 140 (current-source inverter) are synchronized to have the same frequency as the microgrid, which may be a nominal (normal) frequency of 60 Hz. *Id.* ¶¶ 83, 88, 93.

Individual power controllers 230 and 240 may control energy storage inverter 130 (bi-directional converter) and solar power inverter 140 (current-source inverter), respectively, and master controller 210 may coordinate between the controllers 230, 240. *Id.* ¶¶ 74, 75, Fig. 2. The master controller alternatively may be one of controllers 230 and 240, or may be housed within energy storage inverter 130 (bi-directional converter) or solar power inverter 140 (current-source inverter) along with individual power controllers 230, 240. *Id.* ¶¶ 75, 82.

If the energy produced by solar array 190 is greater than the energy needed to power load 170, the surplus energy is used to charge battery 110. *Id.* ¶¶ 72, 95. In one embodiment, controller 230 of energy storage inverter 130 (bi-directional converter) monitors the charge of battery 110 and if battery 110 is being overcharged, controller 230 curtails solar array 190's generation of energy by "tripping the renewable resource offline by changing the microgrid frequency beyond the nominal frequency." *Id.* ¶ 90. In another embodiment, if battery 110 is being overcharged, the master controller "adjust[s] the microgrid frequency to trip the generation sources offline." *Id.* ¶ 95.

Somani thus discloses that when battery 110 is being overcharged, either controller 230 of energy storage inverter 130 (bi-directional converter) or the master controller, which may be one and the same, changes the microgrid frequency from the nominal frequency to trip the renewable resource (solar array 190) offline in order to curtail its power production.

2. Somani prior art issue

Somani was filed on June 29, 2016, was published on January 5, 2017, and claims priority to U.S. Provisional Application No. 62/188,278 (“the Somani Provisional,” Ex. 1008), which was filed July 2, 2015. Ex. 1007, codes (10) (21) (43) (60).

Petitioner asserts that Somani is entitled to claim a right of priority to the Somani Provisional because the ministerial requirements necessary for doing so have been fulfilled, and “the invalidating disclosures from Somani are also in the Somani Provisional (Sections XIV–XVI).” Pet. 7.

Patent Owner asserts that the Petition fails to demonstrate that Somani is prior art because Petitioner repeatedly relies on disclosures in Somani that are not present in the Somani Provisional. Prelim. Resp. 45–48.

The ’755 patent is subject to the Leahy-Smith American Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284 (2011), revisions to 35 U.S.C. § 100 *et seq.*, because its earliest effective filing date is July 28, 2015. Ex. 1001, code (22). “[U]nder the AIA, a reference patent document need only meet the ‘ministerial requirements’ of §§ 119 and 120, and the Provisional or other earlier application(s) to which the reference patent document claims a right of priority must ‘describe[] the subject matter’ relied upon in the reference patent document as prior art. 35 U.S.C. § 102(d)(2).” *Penumbra, Inc. v. RapidPulse, Inc.*, IPR2022-00608, Paper 34 at 29–31 (PTAB Mar. 10, 2023) (designated precedential in relevant part (§ II.E.3)).

Petitioner provides a sufficient showing to establish that the ministerial requirements for Somani’s entitlement to claim a right of priority to the Somani Provisional have been fulfilled. Pet. 8 (stating that “Somani included a priority claim to the Somani Provisional when it was filed; Somani was filed within one year of [the] Somani Provisional; and Somani and [the] Somani Provisional have common inventors (Apurva Somani and John C. Palombini)” (citing Ex. 1012, 164–170 (Somani file history), Ex. 1008, 4–5)). Petitioner also provides parallel citations to Somani and the Somani Provisional in its discussion of the asserted grounds of unpatentability. By providing such parallel citations, Petitioner provides an implicit explanation of how the Somani Provisional describes the subject matter relied upon in Somani.

For purposes of this Decision, we, therefore, determine that Petitioner provides an adequate showing that Somani is entitled to the benefit of the filing date of the Somani Provisional, and that Somani, therefore, is prior art to the ’755 patent. We emphasize, however, that our analysis of Petitioner’s Somani-led unpatentability grounds will focus on those disclosures of Somani relied upon by Petitioner that are described in the corresponding cited portions of the Somani Provisional. *See* 35 U.S.C. § 102(d); *Penumbra*, Paper 34 at 32–33.

3. Somani’s inverter

Petitioner asserts that Somani teaches a current-source inverter configured to adjust an output power as a function of a frequency of an alternating current voltage source as recited in the independent claims of the

'755 patent. Pet. 74–76. Patent Owner disagrees. Prelim. Resp. 53–61.

Our analysis of the parties' arguments and evidence follows.

