

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SMA SOLAR TECHNOLOGY AMERICA LLC,

Petitioner

v.

TIGO ENERGY INC.,

Patent Owner

Case IPR2023-01184

U.S. Patent No. 8,823,218

PETITION FOR *INTER PARTES* REVIEW OF

U.S. PATENT NO. 8,823,218

Table of Contents

LIST OF EXHIBITS.....	v
LIST OF CHALLENGED CLAIMS	vii
I. INTRODUCTION	1
II. STANDING (37 C.F.R. § 42.104(a))	1
III. SPECIFIC RELIEF REQUESTED	1
IV. PRIORITY	3
V. LEVEL OF ORDINARY SKILL	8
VI. OVERVIEW OF THE '218 PATENT AND THE PRIOR ART	8
A. The '218 Patent	8
B. Adest.....	11
C. Kronberg.....	12
D. Goldack.....	14
E. Moine.....	15
VII. CLAIM CONSTRUCTION	16
VIII. DETAILED EXPLANATION OF GROUNDS.....	16
A. Ground 1: <i>Adest</i> and <i>Kronberg</i> Render Obvious Claims 1-4, 6-16, and 18-19.....	16
1. Claim 1	17
2. Claim 2	25
3. Claim 3	26

4.	Claim 4.....	26
5.	Claim 6.....	28
6.	Claim 7.....	35
7.	Claim 8.....	35
8.	Claim 9.....	36
9.	Claim 10.....	39
10.	Claim 11.....	40
11.	Claim 12.....	41
12.	Claim 13.....	43
13.	Claim 14.....	43
14.	Claim 15.....	44
15.	Claim 16.....	45
16.	Claim 18.....	45
17.	Claim 19.....	47
B.	Ground 2: Adest, Kronberg, and/or Goldack Render Obvious Claims 1-4, 6-16, and 18-19	47
1.	Claims 1-4.....	47
2.	Claim 6.....	48
3.	Claim 7.....	51
4.	Claim 8.....	51
5.	Claim 9.....	52
6.	Claim 10.....	54
7.	Claim 11.....	54

8.	Claim 12.....	54
9.	Claim 13.....	54
10.	Claims 14-16 and Claims 18-19	55
C.	Ground 3: <i>Moine</i> and <i>Adest</i> Render Obvious Claims 1-5, 15-17	56
1.	Claim 1	56
2.	Claim 2.....	64
3.	Claim 3.....	64
4.	Claim 4.....	65
5.	Claim 5.....	65
6.	Claim 15.....	66
7.	Claim 16.....	67
8.	Claim 17.....	67
D.	Ground 4: <i>Moine</i> , <i>Adest</i> , and/or <i>Goldack</i> Render Obvious Claims 1-4, 6-14, and 18-19.....	68
1.	Claims 1-4.....	68
2.	Claim 6.....	68
3.	Claim 7.....	71
4.	Claim 8.....	71
5.	Claim 9.....	71
6.	Claim 10.....	73
7.	Claim 11.....	74
8.	Claim 12.....	74
9.	Claim 13.....	76

10.	Claim 14.....	77
11.	Claim 18.....	77
12.	Claim 19.....	79
IX.	DISCRETIONARY FACTORS FAVOR INSTITUTING TRIAL	80
A.	35 U.S.C. § 314(a).....	80
B.	35 U.S.C. § 325(d).....	83
X.	MANDATORY NOTICES UNDER 37 C.F.R. § 42.8.....	83
A.	Real Parties-in-Interest.....	83
B.	Related Matters.....	83
C.	Lead and Backup Counsel.....	85
D.	Service Information.....	86
	CERTIFICATE OF COMPLIANCE.....	87
	CERTIFICATE OF SERVICE	88

LIST OF EXHIBITS

Ex-1001	U.S. Patent No. 8,823,218
Ex-1002	Declaration of Randy R. Dunton
Ex-1003	Curriculum Vitae of Randy R. Dunton
Ex-1004	Prosecution History of U.S. Patent No. 8,823,218
Ex-1005	U.S. Patent No. 8,531,055 to Adest et al. (“ <i>Adest</i> ”)
Ex-1006	U.S. Patent No. 5,054,023 to Kronberg (“ <i>Kronberg</i> ”)
Ex-1007	U.S. Patent No. 6,650,031 to Goldack (“ <i>Goldack</i> ”)
Ex-1008	French Patent Application Publication No. FR2894401A1 (“ <i>Moine</i> ”), English Translation, and Translator’s Declarations
Ex-1009	Excerpts from IEEE 100 THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS (7th Ed. 2000)
Ex-1010	IPR2021-01287, Paper No. 27 (Final Written Decision)
Ex-1011	Statistic (Time to Trial - Delaware)
Ex-1012	Statistic (Time to Trial - Judge Gregory B. Williams)
Ex-1013	Joint Agreed-Upon Amended Scheduling Order [D.I. 57] from <i>Tigo Energy Inc. v. SMA Solar Technology America LLC et al.</i> , 1-22-cv-00915 (D. Del. June 14, 2023).
Ex-1014	File History of U.S. Patent Application No. 12/254,780
Ex-1015	File History of U.S. Patent Application No. 12/411,317
Ex-1016	File History of U.S. Patent Application No. 12/628,977

- Ex-1017** File History of U.S. Provisional Patent Application No. 61/343,155
- Ex-1018** File History of U.S. Provisional Patent Application No. 61/200,601
- Ex-1019** File History of U.S. Provisional Patent Application No. 61/001,587
- Ex-1020** File History of U.S. Provisional Patent Application No. 61/275,977
- Ex-1021** File History of U.S. Provisional Patent Application No. 61/276,753
- Ex-1022** U.S. Certified Copy of *Moine* (French Patent Application Publication No. FR2894401A1—*see* Ex-1008)
- Ex-1023** French Certified Copy of *Moine* (French Patent Application Publication No. FR2894401A1—*see* Ex-1008)

LIST OF CHALLENGED CLAIMS

U.S. Patent No. 8,823,218 – Hadar *et al.*¹

Claim Element Designation	Claim Element	Corresp. Petition Section(s)
Claim 1		VIII.A.1 VIII.B.1 VIII.C.1 VIII.D.1
[1A]	A system comprising:	VIII.A.1.a VIII.C.1.a
[1B]	a master management unit (MMU); and	VIII.A.1.b VIII.C.1.b
[1C]	a local management unit (LMU) in communication with the master management unit (MMU), the LMU controlling one or more solar modules;	VIII.A.1.c VIII.C.1.c
[1D]	wherein the MMU is connected to at least one sensor, the sensor configured to detect an anomaly; and	VIII.A.1.d VIII.C.1.d
[1E]	wherein upon detection of the anomaly by the sensor, the MMU sends a command to the LMU to alter the state of an associated solar module; and	VIII.A.1.e VIII.C.1.e
[1F]	wherein upon receiving a command from the MMU, the LMU alters the state of the one or more solar modules in accordance with command	VIII.A.1.f VIII.C.1.f
Claim 2: The system of claim 1, wherein the MMU queries the sensor for the anomaly.		VIII.A.2.a VIII.B.1 VIII.C.2.a VIII.D.1

¹ The claim element designations in this Claim Listing Appendix correspond to the letters of the subsection(s) in which each element is addressed for each section corresponding to the claim. In some cases, multiple claim elements are grouped together with the same designation in this appendix because they are addressed together in the same subsection(s).

Claim Element Designation	Claim Element	Corresp. Petition Section(s)
Claim 3:	The system of claim 1, wherein the sensor notifies the MMU of the anomaly.	VIII.A.3.a VIII.B.1 VIII.C.3.a VIII.D.1
Claim 4:	The system of claim 1, wherein the command is selected from the group consisting of: a command to shutdown the module; a command to disconnect the module; and a command to alter the output of the module.	VIII.A.4.a VIII.B.1 VIII.C.4.a VIII.D.1
Claim 5:	The system of claim 1, wherein: the MMU is connected to a network; and the sensor is connected to the network.	VIII.C.5.a
Claim 6		VIII.A.5 VIII.B.2 VIII.D.2
[6A]	The system of claim 1, further comprising: a watchdog unit to monitor a communication in a solar array between the master management unit (MMU) and a respective local management unit (LMU);	VIII.A.5.a VIII.B.2.a VIII.D.2.a
[6B]	wherein if the communication is interrupted between the MMU and the respective LMU, the watchdog unit sends polls to the MMU up to a specified number of times;	VIII.A.5.b VIII.B.2.b VIII.D.2.b
[6C]	wherein if the watchdog unit receives no response after completing the polls, receives a command to modify operation of a solar module, or receives an inappropriate response, then the watchdog unit issues an instruction to the respective LMU to modify operation of the solar module.	VIII.A.5.c VIII.B.2.c VIII.D.2.c
Claim 7:	The system of claim 6, wherein the respective LMU comprises the watchdog unit.	VIII.A.6.a VIII.B.3.a VIII.D.3.a

Claim Element Designation	Claim Element	Corresp. Petition Section(s)
Claim 8: The system of claim 6, wherein the instruction is selected from the group consisting of an instruction to shut off the solar module, an instruction to disconnect the solar module from the solar array, and an instruction to reduce the output power of the solar module.		VIII.A.7.a VIII.B.4.a VIII.D.4.a
Claim 9		VIII.A.8 VIII.B.5 VIII.D.5
[9A]	The system of claim 1, further comprising: a watchdog unit coupled between a solar module and a power bus, the power bus configured to connect a plurality of solar modules to an inverter,	VIII.A.8.a VIII.B.5.a VIII.D.5.a
[9B]	the watchdog unit having: a local controller to monitor a communication from a central controller remote from the solar module and determine whether the communication is interrupted;	VIII.A.8.b VIII.B.5.b VIII.D.5.b
[9C]	means to poll the central controller to determine if an interruption of the communication is transient;	VIII.A.8.c VIII.B.5.c VIII.D.5.c
[9D]	at least one switch to disconnect the solar module from the power bus if the interruption of the communication is not transient;	VIII.A.8.d VIII.B.5.d VIII.D.5.d
[9E]	wherein the watchdog unit is configured to connect the solar module to the power bus when the communication is not interrupted.	VIII.A.8.e VIII.B.5.e VIII.D.5.e
Claim 10: The system of claim 9, further comprising a junction box housing the watchdog unit, the junction box to provide connectivity between the solar module and the power bus.		VIII.A.9.a VIII.B.6.a VIII.D.6.a

Claim Element Designation	Claim Element	Corresp. Petition Section(s)
	Claim 11: The system of claim 10, wherein the local controller is configured to control a duty cycle of the switch to control an output voltage from the junction box; and the local controller is configured to operate using power from the solar module.	VIII.A.10.a VIII.B.7.a VIII.D.7.a
	Claim 12: The system of claim 9, further comprising a bypass circuit configured to enable current in the power bus to bypass the solar module when the switch disconnects the solar module from the power bus.	VIII.A.11.a VIII.B.8.a VIII.D.8.a
	Claim 13: The system of claim 9, wherein the watchdog unit is configured to determine irregularity in periodicity of the communication to determine whether the communication is interrupted.	VIII.A.12.a VIII.B.9.a VIII.D.9.a
	Claim 14: The system of claim 9, further comprising the solar module; and a junction box coupled with the solar module to provide connectivity to the power bus, wherein the watchdog unit resides in the junction box.	VIII.A.13.a VIII.B.10 VIII.D.10.a
	Claim 15	VIII.A.14 VIII.B.10 VIII.C.6
[15A]	A method comprising:	VIII.A.14.a VIII.C.6.a
[15B]	monitoring a sensor for an anomaly by a master control unit (MMU);	VIII.A.14.b VIII.C.6.b
[15C]	determining by the MMU if the sensor has detected an anomaly and, if the sensor has detected an anomaly, the MMU determining if the anomaly requires a control change; and	VIII.A.14.c VIII.C.6.c

Claim Element Designation	Claim Element	Corresp. Petition Section(s)
[15D]	issuing a control change command to a local management unit if the anomaly requires a control change, wherein the control change command is selected from the group consisting of: a command to shut down one or more solar modules; a command to disconnect one or more solar modules; a command to shut down one or more solar module strings; a command to alter the output of a solar module; a command to shutdown one or more LMUs; a command to disconnect one or more LMUs; a command to shutdown an inverter; a command to disconnect an inverter; a command to do nothing; and no command.	VIII.A.14.d VIII.C.6.d
Claim 16: The method of claim 15, wherein the monitoring comprises one of: the MMU querying the sensor for the anomaly, and the sensor notifying the MMU of an anomaly.		VIII.A.15.a VIII.B.10 VIII.C.7.a
Claim 17: The method of claim 15, wherein: the MMU is connected to a network; and the sensor is connected to the network.		VIII.C.8.a
Claim 18		VIII.A.16 VIII.B.10 VIII.D.11
[18A]	A computer-implemented method comprising:	VIII.A.16.a VIII.D.11.a
[18B]	monitoring, via a computing device, a signal from a central controller remote from the computing device;	VIII.A.16.b VIII.D.11.b

Claim Element Designation	Claim Element	Corresp. Petition Section(s)
[18C]	determining, via the computing device, if there is a loss of signal;	VIII.A.16.c VIII.D.11.c
[18D]	polling, via the computing device, the central controller to determine if the loss of signal is transient;	VIII.A.16.d VIII.D.11.d
[18E]	disconnecting, via the computing device, one or more solar modules from a power bus if the loss of signal is not transient, the power bus configured to connect a plurality of solar modules to an inverter;	VIII.A.16.e VIII.D.11.e
[18F]	waiting, via the computing device, for a restart signal; and	VIII.A.16.f VIII.D.11.f
[18G]	connecting, via the computing device, the one or more solar modules to the power bus when the restart signal is received.	VIII.A.16.g VIII.D.11.g
Claim 19: The method of claim 18, further comprising: enabling, via the computing device, a bypass circuit when the one or more solar modules are disconnected from the power bus, so that current continues to flow in the power bus.		VIII.A.17.a VIII.B.10 VIII.D.12.a

I. INTRODUCTION

SMA Solar Technology America LLC (“SMA”) petitions for *inter partes* review of claims 1-19 (“challenged claims”) of U.S. Patent No. 8,823,218 (“’218 patent”) (Ex-1001).

II. STANDING (37 C.F.R. § 42.104(a))

SMA certifies that the ’218 patent is available for *inter partes* review, and that SMA is not barred or estopped from requesting review on the grounds herein.

III. SPECIFIC RELIEF REQUESTED

SMA requests, under 35 U.S.C. § 311, review and cancellation of the challenged claims as unpatentable on the following grounds under 35 U.S.C. § 103:

Ground	Prior Art	Claims Challenged
1	USPN 8,531,055 (“ <i>Adest</i> ”) (Ex-1005) in view of USPN 5,054,023 (“ <i>Kronberg</i> ”) (Ex-1006)	1-4, 6-16, and 18-19
2	<i>Adest</i> in view of <i>Kronberg</i> and/or USPN 6,650,031 (“ <i>Goldack</i> ”) (Ex-1007)	1-4, 6-16, and 18-19

3	FR2894401A1 (“ <i>Moine</i> ”) (Ex-1008) ² in view of <i>Adest</i>	1-5 and 15-17
4	<i>Moine</i> in view of <i>Adest</i> and/or <i>Goldack</i> .	1-4, 6-14 and 18-19

Ex-1002, ¶¶57-62.

Each cited reference qualifies as prior art to the ’218 patent, at least as shown in the table below.

Reference	Date(s)	Qualifies as Prior Art Under
<i>Adest</i>	Filed Dec. 5, 2008 Issued Sept. 10, 2013	35 U.S.C. §§102(e) / 102(a) ³ / 103
<i>Kronberg</i>	Issued Oct. 1, 1991	35 U.S.C. §§102(b) / 103
<i>Moine</i>	Published June 8, 2007	
<i>Goldack</i>	Issued Nov. 18, 2003	

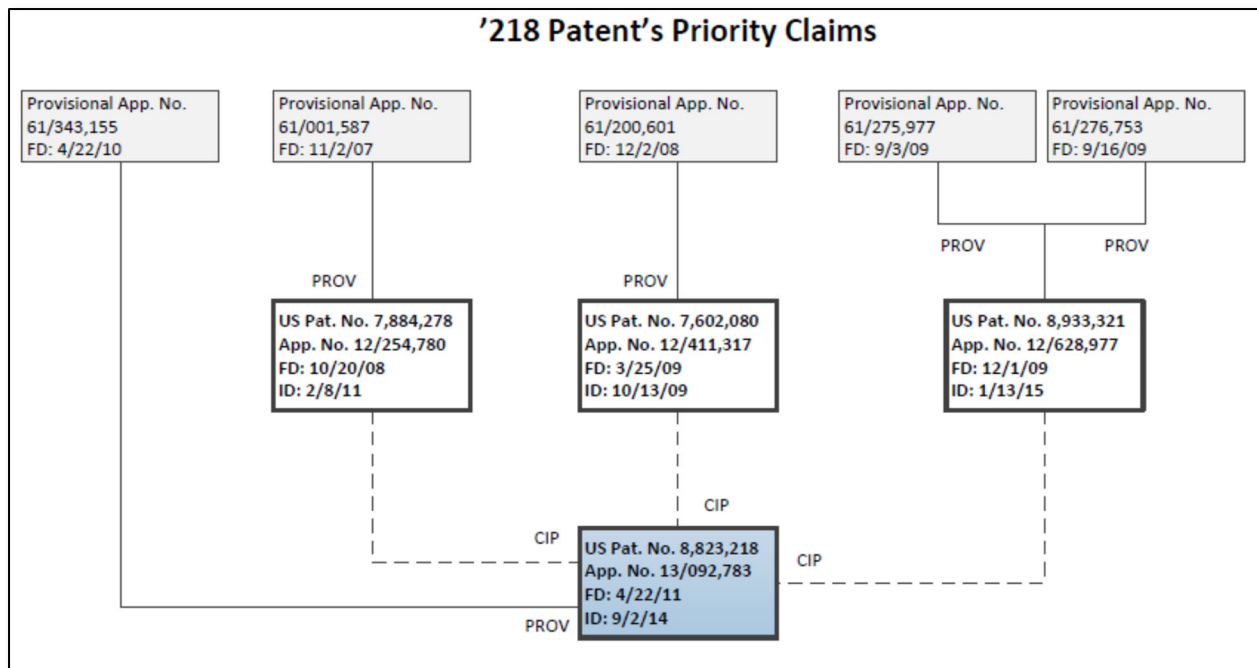
² Ex-1008 is a compilation of documents previously accepted into evidence in IPR2021-01286 and IPR2021-01287 (as Ex-1005 in those proceedings), comprising the English-language translation of *Moine* (1-16), its French language version (17-33), and translator declarations (34-52).

³ *Adest* has a corresponding application (2009/0140715A1) published June 4, 2009, which is also prior art that applies to the challenged claims under 35 U.S.C. § 102(a).

Adest, Kronberg, and Moine were not considered by the Patent Office during prosecution of the '218 patent. *See* Ex-1001, References Cited. *Goldack* appears on the '218 Patent's face and was listed in an IDS, but was not discussed during prosecution.

IV. PRIORITY

The '218 patent issued from Application 13/092,783 filed April 22, 2011. Ex-1001. The '218 patent claims priority as a continuation-in-part ("CIP") to three non-provisional applications and to five provisional applications, as shown below.



Priority Claim	Application	Date Filed
CIP	12/254,780 (“’780 Application”)	Oct. 20, 2008
CIP	12/411,317 (“’317 Application”)	Mar. 25, 2009
CIP	12/628,977 (“’977 Application”)	Dec. 1, 2009
Prov.	61/343,155 (“’155 Provisional”)	Apr. 22, 2010
Prov.	61/001,587 (“’587 Provisional”)	Nov. 2, 2007
Prov.	61/200,601 (“’601 Provisional”)	Dec. 2, 2008
Prov.	61/275,977 (“’977 Provisional”)	Sep. 3, 2009
Prov.	61/276,753 (“’753 Provisional”)	Sep. 16, 2009

Despite these priority claims, no challenged claim is supported by any priority application, and thus the claims are not entitled to a priority date earlier than the ’783 Application’s April 22, 2011 filing date. Ex-1002, ¶¶22-23. *In re NTP, Inc.*, 654 F.3d 1268, 1277 (Fed. Cir. 2011); *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1571 (Fed. Cir. 1997).

All challenged claims depend from independent claims 1, 15, or 18, and as shown below show, the “priority” applications fail to disclose at least the following elements for each independent claim:

Claim 1:

Unsupported Limitation(s)	Application(s)
• “MMU” • “LMU” • “controlling one or more solar modules” • “the MMU sends a command to the LMU to alter the state of an associated solar module” • “LMU alters the state of the one or more solar modules in accordance with command”	’317 Application ’780 Application ’977 Application ’977 Provisional ’753 Provisional
• “MMU” • “sensor” • “anomaly” • “a command to the LMU to alter the state of an associated solar module” • “LMU alters the state of the one or more solar modules in accordance with command”	’601 Provisional ’587 Provisional
• “anomaly”/”detect an anomaly”	’155 Provisional

Claim 15:

Unsupported Limitation(s)	Application(s)
• “monitoring a sensor for an anomaly...” • “determining ... if the sensor has detected an anomaly...” • “determining if the anomaly requires a control change” • “issuing a control change command ...” • “the control change command is selected from the group consisting of [commands]” • The list of [commands]	’317 Application ’780 Application ’977 Application ’977 Provisional ’753 Provisional
• “the control change command is selected from the group consisting of [commands]” • The list of [commands]	’601 Provisional ’155 Provisional
• “monitoring a sensor for an anomaly” • “determining ... if the sensor has detected an anomaly” • “determining if the anomaly requires a control change” • “issuing a control change command” • “the control change command is selected from the group consisting of [commands]”	’587 Provisional

• The list of [commands]	
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Claim 18:

Unsupported Limitation(s)	Application(s)
• “computer-implemented method”	’780 Application
• “monitoring ... a signal from a central controller remote from the computing device”	’317 Application ’977 Application
• “polling ... the central controller to determine if the loss of signal is transient”	’587 Provisional ’601 Provisional
• “disconnecting ... one or more solar modules from a power bus if the loss of signal is not transient...”	’977 Provisional ’753 Provisional
• “waiting ... for a restart signal” • “connecting ... the one or more solar modules to the power bus when the restart signal is received”	
• “polling ... the central controller to determine if the loss of signal is transient”	’155 Provisional

Ex-1002, ¶23.

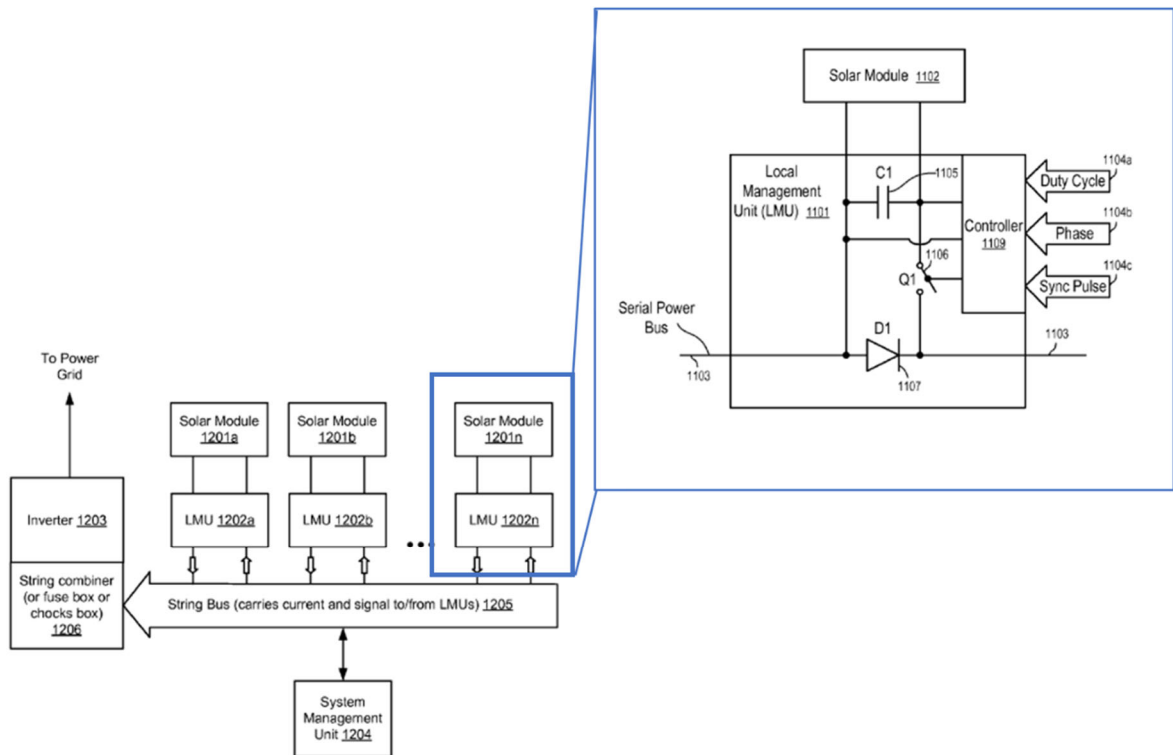
V. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art (“POSITA”) at the time of the ’218 patent’s alleged invention (early 2011), would have had a bachelor’s or similar degree in electrical engineering and one year of experience designing solar power systems, power control systems, and/or power safety systems. More education can supplement practical experience and vice versa. The POSITA could have also obtained similar knowledge and experience through other means. Ex-1002, ¶¶24-26.

VI. OVERVIEW OF THE ’218 PATENT AND THE PRIOR ART

A. The ’218 Patent

The ’218 patent describes “automated shutdown, disconnect, or power reduction of solar panels.” Ex-1001, Abstract. The ’218 patent claims to “reduce the safety risks during the shipment, installation and/or maintenance of photovoltaic systems.” *Id.*, 4:5-6, Figs. 10, 13.



Ex-1001, Figs. 10, 13.⁴

The '218 patent describes a system using “local management units” (“LMUs”), each coupled between a “solar module” and a “string bus (power line),” which acts as a system power bus. Ex-1001, 7:54-60. The LMU unit may receive “duty cycle,” “phase,” and synchronization pulse” inputs. *Id.*, 9:60-64.

⁴ All **bold/italics/color** emphases and annotations are added unless noted otherwise.