Petitioner asserts that Somani discloses a “master/slave configuration . . . [where] one of the power converters can act as a microgrid master which attempts to control the output voltage amplitude and frequency.” Pet. 74–75 (citing Ex. 1007 ¶ 91; Ex. 1008, 18). Petitioner asserts that Somani discloses that energy storage inverter 130 (bi-directional converter) is a master power converter and solar power inverter 140 (current-source inverter) is a slave power converter. Pet. 75 (citing Ex. 1007, Fig. 1B; Ex. 1008, Fig. 3; Ex. 1003 ¶ 289).

According to Petitioner, Somani discloses that to avoid “over-charging,” “Somani’s master power converter may ‘trip[] the renewable resource [e.g., PV inverter 140 and solar array 190] offline by changing the microgrid frequency [e.g., frequency of the master power converter 130] beyond the nominal frequency.’” Pet. 75 (citing Ex. 1007 ¶ 90; Ex. 1008, 18). Based on these disclosures, Petitioner asserts that “Somani’s PV inverter 140 is configured to adjust an output power . . . in response to frequency changes of the master power converter 130.” Pet. 76 (citing Ex. 1003 ¶¶ 289–291).

Patent Owner contends that the disclosures of Somani relied upon by Petitioner do not disclose or suggest that Somani’s PV inverter is configured to adjust an output power, and instead discuss Somani’s renewable power resource (solar array) being tripped offline. Prelim. Resp. 54 (citing Ex. 1007 ¶¶ 90, 95; Ex. 2001 ¶¶ 114–120). Patent Owner contends that

Petitioner attempts to account for this deficiency by improperly treating Somani's PV inverter and solar array as a single component, despite the fact that Somani explicitly teaches that the PV inverter and solar array are two separate and distinct components of Somani's microgrid. *Id.* at 55–56, 59 (citing Ex. 1007 ¶ 4; Ex. 2001 ¶¶ 118–121).

On the record before us, Petitioner does not provide sufficient information to show that Somani discloses a current-source inverter configured to adjust an output power as a function of a frequency of an alternating current voltage source, for reasons that follow. We reiterate that our analysis focuses on those disclosures of Somani relied on by Petitioner that are described in the corresponding cited portions of the Somani Provisional.

First, although Petitioner cites to Figure 3 of the Somani Provisional as disclosing that Somani's energy storage inverter 130 (bi-directional converter) is a master power converter and solar power inverter 140 (current-source inverter) is a slave power converter, Figure 3 provides no such disclosure:

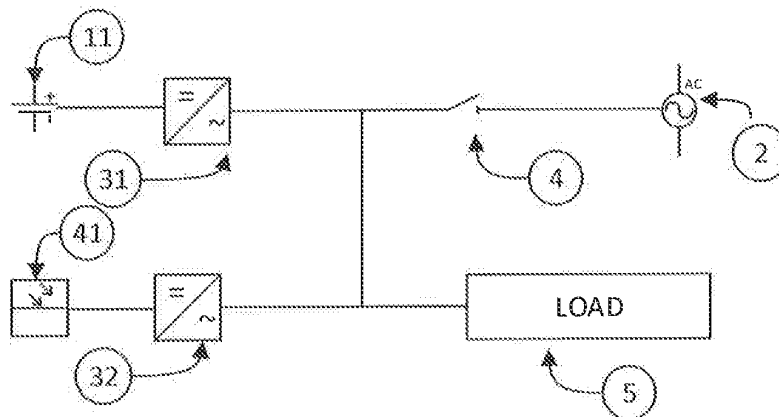


Figure 3 shows an implementation of Somani’s microgrid that includes one battery source and one solar source. Ex. 1008, 15.

Contrary to Petitioner’s assertions, Figure 3 of the Somani Provisional simply illustrates inverter 31 coupled to battery 11 and inverter 32 coupled to solar array 41. The Somani Provisional’s description of Figure 3 explicitly indicates that “solar inverter, 32, may or may not be under the control of the controller.” Ex. 1008, 15. Petitioner, therefore, does not provide sufficient information to show that Somani’s energy storage inverter 130 (bi-directional converter) is a master power converter and solar power inverter 140 (current-source inverter) is a slave power converter under the control of energy storage inverter 130 (bi-directional converter).

Second, as Patent Owner points out (Prelim. Resp. 55), Petitioner’s assertions are based on an implicit contention that Somani’s solar array 190 and solar power inverter 140 (current-source inverter) are both part of the “renewable resource” described in Somani. In particular, as discussed above, Petitioner asserts, citing page 18 of the Somani Provisional, that “Somani’s master power converter may ‘trip[] the renewable resource [e.g.,

PV inverter 140 and solar array 190] offline by changing the microgrid frequency [e.g., frequency of the master power converter 130] beyond the nominal frequency.” Pet. 75 (citing Ex. 1007 ¶ 90; Ex. 1008, 18).