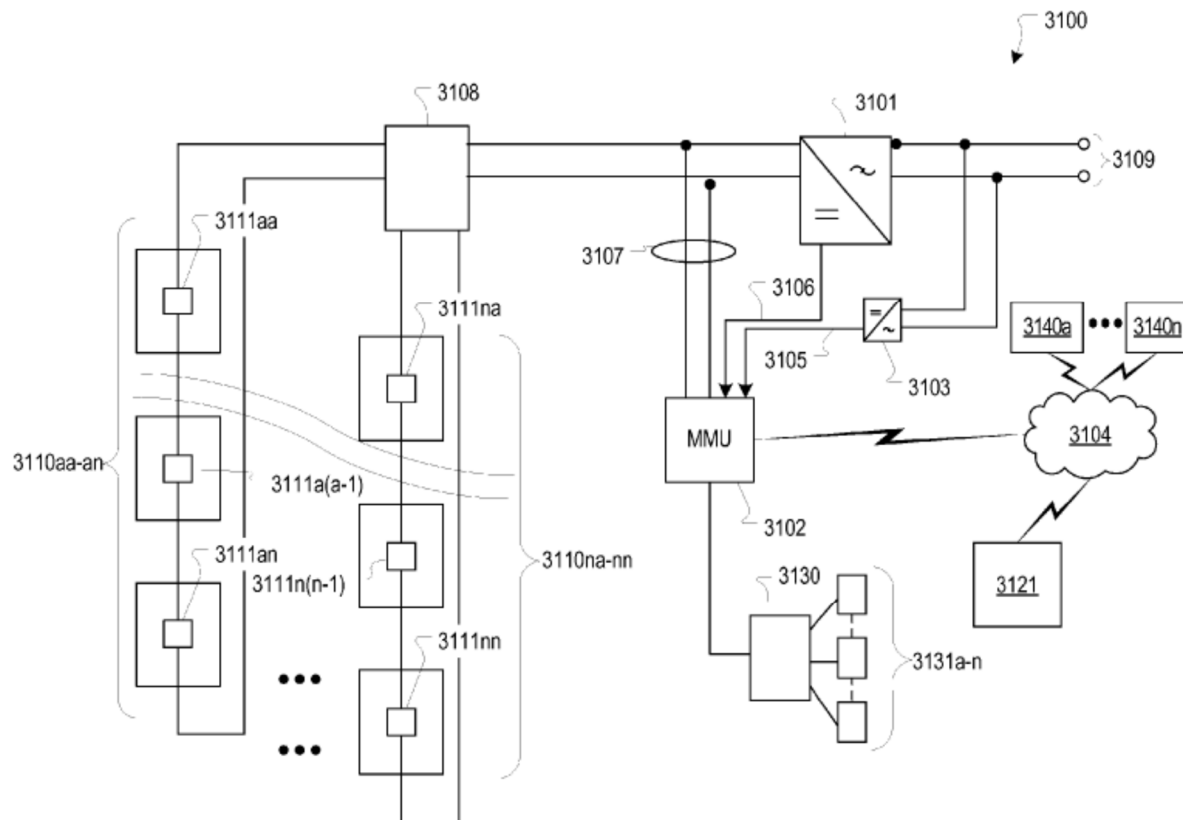


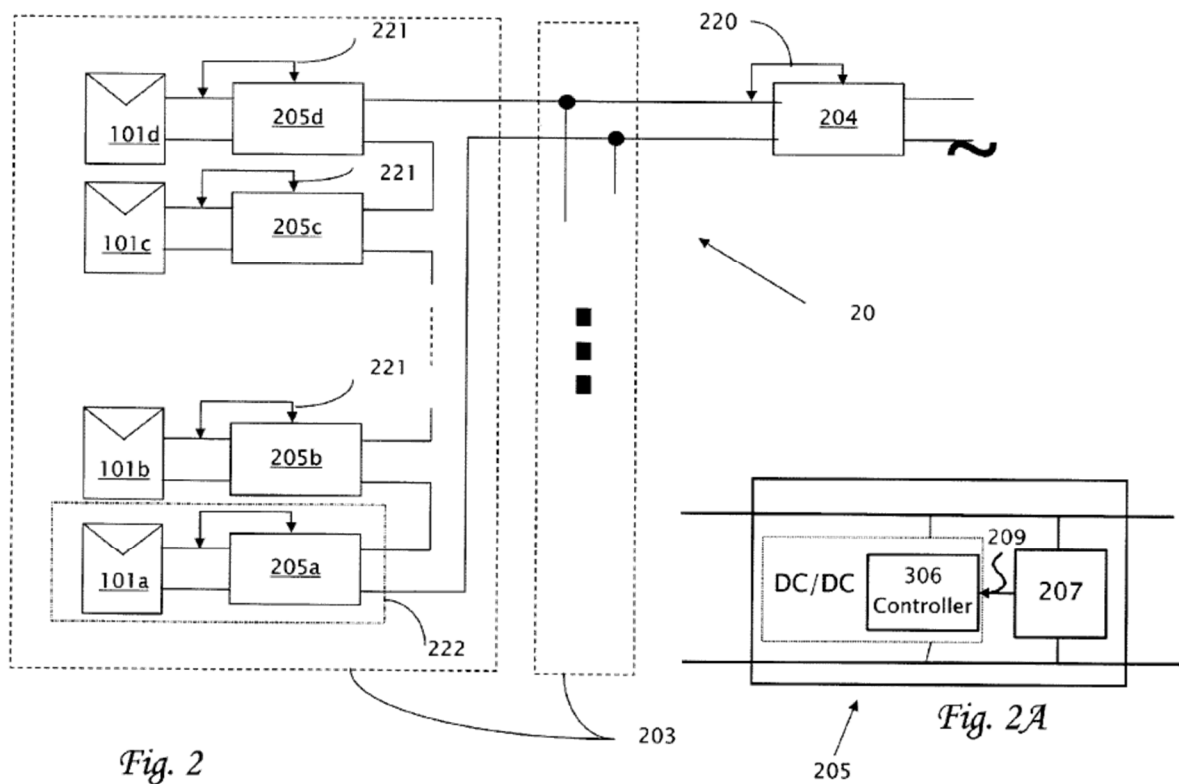
FIGURE 22
Ex-1001, Fig. 22.

The '218 patent's LMU may output signals via a wired or wireless connection. *Id.*, 10:8-11. The LMU's controller may incorporate watchdog code to perform shutdown functions. *Id.*, 16:61-65. When detecting an anomaly (*e.g.*, through sensors 3131), a master management unit ("MMU") may send a command to the LMU to alter the state of an associated solar module (*e.g.* shutting down or disconnecting one or more solar modules). *Id.*, 7:11-16, 18:36-40, 20:60-65. The LMU's controller controls a switch to perform the shutdown in response to that command. *Id.*, 16:63-17:3. Watchdog code 2308 can perform the shutdown

command. *Id.*, 16:60-65, 17:34-36, Figs. 20, 21. The '218 patent also explains that its shutoff signals may be used to add system security or to address safety issues. *Id.*, 17:24-30, 2:36-47. See Ex-1002, ¶¶37-42.

B. Adest

Adest discloses waking up and shutting down photovoltaic distributed power systems. Ex-1005, 1:25-27. *Adest* describes power generating elements 222 that comprise a solar panel 101 and an associated power converter circuit 205, as shown in Figs. 2 and 2A. *Id.*, 5:49-50.

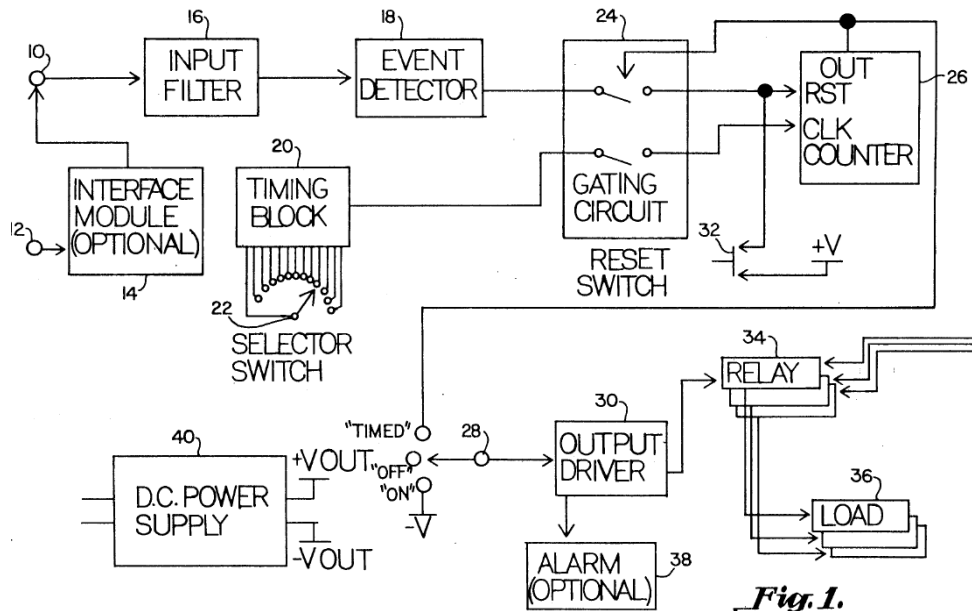


Ex-1005, Figs. 2, 2A

The power converter circuits 205 (a.k.a. power modules 205 or converters 205) “adapt optimally to the power characteristics of the connected solar panels and transfer the power from the solar panel efficiently from input to output.” Ex-1005, 5:52-55. The converter 205, includes a detector/receiver 207, that receives a signal from an inverter 204. *Id.*, 6:54-59, 2:65-67, 12:10-15. The converter’s 205 normal operation is maintained as long as the signal is received. *Id.*, 10:2-5, 12:33-39. If the communication signal is not detected, the converter 205 is typically turned off. *Id.*, 10:5-8. *Adest’s* system has the same purpose as the ’218 patent—to safely shutdown a solar array in case of an emergency. Ex-1002, ¶¶43-45.

C. Kronberg

Kronberg discloses a smart watchdog safety switch to “provide automatic shutdown of critical devices in case of failure,” and to ensure “process equipment is not damaged in the event of a controller failure” Ex-1006, abstract, 1:12-15, 2:30-32, Fig. 1.

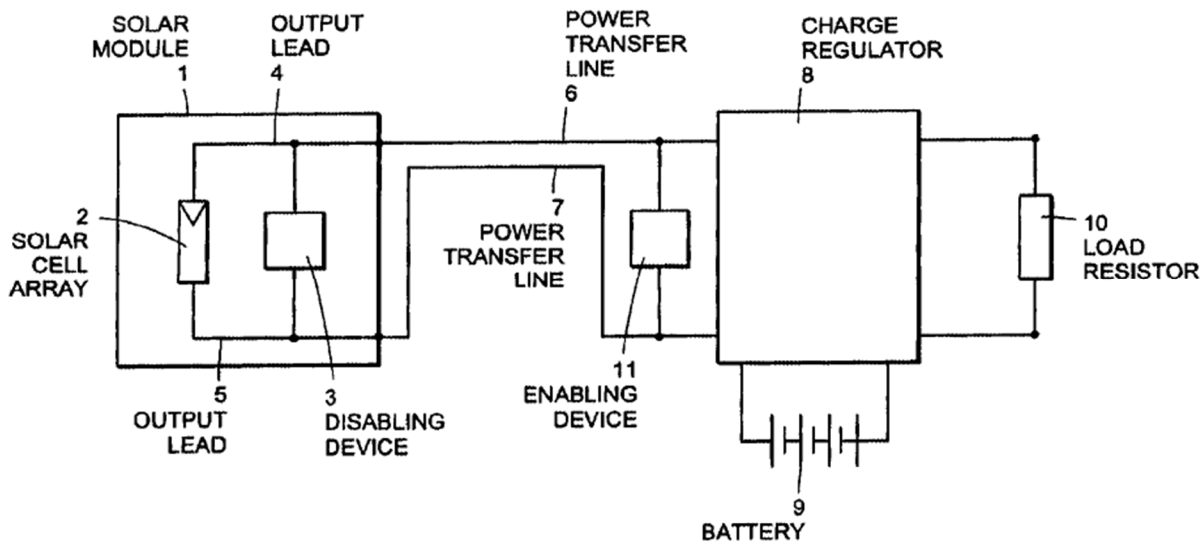


Ex-1006, Fig. 1

Kronberg monitors events such as an input signal and identifies “transitions” of the signal using an event detector 18. Ex-1006, 1:45-48, 3:22-26. A counter continuously counts generated pulses from a timing block 20. *Id.*, 3:27-32. The event detector can reset a counter 26 to zero upon receipt of the generated event pulses. *Id.*, 3:33-37. If an event pulse is not received before a specified number of timing pulses, the counter outputs a 1, which may be used to indicate a malfunction. *Id.*, 3: 38-46, 59-61. *Kronberg*’s watchdog also serves the same purpose as the watchdog system in the ’218 patent—to monitor communication and receive instruction to modify operation of the system components (*e.g.*, a solar module), and to shutdown equipment to protect it in case of a failure. Ex-1002, ¶¶46-48.

D. Goldack

Goldack discloses “a system for protecting a solar module against theft or unauthorized use by an authorized consumer.” Ex-1007, Abstract, Fig. 1.



Ex-1007, Fig. 1

Goldack discloses a solar module-sited disabling device sends a first signal or code during power generation. Ex-1007, 3:62-66. This first signal may include pulses that vary in “shape, length and number of the pulses.” *Id.*, 4:3-5. The consumer-sited enabling device detects the first signal and sends a second signal back. *Id.*, 4:6-8. The transmissions may be via wire or wirelessly. *Id.*, 4:8-11. If there is no response to the first signal in “timeout of the first predetermined time period,” the system is disabled. *Id.*, 4:23-30; 39-41. *Goldack*’s theft protection also serves the same purpose as the ’218 Patent—shutting down or disabling the system

in the event that communication ceases from a solar panel (e.g., in the case of disconnection). Ex-1002, ¶¶49-51.

E. Moine

Moine discloses a system including “an interruption device on the solar module” and a “release device on the consumer side.” Ex-1008, Abstract, Fig. 1.