Although page 18 of the Somani Provisional refers to the “renewable generation sources,” it does not provide any indication that the renewable generation sources include an inverter. Furthermore, Figure 3 of the Somani Provisional shows that solar array 41 and inverter 32 are separate and distinct components of the illustrated microgrid.

Somani explicitly discloses that exemplary “renewable resources” include “solar panels or wind turbines.” Ex. 1007 ¶ 4. Petitioner does not identify any disclosure in Somani indicating that PV inverters are considered to be a renewable resource or a part thereof. Somani also discloses that power resources and power converters are separate elements of Somani’s microgrid. *Id.* ¶¶ 63, 64. And Somani explicitly refers to “solar array 190” as a “power resource.” *Id.* ¶ 70.

Petitioner, therefore, does not provide sufficient information to show that Somani’s “renewable generation sources” include an inverter.

Third, the page of the Somani Provisional Petitioner cites for disclosure of an inverter configured as recited in the independent claims indicates that when the battery of Somani’s microgrid is being overcharged, the master controller adjusts the microgrid frequency to trip the generation sources offline. Pet. 75 (citing Ex. 1008, 18). This disclosure does not mention an inverter, much less describe a current source inverter that adjusts its output power as a function of the frequency of the microgrid. Neither

Petitioner nor Petitioner's witness explains sufficiently how and why the relied-upon disclosure of adjusting the microgrid frequency to trip the generation sources offline teaches that Somani's inverter 32 adjusts its output power. Petitioner and Petitioner's witness also do not explain sufficiently how and why Somani discloses that inverter 32 adjusts its output power as a function of the microgrid frequency.

Petitioner, therefore, does not provide sufficient information to show that Somani discloses a current-source inverter configured to adjust an output power as a function of a frequency of an alternating current voltage source.

4. Somani's controller

Petitioner asserts that Somani discloses a controller configured to regulate a power flow of a current source inverter by adjusting a frequency of an alternating current voltage source. Pet. 76–78. Patent Owner disagrees. Prelim. Resp. 55, 59–60. Our analysis of the parties' arguments and evidence follows, again focusing on those disclosures of Somani relied upon by Petitioner that are described in the corresponding cited portions of the Somani Provisional.

Petitioner asserts that Somani discloses that controller 230 of energy storage inverter 130 (bi-directional converter) or master controller 210 controls the frequency at the AC port of energy storage inverter 130 (bi-directional converter) to cause the output power of solar power inverter 140 (current-source inverter) to change. Pet. 74, 76–78 (citing Ex. 1007 ¶ 82, Fig. 2; Ex. 1008, 19, Fig. 4; Ex. 1003 ¶¶ 292–294).

Patent Owner counters that Somani's controller controls the "renewable power resource," rather than regulating a power flow of solar power inverter 140 (current-source inverter). Prelim. Resp. 55, 59–60 (citing Ex. 2001 ¶¶ 114–121, 123). Patent Owner contends that although tripping Somani's solar array offline may cut off power going to the PV inverter, the PV inverter would nonetheless still convert all the power it receives. *Id.* at 60.

On the record before us, Petitioner does not provide sufficient evidence to show that Somani discloses a controller configured to regulate a power flow of a current source inverter by adjusting a frequency of an alternating current voltage source, for the reasons that follow.

Petitioner cites Figure 4 and page 19 of the Somani Provisional to support its assertion that Somani discloses a controller configured as recited in independent claims 1, 18, and 20. We address each of these portions of Somani in turn.

First, Figure 4 of the Somani Provisional is reproduced below:

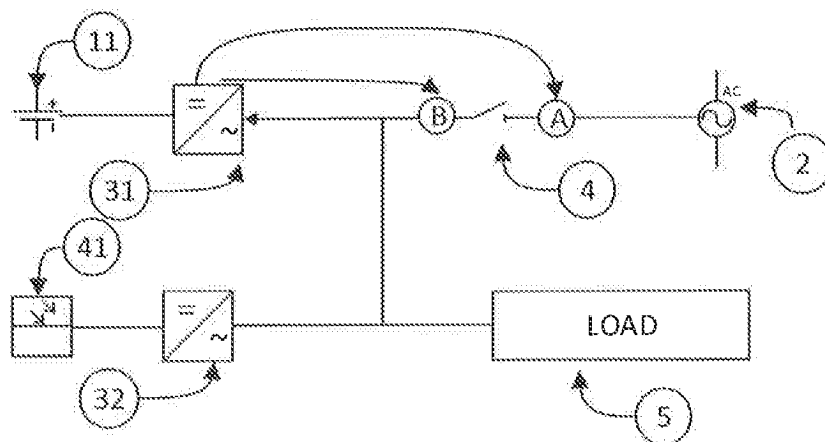


Figure 4 shows an exemplary implementation of Somani's "control scheme." Ex. 1008, 17.