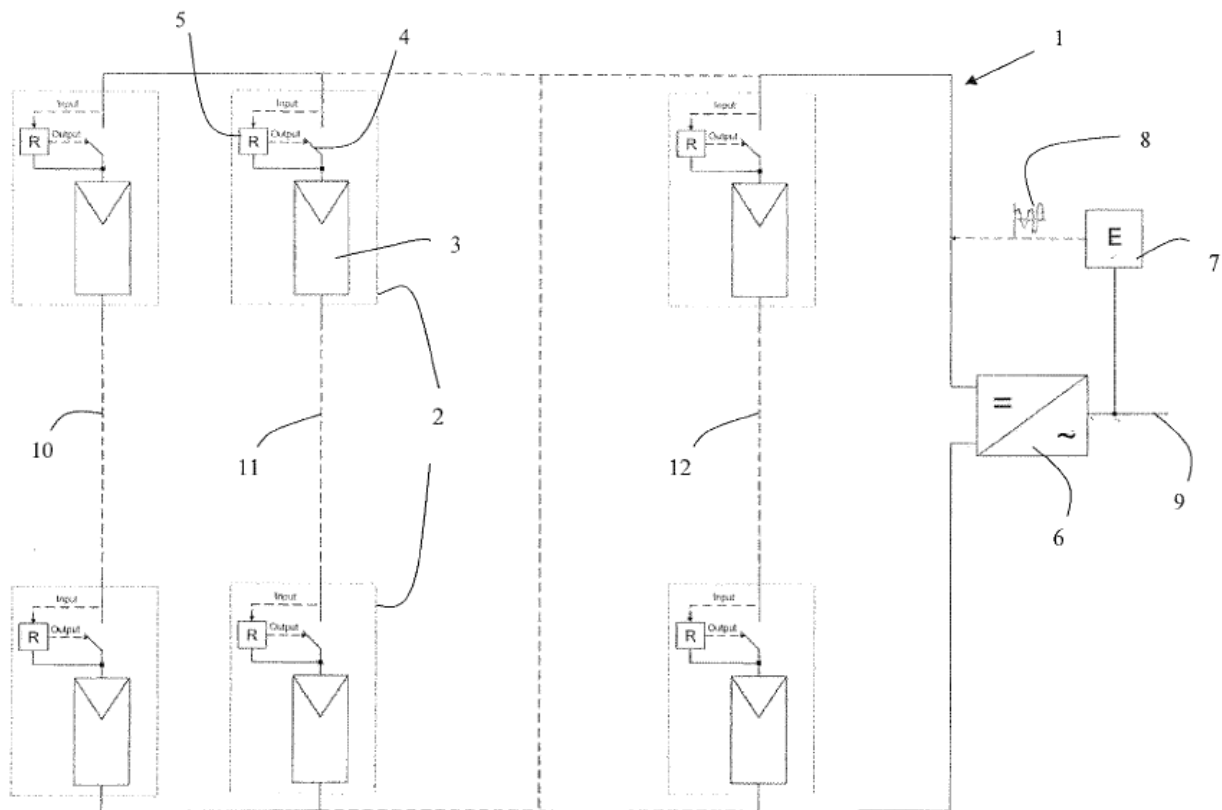


Figure 1

Ex-1008, Fig. 1

Moine's "interruption device" comprises a receiver 5 and switch 4. The receiver 5 receives a signal from a transmitter 7. When the signal is absent, such as when the domestic power supply lacks current, the switch shuts down the system by disconnecting the solar module 3. Ex-1008, 6:1-10. "[T]his makes it possible for

maintenance or safety personnel to intervene with no risk of electrocution from the facility.” *Id.*, 6:12-13. *Moine*’s system has the same purpose as the ’218 patent—to safely shutdown a solar array in case of an emergency. Ex-1002, ¶¶52-54.

VII. CLAIM CONSTRUCTION

Under *Phillips*, the Board gives claim terms their ordinary meanings, as understood by a POSITA at the time of the invention, unless they are otherwise defined, and only construes terms when necessary to resolve a controversy. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-16 (Fed. Cir. 2005); *Toyota Motor Corp. v. Cellport Sys., Inc.*, IPR2015-00633, Paper No. 11 at 16 (Aug. 14, 2015).

No express constructions are necessary; the claim terms should be given their ordinary meanings. *See* Ex-1002, ¶¶55-56.

VIII. DETAILED EXPLANATION OF GROUNDS

A. **Ground 1: *Adest* and *Kronberg* Render Obvious Claims 1-4, 6-16, and 18-19.**

It would have been obvious to a POSITA at the time of the invention to combine the teachings of *Adest* and *Kronberg*, as they were both directed to automatically shutting down devices in case of failures. Ex-1006, abstract, 1:12-15; Ex-1005, 7:6-12. The Board previously agreed that a POSITA would be motivated to combine the teachings of *Adest* and *Kronberg* in a similar context on a related patent *See* Ex-1010 at 35.

1. Claim 1

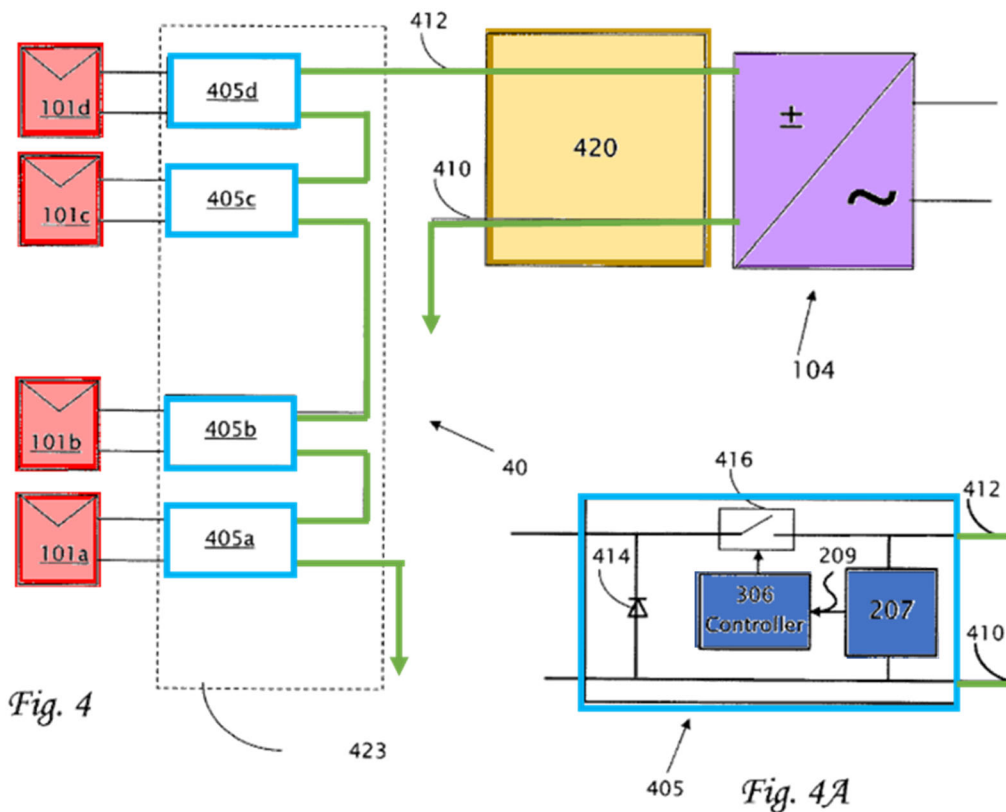
a. “A system comprising:”

To the extent the preamble is limiting, *Adest* discloses/suggests⁵ this feature. Ex-1005, Abstract (“A distributed power *system*”), Figs. 2, 2A, 1:26-27. Ex-1002, ¶64.

b. “a master management unit (MMU); and”

Adest discloses this feature. Ex-1002, ¶¶65-71. A POSITA would understand that *Adest* discloses the same configuration as the '218 patent, including the claimed **MMU** connected to a **string bus 3107**, which is connected to **local management units (LMUs) 3111**, each connected to a **solar module 3110**. Ex-1002, ¶¶66-67; Ex-1001, 16:63-17:3; 18:6-19:29, Fig. 22.

⁵ Petitioner uses the terms “suggest” or “suggests” to mean that a reference may render obvious the claim term at issue, either alone or together with the knowledge generally available to a POSITA, including the teachings of the other references in the ground under discussion.



Ex-1005, Figs. 4, 4A.

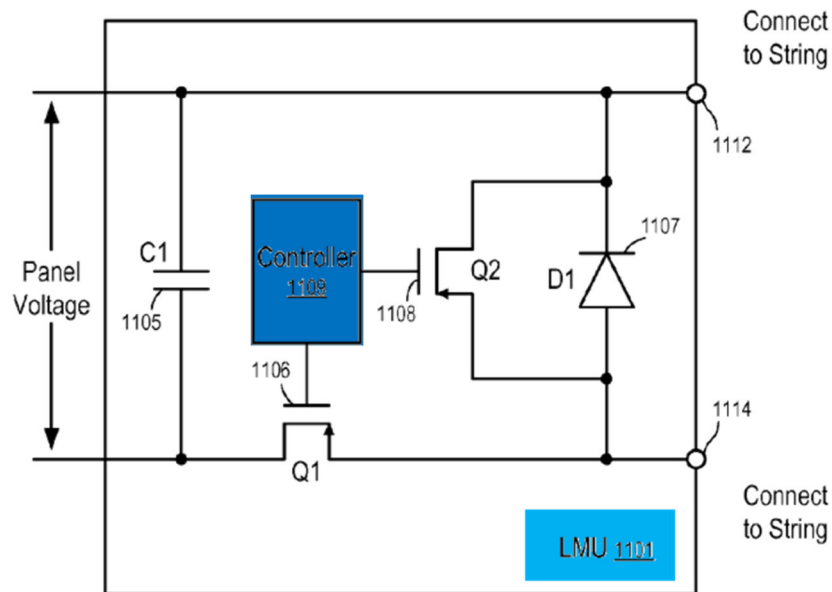
Adest discloses “**a signaling mechanism 420** which superimposes a signal on serial string 423 through **wires 412 and 410** when inverter 104 is converting power to the grid.” Ex. 1005, 9:2-4, Fig. 4B. **The signaling mechanism** “refers to either a signal modulated on an electromagnetic carrier signal or a simple unmodulated signal such as an on/off signal “keep alive” signal or “dry contact” signal. *Id.*, 2:66-3:1. It “is adapted for controlling operation of the power module.” *Id.*, 3:32-34. **The signaling mechanism** can produce a 100Hz signal received by the detector/receiver 207 to confirm normal operation. *Id.*, 9:34-41. A POSITA would understand that **the signaling mechanism 420** is an **MMU** because it controls

operation of the solar module and sends signals to confirm normal operation. Ex-1002, ¶¶67-71.

c. “a local management unit (LMU) in communication with the master management unit (MMU), the LMU controlling one or more solar modules;”

Adest discloses this feature. Ex-1002, ¶¶72-76. For example, **power modules 405** connected to each **solar panel 101** contain “**detector/receiver 207** which is configured to receive, optionally amplify and detect the signal, e.g. at 100Hz, produced by **signal mechanism 420**” and “**controller 306** which functions to stop normal operation of power from the input of module 405 to the output of 405 when signal input 209 is absent indicating that inverter 104 is not transferring power to the electrical grid.” Ex-1005, 9:34-49.

A POSITA would have understood that *Adest*’s **power module** is **an LMU**. Just as the **LMU** of the ’218 patent includes a **controller 1109**, receives input from the **MMU**, and controls the operation of the solar panels (*see* Ex-1001, 7:6-10, 16:63-17:3, 18:29-36, Fig. 12; Ex-1002, ¶73), the **power module 405** of *Adest* includes a **controller 306** and receives input (*e.g.*, a 100Hz signal) from the **signaling mechanism 420**, and shuts down operations of the **solar panel(s)** via a controller. Ex-1005, 9:34-49. Ex-1002, ¶¶74-76.



Ex-1001, Fig. 12.

d. “wherein the MMU is connected to at least one sensor,
the sensor configured to detect an anomaly; and”

Adest discloses this feature. Ex-1002, ¶¶77-81. For example, *Adest* discloses a microcontroller 422 of its **signaling mechanism 420** that “is typically connected to one or more **sensors** in order to monitor the operation of inverter 104,” including a “**Hall-effect sensor**.” Ex. 1005, 9:13-20, Fig. 4B. *Adest*’s **sensor** can monitor components and detect anomalies in their operation (*e.g.*, an over-voltage condition), which can “result[] in microcontroller 422 stopping the signaling through relay 428 and/or opening one or more protective relays 424, 426...” *Id.*, 9:22-26.

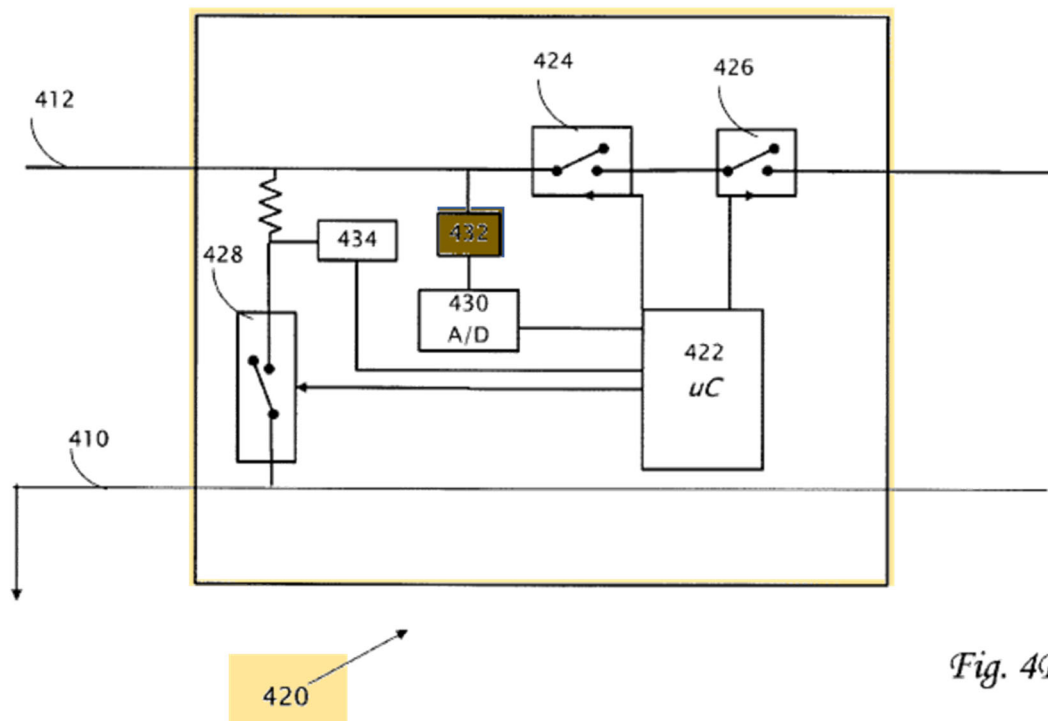


Fig. 4B

Ex-1005, Fig. 4B.

A POSITA would understand that the over-voltage condition detected by the **sensors** of Adest's **signaling mechanism 420** is an anomaly, detected in a similar manner using a similar **sensor** to the '218 patent. Ex-1002, ¶¶79-80; Ex-1005, 9:21-26, 11:4-9; Ex-1001, 18:53-55, Fig. 22.

- e. “wherein upon detection of the anomaly by the sensor, the MMU sends a command to the LMU to alter the state of an associated solar module; and”

Adest discloses this feature. Ex-1002, ¶¶82-87. The **controller 306** of Adest's **power module 405** controls operation of a switch 416 based on whether **detector/receiver 207** receives a communication. Ex-1005, 9:34-49, Fig. 4A. The “**controller 306** maintains safety mode operation (step 53) until a communications

signal, e.g. 100Hz, is received by **receiver/detector 207** from inverter 204 or **signaling block 420**. When the communications signal is received (decision block 505) indicating inverter 104 or 204 is connected and converting power, safety mode (step 53) of operation ends.” *Id.*, 10:40-46. If the signal is not detected, “the normal mode (step 57) is typically ended and power conversion of **module 405** is typically turned off.” *Id.*, 10:59-62, Fig. 5A.

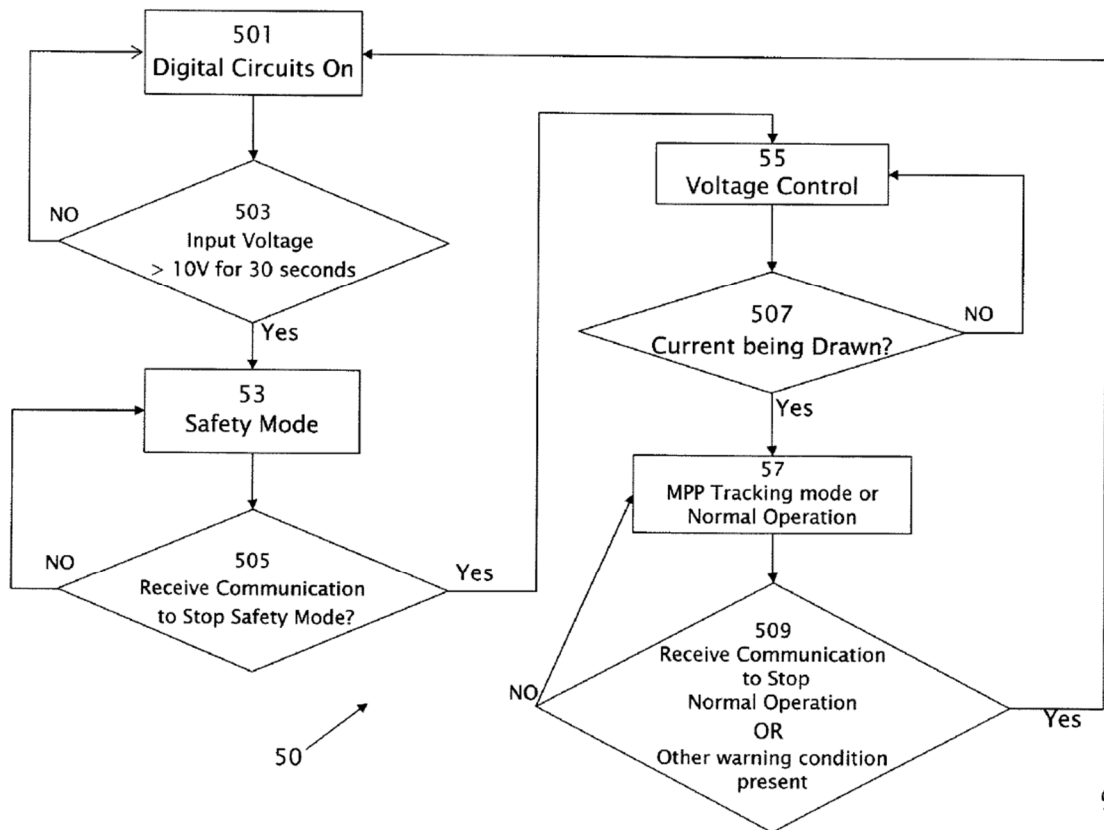


Fig. 5A

Ex-1005, Fig. 5A.

Adest's Fig. 5A shows a flow diagram detailing normal operation and safety mode. When a communication to stop normal operation has not been received, normal operation continues. But when a communication has been received, e.g.,

receiving communication to stop normal operation or other warning condition present in 509, the normal mode (step 57) is typically ended and power conversion of modules 405 is typically turned off (Ex-1005, 10:9-12) as altering the state of an associated solar module.

As discussed in Section VIII.A.1.c, the **LMU** may include a **solar module controller** to control the operation of the solar module and the **MMU** may “interact with the inverter” and “send enough current to the to wake up the **LMUs** ... and allow them to do a quick query” of the **solar panels**. Ex-1001, 7:6-10; 18:29-36. If an **LMU** does not respond, “the system would send an alarm indicating a possible security breach, such as a wire being cut or a panel being removed.” *Id.* at 18:38-40. For example, the panel was removed for maintenance, the panel was stolen, etc. Ex-1002, ¶85. Upon detection of a fault in the wiring, the controller “may also automatically trigger a disconnect” of one or more **solar panels 101**. Ex-1001, 17:26-29.

A POSITA would also have understood that the **controller 306** of *Adest*’s **power module 405** receives communications from the **signaling mechanism 420** and alters the state of (*e.g.*, shuts down or disconnects) the **solar module**, similar to how the ’218 patent’s **LMU** of receives communications from the **MMU** and the **LMU** alters the state of the **module**. Ex-1002, ¶¶86-87.

- f. **“wherein upon receiving a command from the MMU, the LMU alters the state of the one or more solar modules in accordance with command.”**

Adest discloses this feature. Ex-1002, ¶¶88-92. As discussed in Section VIII.A.1.e, as long as the **power module 405** receives 100Hz signals from **signaling mechanism 420**, normal operation continues. Ex-1005, 9:34-49, 10:40-46. But if **power module 405** either fails to receive 100Hz signals or receives a communication to stop normal operation or other warning condition present, the normal mode is typically ended and power modules is then typically turned off. *Id.*, 10:9-12, 10:59-62, Fig. 5A. A POSITA would understand that *Adest* accomplishes this in the same way and using the same configuration as the '218 patent. *See* Ex-1001, 17:28-29; 18:36-43; Ex-1002, ¶91.

2. Claim 2

- a. **“The system of claim 1, wherein the MMU queries the sensor for the anomaly.”**

Adest discloses/suggests this feature. *See* Ex-1002, ¶¶93-96. As shown in Section VIII.A.1.d, the microcontroller 422 of *Adest*'s **signaling mechanism 420** “is typically connected to one or more **sensor** in order to monitor the operation of inverter 104.” Ex-1005, 9:13-16. The microcontroller 422 can measure anomalies based on signals received through the **sensor** (*e.g.*, an over-voltage condition) that

can cause the microcontroller to stop signaling (*e.g.*, through relays 424, 426, and/or 428). *Id.*, 9:22-26.

3. Claim 3

a. “The system of claim 1, wherein the sensor notifies the MMU of the anomaly.”

Adest discloses/suggests this feature as discussed in Sections VIII.A.1.d and VIII.A.1.e. *See* Ex-1002, ¶¶97-99. To the extent that Patent Owner or the Board contends that *Adest* does not disclose the **sensor** notifying the **signaling mechanism 420/MMU** of an anomaly, a POSITA would have understood that the **sensor** may notify the **MMU** of the anomaly, as purpose and function of a **sensor** is to detect and provide notice of a condition. Ex-1002, ¶¶98-99. To give effect to the use of a **sensor**, either the **MMU** must query the sensor for its results, or the **sensor** must provide its results to the **MMU**, either of which result in the sensor notifying the **MMU** of the anomaly. *Id.*

4. Claim 4

a. “The system of claim 1, wherein the command is selected from the group consisting of: a command to shutdown the module; a command to disconnect the module; and a command to alter the output of the module.”

Adest discloses/suggests this feature. Ex-1002, ¶¶100-105. *Adest* discloses “wake-up and shutdown algorithms” for PV systems. Ex-1005, 1:25-27. In the event of an anomaly (*e.g.*, an over-voltage condition), the microcontroller 422 stops

“the signaling through relay 428 and/or opening one or more protective relays 424, 426 in series with the input DC voltage to inverter 104.” *Id.*, 9:23-26. A switch “controlled by **controller 306**” functions “to stop normal operation of power from the input of **module 405** to the output of **405** when signal input 209 is absent,” thereby powering down the **solar panel**. *Id.*, 9:45-48. As discussed in Section VIII.A.1.f, power conversion is turned off in the absence of a signal from **signal mechanism 420**. Ex-1005, 10:59-62. Additionally, “the **controller 306** may alternate the switches (*e.g.*, switches 324 & 326 of buck converter) at a low duty-cycle in order to maintain a low output voltage,” altering the output of the module. *Id.*, 10:36-39.

In a prior IPR on a related patent, the Board agreed in its Final Written Decision (“FWD”) that shutting down a module is essentially the same as reducing its voltage/duty cycle to zero. *See* Ex-1010, 47-48.

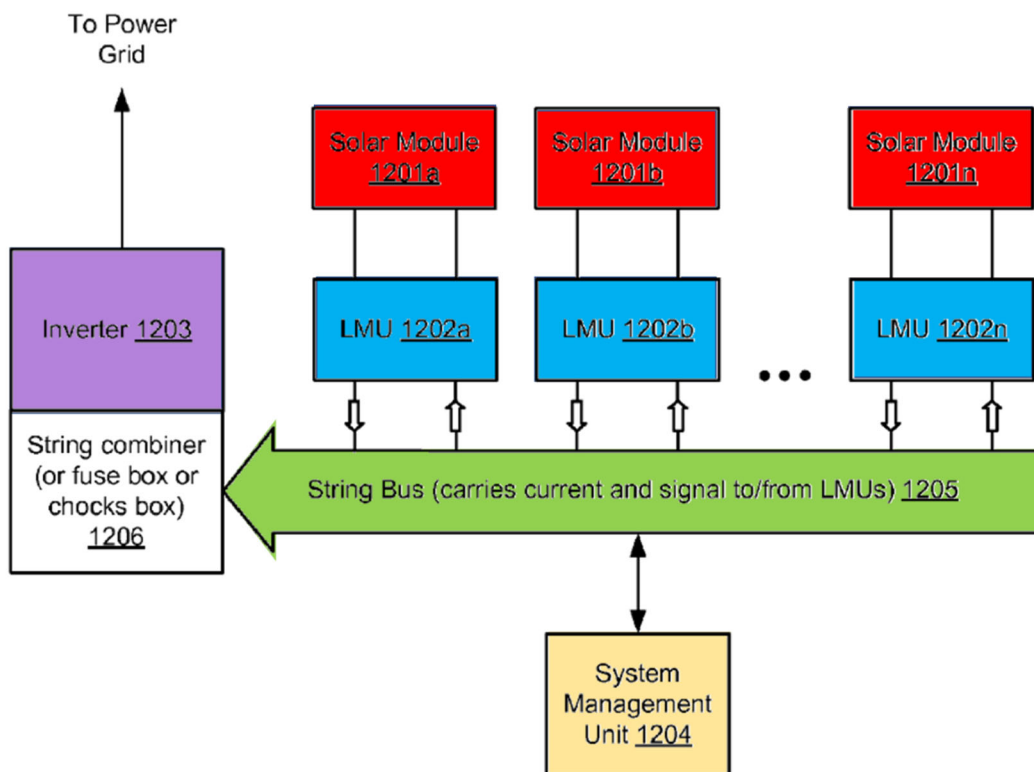
A POSITA would also understand that *Adest* describes shutting down, disconnecting, or altering the output of a solar module, in a similar manner described and claimed in the ’218 patent. Ex-1002, ¶¶104-105; *see* Ex-1001, 15:15-19, 16:29-21, 17:28-29.