Contrary to Petitioner's assertions, Figure 4 does not show that a controller of inverter 31 (bi-directional power converter) or a master controller controls the frequency at the AC port of inverter 31 (bi-directional power converter) to cause the output power of solar inverter 32 to change. Instead, Figure 4 and the corresponding description of the Figure provided in the Somani Provisional disclose that if inverter 31 (bi-directional power converter) senses that the voltage or frequency of power provided by utility grid 2 are "out of bounds," inverter 31 (bi-directional power converter) opens switch 4, or, alternatively, "[t]here might be some controller between inverter 31 and switch 4 that is actually responsible for opening switch 4." *Id.* at 17–18; *see also id.* at 1 (stating "upon detection of abnormal grid voltage and/or frequency conditions, the cluster of units can seamlessly transition to islanded mode"). Opening switch 4 "islands" Somani's inverters 31, 32 from grid 2 to form a microgrid. *Id.* at 19.

Second, page 19 of the Somani Provisional continues the discussion of transitioning Somani's system from a grid-tied mode to an islanded mode or microgrid, via switch 4, when the voltage and frequency of power provided by grid 2 are outside boundaries. This page further indicates that the "control scheme, logic" may be housed in the controller of inverter 31, or a controller external to any inverter may house the control scheme. Ex. 1008, 19. Page 19 does not disclose that a controller of inverter 31 (bi-directional power converter) or a master controller controls the frequency at

the AC port of inverter 31 (bi-directional power converter) to cause the output power of solar inverter 32 to change, contrary to Petitioner's assertions.

As discussed above, Somani—and the Somani Provisional—disclose that when the battery of Somani's microgrid is being overcharged, a master controller adjusts the microgrid frequency to trip the generation sources offline. Ex. 1007 ¶¶ 90, 95; Ex. 1008, 18 (“[A] master controller device may . . . adjust the microgrid frequency to trip the generation sources offline.”). Neither Petitioner nor Petitioner's witness explains sufficiently how and why this disclosure of a controller that adjusts the microgrid frequency to trip generation sources offline teaches a controller configured to regulate a power flow of a solar inverter (current-source inverter).

On the record before us, therefore, Petitioner does not provide sufficient information to show that the Somani Provisional discloses a controller that regulates a power flow of solar inverter 32 (current-source inverter) by adjusting the frequency of inverter 31 (alternating current voltage source).

Petitioner, therefore, does not provide sufficient information to persuasively show that Somani discloses a system in which a controller is configured to regulate a power flow of a current source inverter by adjusting a frequency of an alternating current voltage source.

As a consequence, Petitioner does not provide sufficient information to establish, for purposes of institution, that Somani anticipates independent claims 1 and 18, and claims 2, 3, 5–7, and 13, which depend from claim 1.

Because Petitioner relies solely on Somani for disclosing a current-source inverter and a controller configured as recited in independent claims 1, 18, and 20 (Pet. 74–78, 86, 88, 92–93) and because Petitioner does not rely on Matan, Wilhelm, or Wu for any disclosure that remedies the deficiencies of Petitioner’s reliance on Somani (Pet. 86–96) Petitioner does not provide sufficient information to establish that claims 1–20 would have been obvious over Somani and the asserted combinations of the additional references.

Petitioner’s assertions, therefore, are not sufficient to support institution on Grounds 5, 6, and 8 because Petitioner does not demonstrate a reasonable likelihood of prevailing in its challenge to the patentability of at least one of the claims challenged in these grounds.

F. Discretion to Deny Institution Under 35 U.S.C. § 325(d)

In view of our determination that Petitioner does not meet the threshold for instituting review on the merits, we need not address the parties’ dispute about whether we should exercise our discretion to deny institution under § 325(d). Pet. 11–13; Prelim. Resp. 7–23; Reply 1–4; Sur-reply 3–4.

G. Discretion to Deny Institution under 35 U.S.C. § 314(a)

In view of our determination that Petitioner does not meet the threshold for instituting review on the merits, we need not address the parties’ dispute about whether we should exercise our discretion to deny institution under 35 U.S.C. § 314(a). Prelim. Resp. 23–26 (citing *Adaptics Ltd. v. Perfect Co.*, IPR2018-01596, Paper 20, at 15, 17 (PTAB Mar. 6, 2019)); Reply 4–5; Sur-reply 4–5.

IV. ORDER

It is ORDERED that the Petition is *denied*, and no trial is instituted.

IPR2024-00389
Patent 9,793,755 B2

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