5. Claim 6

- a. “The system of claim 1, further comprising: a watchdog unit to monitor a communication in a solar array between the master management unit (MMU) and a respective local management unit (LMU);”

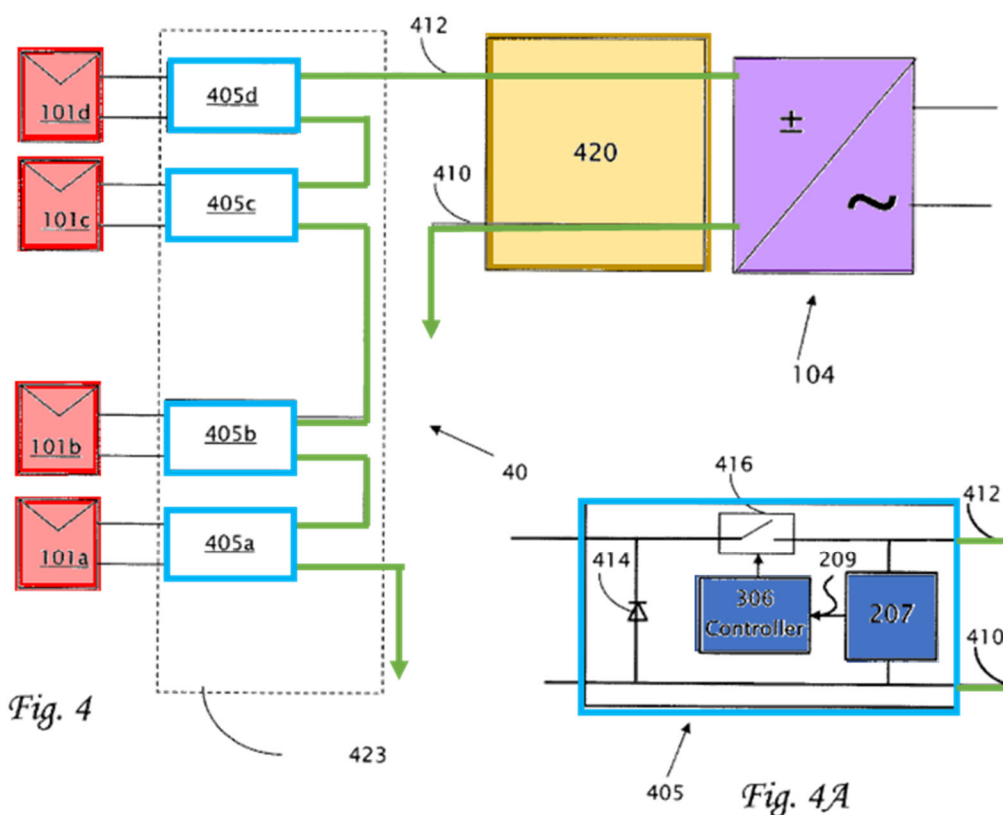
Adest, alone or in combination with the teachings of *Kronberg* discloses/suggests or renders obvious this feature. Ex-1002, ¶¶106-137; *see* Ex-1001, 9:34-47, 7:1-10, Fig. 13.

Adest discloses a **watchdog unit** used in the same configuration as the '218 patent. Ex-1002, ¶¶107-110.



Ex-1001, Fig. 13

In particular, **power modules 405a-405d** of *Adest* in whole or in part perform as the **watchdog unit** coupled between **solar panel 101a-101d** and a **power bus**, which is connected to the **signal mechanism 420**. Ex-1005, 8:61-64, Figs. 4, 4A.

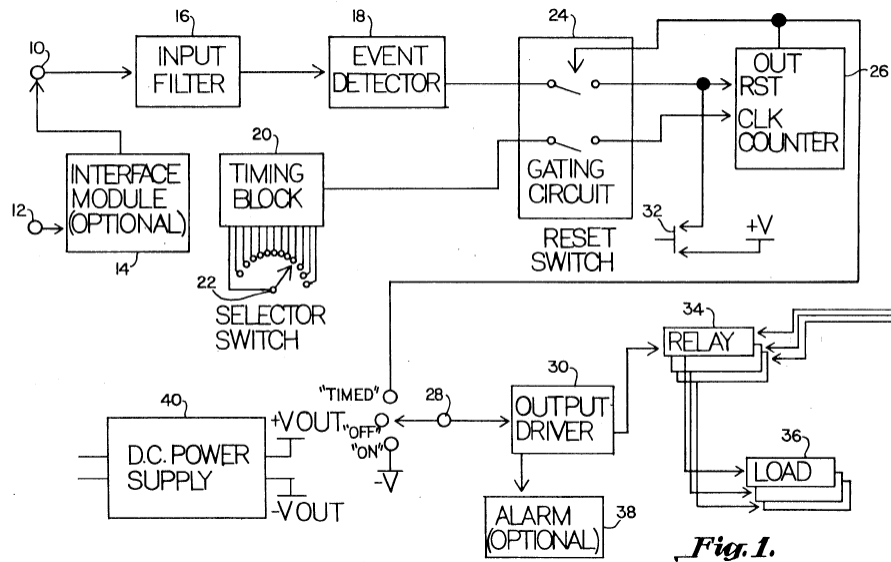


Ex-1005, Figs. 4, 4A.

Adest shows the **power module 405** includes “**detector/receiver 207** which is configured to receive, optionally amplify and detect the signal, e.g. at 100Hz, produced by the **signal mechanism 420**,” continues normal operation as long as the signal is received, and “stop[s] normal operation of power from the input of **module 405** to the output of **405** when signal input 209 is absent.” Ex-1005, 9:33-49, 10:57-62, Fig. 5A. *Adest* can shutdown/disconnect power conversion and output power

can be reduced, similar to the operation disclosed in the '218 patent. *Id.*, 10:36-39, 59-62. The **controller 306** possesses the capability to “poll[] a signal input 209 from receiver/detector 207” to detect the 100Hz signal. Ex-1005, 6:60-64; *see also* 9:38-41. In the event that it does not detect the 100Hz signal, the **controller 306** “functions to stop normal operation of power.” *Id.*, 9:44-48. The **LMU** could include a watchdog unit, as the '218 patent describes. *See* Ex-1001, 16:63, 17:59-61. A POSITA would understand that the **power modules 405** in whole or in part perform as a **watchdog unit**. A POSITA would also have understood that *Adest*'s **solar panels** are each a “**solar module**.” Ex-1002, ¶113; *see also* Ex-1005, 10:25-36, Fig. 5A (discussing safety mode operation).

To the extent that Patent Owner or the Board disagrees that *Adest* and knowledge of a POSITA disclose a “watchdog unit,” *Kronberg* discloses this feature and it would have been obvious to combine the teachings of *Kronberg* with the teachings of *Adest*. Ex-1002, ¶¶119-137. *Kronberg* discloses a “‘smart’ watchdog safety switch ... for protecting critical processes in the event of controller failure.” Ex-1006, 2:30-32, Fig. 1.



Ex-1006, Fig. 1.

The watchdog apparatus of *Kronberg* monitors a signal received at input 10, which is filtered and marked as “event” with pulses at event detector section 18. Ex-1006, 3:13-26. A POSITA would understand the transitions of the signal/pulses are “heartbeat signals.” Ex-1002, ¶122. *Kronberg*’s internal timing block 20 produces a train of timing pulses having a frequency determined by a selector switch and multistage binary counter 26 that receives and counts the train of timing pulses (*i.e.*, timeout counter). Ex-1006, 3:27-32. As long as an event pulse is received, the binary counter continues to receive a signal and the counter is continuously reset to zero. *Id.*, 3:33-37. If the watchdog receives no event pulse before a specified number of timing pulses, then the counter outputs a “1,” which indicates the “attainment of a specified binary count.” *Id.*, 3:38-43. This binary count can be, for example, “2048 ... or another power of 2.” *Id.*, 3:38-43. A POSITA would

understand that attainment of the specified count (*i.e.*, that the periodic signal has not been detected for a certain amount of time) is the detection of irregularity in the periodic signal, or a “malfunction.” Ex-1002, ¶124; Ex-1006, 3:59-61.

The watchdog of *Kronberg* could be used as part of the **receiver/detector 207** of *Adest* to detect the absence of *Adest*’s communications signal. Ex-1002, ¶¶126-137. Rather than attach the output of the watchdog to a relay, the output of watchdog would need only be provided to the **controller 306** of *Adest*. A POSITA would have been motivated combine the watchdog apparatus as taught by *Kronberg* with the solar power system taught by *Adest* to monitor communications between the **signal mechanism 420** and **power modules 405** of *Adest*. *Id.*, ¶127 Watchdog timers like *Kronberg*’s were well-known to POSITAs for detecting malfunctions at the time of the invention. *Id.*, ¶128; *see also* Ex-1009 at 1269 (defining “watchdog timer” as “[a] form of interval timer that is used to detect a possible malfunction.”). A POSITA looking to implement the **receiver/detector 207** of *Adest*, would have been motivated to look to electronic signal detection devices, such as the watchdog timer of *Kronberg*, as it would be one of a number of solutions for detecting the absence of a periodic signal. Ex-1002, ¶¶129. *Kronberg* suggests that its watchdog apparatus is to be used to provide “automatic shutdown of critical devices in case of failure” (Ex-1006, 1:12-15), which is similar to *Adest*’s goal of shutting down a power generating facility when a transmitter fails to send a communication that could be

“caused, for example, by a fire, or due to the theft of one or several of the photovoltaic modules comprising the facility.” *See, e.g.*, Ex-1005, 7:6-12.

As mentioned, the Board previously agreed that it would be obvious to combine the teachings of *Adest* and *Kronberg* in a similar context on a related patent Ex-1010 at 35. The same rationale should be applied here, and a POSITA would have a reasonable expectation of success. Ex-1002, ¶¶131-137.

b. “wherein if the communication is interrupted between the MMU and the respective LMU, the watchdog unit sends polls to the MMU up to a specified number of times;”

Adest discloses/suggests this feature. Ex-1002, ¶¶138-143. The **receiver/detector 207** is configured to receive a 100Hz signal produced by mechanism 420. Ex-1005, 9:35-37. The **controller 306** possesses the capability to “poll[] a signal input 209 from **receiver/detector 207**” to detect the 100Hz signal. *Id.*, 6:60-64; *see also* 9:38-41. In the event that it does not detect the 100Hz signal, the **controller 306** “functions to stop normal operation of power.” *Id.*, 9:44-48. The **LMU** in whole or in part performs as a watchdog unit. A POSITA would have understood the polling performed by the controller of *Adest* to be polling of a **watchdog** unit that may poll the **MMU**. Ex-1002, ¶¶139-140. *Adest* already contemplated polling of the receiver/detector to detect the relevant signal, and possesses the relevant technology. *Id.*, ¶142. It would have been obvious to a

POSITA to take the then-existing technology of polling of the **receiver/detector** for a 100Hz signal in *Adest* and apply it to polling of the **MMU** for a 100Hz signal. *Id.*

- c. **“wherein if the watchdog unit receives no response after completing the polls, receives a command to modify operation of a solar module, or receives an inappropriate response, then the watchdog unit issues an instruction to the respective LMU to modify operation of the solar module.”**

Adest alone or in combination with the knowledge of a POSITA discloses this feature. Ex-1002, ¶¶144-148. Particularly, as discussed in Sections VIII.A.1.f and VIII.A.5.a, if **power module 405** fails to receive 100Hz signals, the normal mode is typically ended and power modules is then typically turned off as modifying operation of the **solar module**. Ex-1005, 10:8-12; 10:59-62. *See* Sections VIII.A.1 and VIII.A.5. It would have been obvious to a POSITA to use the knowledge of a POSITA with the implementation of the **MMU** and **LMU** taught by *Adest* to disclose this limitation.”

To the extent that Patent Owner or the Board disagrees that *Adest* and knowledge of a POSITA disclose a **“watchdog unit,”** *Kronberg* discloses this feature, as described above in Section VIII.A.5.a. It would have been obvious to a POSITA at the time of the invention to combine the teachings of *Adest* and *Kronberg* to achieve this claim element. Ex-1002, ¶148.

6. Claim 7

- a. “The system of claim 6, wherein the respective LMU comprises the watchdog unit.”**

Adest and/or *Kronberg* discloses/renderes obvious this feature as discussed in Section VIII.A.5. Ex-1002, ¶149.

7. Claim 8

- a. “The system of claim 6, wherein the instruction is selected from the group consisting of an instruction to shut off the solar module, an instruction to disconnect the solar module from the solar array, and an instruction to reduce the output power of the solar module.”**

Adest and/or *Kronberg* discloses/renderes obvious this feature as discussed in Section VIII.A.5. Ex-1002, ¶¶150-154. *Adest* teaches that “[a]ccording to a feature of the present invention, information regarding wakeup or shut-down may be conveyed from inverter 204 to converters 205. The information may be transmitted using any of the methods well known to those experienced in the art.” Ex-1005, 6:32-36. Similarly, *Kronberg*, states that “prompt shutdown of critical load elements 36 is implemented whenever valid transitions fail to arrive at input 10 (or, alternatively at input 12) within the period set by timing block 20 and counter 26.” Ex-1006, 4:5-9.

8. Claim 9

- a. **“The system of claim 1, further comprising: a watchdog unit coupled between a solar module and a power bus, the power bus configured to connect a plurality of solar modules to an inverter,”**

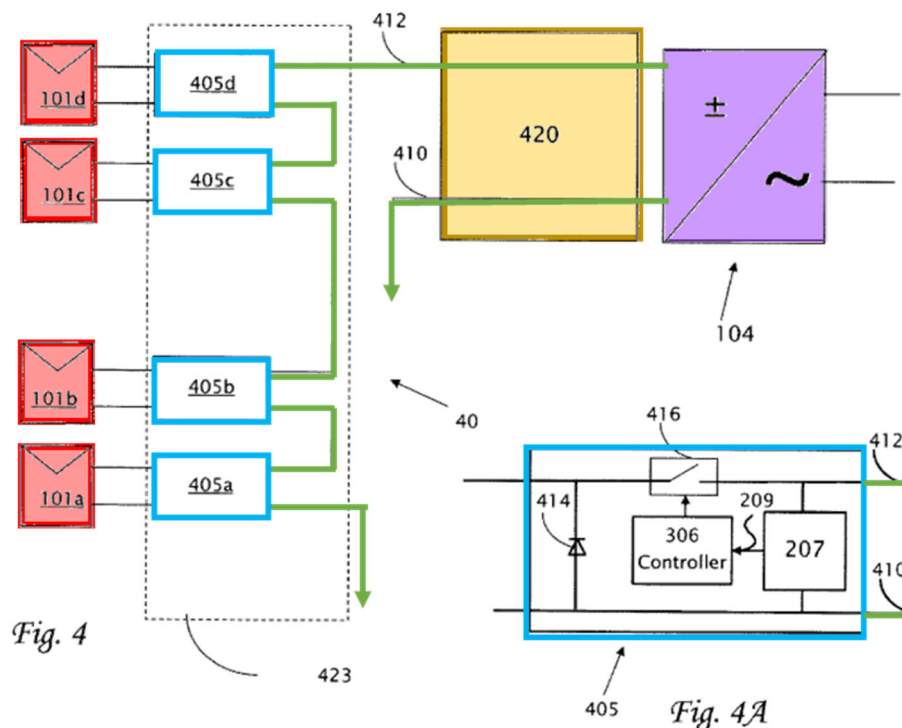
Adest discloses this feature as discussed in Section VIII.A.5. Ex-1002, ¶¶155-159. *Adest*’s **power modules 405a-405d** (i.e., **watchdog units**) are each connected between a **solar panel 101a-101d** (i.e., **solar module**) and **power bus**. In addition, a POSITA would have understood that *Adest* discloses a **watchdog unit** coupled between a **solar module** and a **power bus**, as required by claim 1 of the ’218 patent. Ex-1002, ¶156; Ex-1001, Fig. 4.

To the extent that Patent Owner or the Board disagree that *Adest* and knowledge of a POSITA disclose a “watchdog unit,” *Kronberg* discloses this feature in Section VIII.A.5.a. Ex-1002, ¶159.

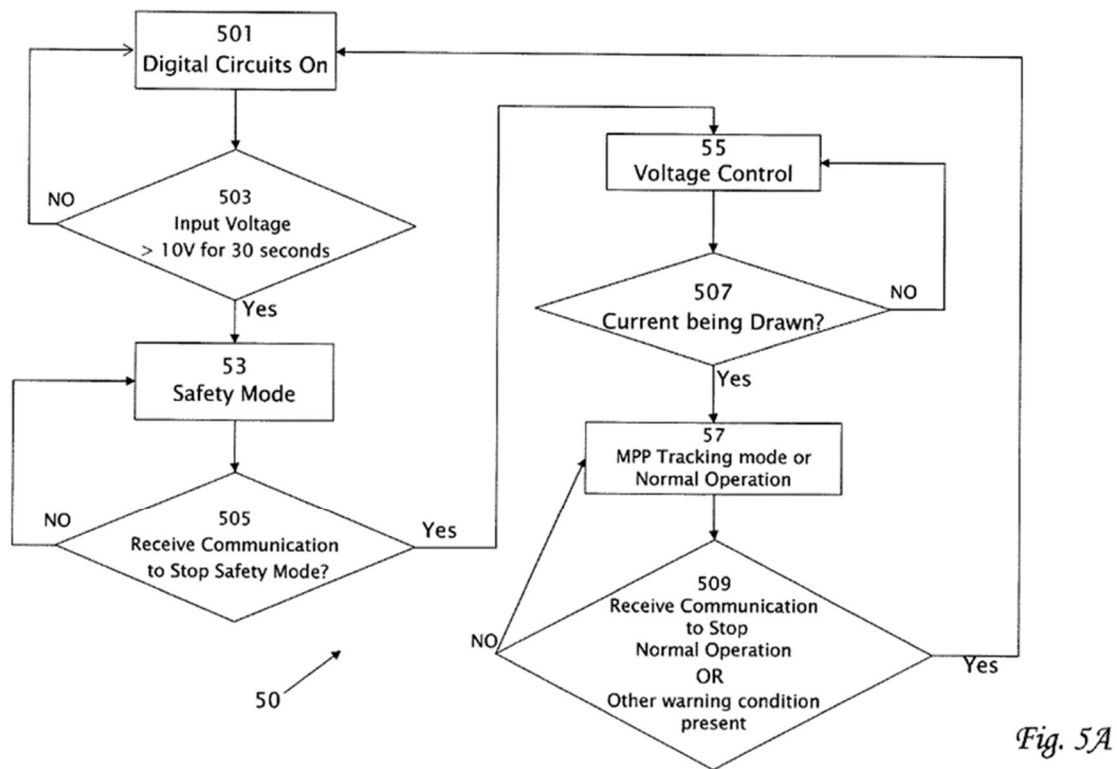
- b. **“the watchdog unit having: a local controller to monitor a communication from a central controller remote from the solar module and determine whether the communication is interrupted;”**

Adest discloses this feature as partially discussed in Section VIII.A.1.c. Ex-1002, ¶¶160-168. *Adest*’s **detector/receiver 207** together with the **controller 306** are a “**local controller**” of a **watchdog unit** consistent with the teachings of the ’218 patent. Ex-1002, ¶¶161-162. *Adest* discloses that the **controller 306** controls the operation of **switch 416** based on whether **detector/receiver 207** receives a

communication. *Id.*, 9:34-49. Furthermore, *Adest* discloses that “**controller 306** maintains safety mode operation (step 53) until a communications signal, *e.g.* 100Hz, is received by **receiver/detector 207** from **inverter 204** or **signaling block 420**. When the communications signal is received (decision block 505) indicating inverter 104 or 204 is connected and converting power, safety mode (step 53) of operation ends.” *Id.*, 10:40-46. Thus, a POSITA would have understood that the **detector/receiver 207** together with **controller 306** disclosed by *Adest* is a “**local controller**.” Ex-1002, ¶164.



Ex-1005, Figs. 4 and 4A



Ex-1005, Fig. 5.

A POSITA would have understood that the **signal mechanism 420** of *Adest* also performs the function of a **central controller** described in the '218 patent . Ex-1002, ¶165; Ex-1001, 7:6-10, 7:34-35, 16:49-50.

Because **signal mechanism 420** of *Adest* is configured to transmit a 100Hz periodic (*i.e.*, repeated) signal, a person of ordinary skill in the art would have understood **signal mechanism 420** of *Adest* to be a **central controller** as described by the '218 patent. The **signal mechanism 420** triggers **controller 306** to open or close the switches (*i.e.*, it **controls** them) by either transmitting or not transmitting a periodic signal. *See* Ex-1005, 9:33-49. Thus, a POSITA would have understood

signal mechanism 420 also performs the function of a “central controller,” as described in the ’218 patent. Ex-1002, ¶¶166-168.

- c. “means to poll the central controller to determine if an interruption of the communication is transient;”**

Adest alone or in combination with the knowledge of a POSITA discloses this feature as discussed in Section VIII.A.5.a. Ex-1002, ¶169.

- d. “at least one switch to disconnect the solar module from the power bus if the interruption of the communication is not transient;”**

Adest discloses this feature as discussed in Section VIII.A.5. Ex-1002, ¶170.

- e. “wherein the watchdog unit is configured to connect the solar module to the power bus when the communication is not interrupted.”**

Adest discloses this feature as discussed in Sections VIII.A.5.a and VIII.A.5.b. Ex-1002, ¶171.

9. Claim 10

- a. “The system of claim 9, further comprising a junction box housing the watchdog unit, the junction box to provide connectivity between the solar module and the power bus.”**

Adest and/or *Kronberg* discloses/renders obvious this feature. Ex-1002, ¶¶172-176. As described in Section VIII.A.5.a, a POSITA would understand that the **watchdog unit** would be placed between the **solar module** and the **power bus**. A POSITA would also understand that a junction box is an electrical enclosure

that houses one or more wiring connections and the placement of the **watchdog unit** in a junction box would be immaterial as it would not alter the function of the **watchdog unit**. Ex-1002, ¶174. The placement of the watchdog unit would not increase its effectiveness or improve its ability to act to shut down the **solar module**. *Id.*, ¶175.

10. Claim 11

- a. **“The system of claim 10, wherein the local controller is configured to control a duty cycle of the switch to control an output voltage from the junction box; and the local controller is configured to operate using power from the solar module.”**

As discussed in Sections VIII.A.5.a, VIII.A.7, and VIII.A.8 the claimed watchdog unit is disclosed or rendered obvious by *Adest*, either alone or in combination with *Kronberg*. Ex-1002, ¶177-182. *Adest* discloses or renders obvious the rest of this claim feature. For example, *Adest* discloses the **controller 306** may alternate the switches (e.g. switches 324 & 326 of buck converter) at a low duty-cycle to maintain a low output voltage, and “may include a pulse width modulator, PWM, or a digital pulse width modulator, DPWM, to be used with the buck and boost converter circuits.” Ex-1005, 8:1-3, 10:36-39; Ex-1002, ¶179.

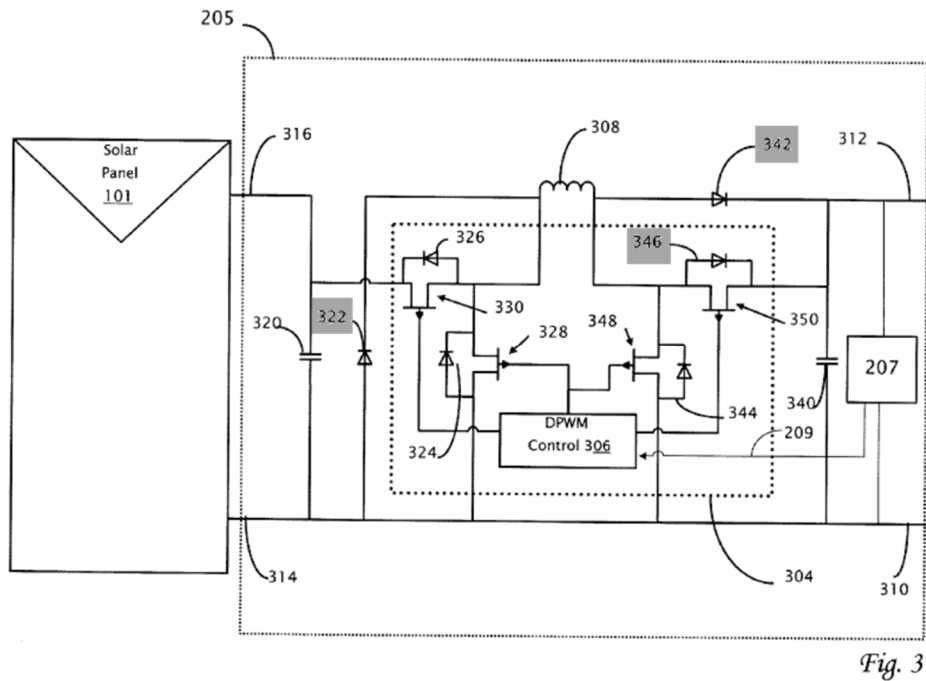
A POSITA would understand that “the local controller is configured to operate using power from the **solar module**.” Ex-1002, ¶181. A POSITA would understand that a local controller (the **LMU**) could use some of the electricity

generated by the solar panels to operate, as it would have to pass from the **solar panels** through the **LMU** to reach the **string bus** and the power grid anyway. *Id.*; see Ex-1001, Fig. 3. A POSITA would also understand that the operation of the *Adest* system using PWM or other duty cycles is similar to what is described in the '218 patent. See Ex-1001, 10:47-59; Ex-1002 at 180-181.

11. Claim 12

- a. **“The system of claim 9, further comprising a bypass circuit configured to enable current in the power bus to bypass the solar module when the switch disconnects the solar module from the power bus”**

Adest discloses/suggests this feature. Ex-1002, ¶¶183-188. As discussed in Section VIII.A.8, *Adest* discloses the elements of claim 9. Further, *Adest* discloses “bypass circuits circuit configured to enable current in the power bus to bypass the solar module when the switch disconnects the solar module from the power bus.” In Fig. 3, *Adest* discloses “**back-flow prevention diodes 322, 342.**” Ex-1005, 7:20-21.



Ex-1005, Fig. 3.

Adest discloses that electrical components “have one or more bypass routes associated with them that carry the current in case of an electrical component failing within one of converters 205.” Ex-1005, 8:48-56. The “parasitic diodes” allow for bypassing any “current from the output 312 to backflow into solar panel 101.” *Id.*, 7:23-28. A POSITA would understand that the presence of back-flow prevention diodes, as well as transistors, would create a bypass circuit to enable current to bypass the solar module. Ex-1002, ¶¶186-187.

12. Claim 13

- a. “The system of claim 9, wherein the watchdog unit is configured to determine irregularity in periodicity of the communication to determine whether the communication is interrupted.”**

Adest and/or *Kronberg* discloses/suggests this feature. Ex-1002, ¶¶189-192.

As discussed in Section VIII.A.1.c, the receiver/detector 207 detects that the 100Hz communication is not being received. A POSITA would understand that to detect that a periodic signal, e.g. 100Hz, is not being received, the detector would need to detect that at least one periodic signal is not received. Ex-1002, ¶190. Furthermore, because the 100Hz signal may be partially blocked by the inverter, to account for noise and interference, a POSITA would understand that detection of the 100Hz signal would likely require a threshold of more than just only missing the signal for a predetermined period of time. Ex-1002, ¶191. Therefore, a POSITA would understand that *Adest* discloses “to determine an irregularity in periodicity of the communication to determine whether the communication is interrupted.” *Id.*

13. Claim 14

- a. “The system of claim 9, further comprising the solar module; and a junction box coupled with the solar module to provide connectivity to the power bus, wherein the watchdog unit resides in the junction box.”**

Adest and/or *Kronberg* discloses/rendered obvious this feature as discussed in Section VIII.A.9. Ex-1002, ¶193.

14. Claim 15

a. “A method comprising:”

Adest discloses/suggests this feature. Ex-1002, ¶¶194-196. *Adest* discloses “a method 50 for wake-up and shutdown of module 405, according to embodiments of the present invention.” *Id.*; Ex-1005, 10:14-15; *see also* 9:50-52; claims 13-18; Figs. 5, 5A, 6.

b. “monitoring a sensor for an anomaly by a master control unit (MMU);”

Adest discloses/suggests this feature as discussed in Section VIII.A.1.d. Ex-1002, ¶197.

c. “determining by the MMU if the sensor has detected an anomaly and, if the sensor has detected an anomaly, the MMU determining if the anomaly requires a control change; and”

Adest discloses/suggests this feature as discussed in Section VIII.A.1.e. Ex-1002, ¶198.

- d. “issuing a control change command to a local management unit if the anomaly requires a control change, wherein the control change command is selected from the group consisting of: a command to shut down one or more solar modules; a command to disconnect one or more solar modules; a command to shut down one or more solar module strings; a command to alter the output of a solar module; a command to shutdown one or more LMUs; a command to disconnect one or more LMUs; a command to shutdown an inverter; a command to disconnect an inverter; a command to do nothing; and no command.”**

Adest discloses/suggests this feature as discussed in Sections VIII.A.1.f and VIII.A.4. Ex-1002, ¶199.

15. Claim 16

- a. The method of claim 15, wherein the monitoring comprises one of: the MMU querying the sensor for the anomaly, and the sensor notifying the MMU of an anomaly.**

Adest discloses/suggests this feature as discussed in Sections VIII.A.1.d, VIII.A.2, and VIII.A.3. Ex-1002, ¶200.

16. Claim 18

- a. “A computer-implemented method comprising:”**

Adest discloses/suggests this feature. Ex-1002, ¶¶201-203. *Adest* discloses “a method 50 for wake-up and shutdown of module 405,” and “can be implemented using “many different combinations of hardware, software, and firmware.” Ex-1005, 10:14-15, 11:52-55; *see also* 9:50-52; claims 13-18; Figs. 5, 5A, 6; Section

VIII.A.14.a. A POSITA would have understood that this method could be implemented by a computer. Ex-1002, ¶202.

b. “monitoring, via a computing device, a signal from a central controller remote from the computing device;”

Adest discloses/suggests this feature as discussed in Sections VIII.A.1.b, VIII.A.1.c, VIII.A.8.b, and VIII.A.16.a. Ex-1002, ¶204.

c. “determining, via the computing device, if there is a loss of signal;”

Adest discloses/suggests this feature as discussed in Sections VIII.A.1.b, VIII.A.1.c, VIII.A.8.b, and VIII.A.16.a. Ex-1002, ¶205.

d. “polling, via the computing device, the central controller to determine if the loss of signal is transient;”

Adest discloses/suggests this feature as discussed in Sections VIII.A.5.b, VIII.A.1.c, VIII.A.8.c, and VIII.A.16.a. Ex-1002, ¶206.

e. “disconnecting, via the computing device, one or more solar modules from a power bus if the loss of signal is not transient, the power bus configured to connect a plurality of solar modules to an inverter;”

Adest discloses/suggests this feature as discussed in Section VIII.A.5, VIII.A.8.d, and VIII.A.16.a. Ex-1002, ¶207.

f. “waiting, via the computing device, for a restart signal; and”

Adest discloses/suggests this feature as discussed in Section in Sections VIII.A.5, VIII.A.8.b, and VIII.A.16.a. Ex-1002, ¶208.

- g. “connecting, via the computing device, the one or more solar modules to the power bus when the restart signal is received.”**

Adest discloses/suggests this feature as discussed in Sections VIII.A.5, VIII.A.8.b, VIII.A.16.a, and VIII.A.16.f, Ex-1002, ¶209.

17. Claim 19

- a. “The method of claim 18, further comprising: enabling, via the computing device, a bypass circuit when the one or more solar modules are disconnected from the power bus, so that current continues to flow in the power bus.”**

Adest discloses/suggests this feature as discussed in Section VIII.A.11 above. Ex-1002, ¶210.

B. Ground 2: Adest, Kronberg, and/or Goldack Render Obvious Claims 1-4, 6-16, and 18-19

As explained in Section VIII.A, it would have been obvious for a POSITA to combine the teachings of *Adest* and *Kronberg*. Additionally, it would be obvious to combine the teachings of *Adest*, *Kronberg*, and *Goldack*, because each reference is directed to operational safety and shutting down components of solar power systems.

1. Claims 1-4

Adest discloses, suggests, or renders obvious the features of these claims, as discussed in Sections VIII.A.1 – VIII.A.4. Ex-1002, ¶211.

2. Claim 6

a. Claim [6A]

Adest alone or in combination with *Kronberg* discloses/suggests this feature as discussed in Section VIII.A.5.a. Ex-1002, ¶212.

b. Claim [6B]

Adest discloses/suggests this feature as discussed in Section VIII.A.5.b. Ex-1002, ¶213-225. To the extent that Patent Owner or the Board disagrees that *Adest* in combination with *Kronberg* discloses this feature, *Goldack* discloses this feature. Ex-1002, ¶¶214-215. *Goldack* discloses the transmission of “a first signal” via power line to the release device, which then interrupts energy transmission if the interruption device does not receive a second signal from the release device within a specified first period. Ex-1007, Abstract. The signals contain at least one pulse. *Id.* at 2:25-27. The code sent by the signal “can be varied in shape, length, and number of the pulses.” *Id.* at 4:4-5. Communication can take place either via wires or wirelessly. *Id.* at 4:11.

A POSITA could combine the polling described in *Goldack* with the MMU/LMU of *Adest* and the watchdog unit of *Kronberg* to sends polls to the MMU up to a specified number of times as the limitation in this claim. The polling of *Goldack* could be used as part of the MMU/LMU and watchdog unit system of *Adest* alone or in combination with *Kronberg* to poll the LMU. Ex-1002, ¶216.

A POSITA would be motivated to combine *Goldack* with *Adest* and *Kronberg* as each reference is directed to solar module handling and operational safety. *Adest* is concerned with safety in distributed power installations. *See, e.g.* Ex-1005, Title; 3:47-59 (noting that “during the safety mode, the power at the output of the power module, the voltage across the output of the power module, and/or the current flowing through it, are limited so as to not endanger personnel”); 5:21-29 (noting that the present invention has “important safety benefits” for those “installing or performing maintenance on photovoltaic systems”). *Kronberg* is concerned with the same safety concerns. *See, e.g.* Ex-1006, Title; 2:5-8 (noting that “an object of the invention” is for “shutting down process equipment in the event of control equipment failure”). *Goldack* similarly deals with disabling power transfer in the absence of a solar module, for example due to theft, like the ’218 patent. *See* Ex-1001 at 17:24-30, 2:36-47; Ex-1007 at Abstract, 2:47-50.

Goldack also discloses that in the event there has not been a second signal returned to it after sending the first signal “the activator means 21 activates the switching device 22 such that the power transfer is disabled.” Ex-1007, 5:41-48; *see also* 4:64-5:14. The ’218 patent also focuses on absence of a solar module due to theft, stating that “the system would send an alarm indicating a possible security breach, such as a wire being cut or a panel being removed.” Ex-1001, 18:38-40. A POSITA would have looked to *Goldack* as a solar module safety-related patent that

added polling to the MMU described in *Adest*. The combination of the MMU/LMU and watchdog disclosed by *Adest* alone or in combination with *Kronberg* would be able to incorporate the security system articulated in *Goldack* to monitor the safety of the solar panel system. *Adest*, *Kronberg*, and *Goldack* contemplate that in the absence of a returning signal, the system should be shut down, deactivated, or undergo a decrease in voltage. Ex-1002, ¶¶217-221.

A POSITA would also have had a reasonable expectation of success with combining *Adest* and *Kronberg* with *Goldack*. Ex-1002, ¶222 The addition of *Goldack* would have permitted the system comprising *Adest* and *Kronberg* to poll the MMU in the event of an absence of signal to verify if equipment is still operational. *Goldack* discloses the detection of a variety of signals, which could vary in “shape, length and number of the pulses.” Ex-1007, 4:1-5. *Goldack* would thus be able to detect the 100Hz pulses described from *Adest*. All three pieces of prior art also contemplate that in the absence of a signal, that the system should be shut down, deactivated, or undergo a decrease in voltage, demonstrating that the addition of *Goldack* would not disrupt the execution of *Adest* or *Kronberg*. Ex-1002, ¶¶223-224.

Accordingly, it would have been obvious to a POSITA to use the polling described in *Goldack* in combination with the watchdog unit of *Kronberg* and the implementation of the MMU/LMU taught by *Adest* to disclose “wherein if the

communication is interrupted between the MMU and the respective LMU, the watchdog unit sends polls to the MMU up to a specified number of times.” *Id.*, ¶225.

c. Claim [6C]

Adest alone or in combination with the knowledge of a POSITA discloses/suggests this feature as discussed in Section VIII.A.5.c. To the extent that Patent Owner or the Board disagree that *Adest* and knowledge of a POSITA disclose a “watchdog unit,” *Kronberg* discloses this feature, as discussed in Section VIII.A.5.a and VIII.A.5.c, and it would have been obvious to a POSITA at the time of the invention to combine the teachings of *Kronberg* with the teachings of *Adest*.
Ex-1002, ¶¶226-227

3. Claim 7

a. Claim 7

Adest discloses/suggests this feature as discussed in Sections VIII.B.1 and VIII.B.2. Ex-1002, ¶228.

4. Claim 8

a. Claim 8

Adest discloses/suggests this feature as discussed in Sections VIII.A.4 and VIII.A.7. Ex-1002, ¶229.

5. Claim 9

a. Claim [9A]

Adest alone or in combination with the knowledge of a POSITA discloses/suggests this feature as discussed in Section VIII.A.8.a. To the extent that Patent Owner or the Board disagree that *Adest* and knowledge of a POSITA disclose a “watchdog unit,” *Kronberg* discloses this feature in Section VIII.A.5, and it would have been obvious to a POSITA at the time of the invention to combine the teachings of *Kronberg* with the teachings of *Adest*. Ex-1002, ¶¶230-231.

b. Claim [9B]

Adest discloses/suggests this feature as discussed in Section VIII.A.8.b. Ex-1002, ¶232.

c. Claim [9C]

Adest alone or in combination with the knowledge of a POSITA discloses/suggests this feature as discussed in Section VIII.A.8.c. Ex-1002, ¶233.

Further, to the extent that Patent Owner or the Board disagree that *Adest* and knowledge of a POSITA disclose “means to poll the central controller to determine if an interruption of the communication is transient,” *Goldack* discloses this feature. *Goldack* discloses the transmission of “a first signal” via power line to the release device, which then interrupts energy transmission if the interruption device does not receive a second signal from the release device within a specified first period. Ex-

1007, Abstract. The signals contain at least one pulse. *Id.*, 2:25-27. The code sent by the signal “can be varied in shape, length, and number of the pulses.” *Id.*, 4:4-5. When the code has not received a second signal in a predefined time, power output is disabled. *Id.*, 2:13-16. Communication can take place either via wires or wirelessly. *Id.*, 4:11. Ex-1002, ¶¶234-235.

A POSITA could use the polling described in *Goldack* with the MMU/LMU of *Adest* and the watchdog unit of *Kronberg* to poll the MMU a specified number of times. Ex-1002, ¶236.

d. Claim [9D]

Adest discloses/suggests this feature as discussed in Section VIII.A.8.d. Ex-1002, ¶237.

e. Claim [9E]

Adest discloses/suggests this feature as discussed in Sections VIII.A.5.a and VIII.A.5.b. Ex-1002, ¶¶238-240. To the extent that Patent Owner or the Board disagree that *Adest* and knowledge of a POSITA disclose a “watchdog unit,” *Kronberg* discloses this feature. *Id.*, ¶¶.

Kronberg discusses the situation of shutting off power versus normal operation. During “[t]he delay of an expected event opens heavy-duty relays to shut off power to process equipment.” Ex-1007, 2:17-19. However, “[d]uring normal

operation these relays are closed so that the switch is transparent to main controller signals.” *Id.*, 2:19-21.

6. Claim 10

a. Claim 10

Adest in combination with the knowledge of a POSITA discloses/suggests this feature in Section VIII.A.9. Ex-1002, ¶241.

7. Claim 11

a. Claim 11

Adest discloses/suggests this feature as discussed in Section VIII.A.10. Ex-1002, ¶242.

8. Claim 12

a. Claim 12

Adest discloses/suggests this feature in Section VIII.A.11. Ex-1002, ¶243.

9. Claim 13

a. Claim 13

Adest/Kronberg discloses/suggests this feature. Ex-1002, ¶¶244-251. As discussed in Section VIII.A.1.c, the receiver/detector 207 detects that the 100Hz communication is not being received. A POSITA would understand that to detect that a periodic signal 100Hz is not being received, the detector would need to detect that at least one “heartbeat” is not received (*i.e.*, is skipped). Because the 100Hz

signal may be partially blocked by the inverter, to account for noise and interference, a POSITA would understand that detection of the 100Hz signal would likely require a threshold of more than one skip. Therefore, a POSITA would understand that *Adest* discloses an irregularity in periodicity of the communication. Ex-1002, ¶¶245-248.

To the extent that Patent Owner or the Board disagree that *Adest* discloses “wherein the watchdog unit is configured to determine irregularity in periodicity of the communication to determine whether the communication is interrupted,” *Goldack* discloses this feature. Ex-1002, ¶249. *Goldack* discloses the transmission of “a first signal” via power line to the release device, which then interrupts energy transmission if the interruption device does not receive a second signal from the release device within a specified first period. Ex-1007, Abstract. The signals contain at least one pulse. *Id.* at 2:25-27. The code sent by the signal “can be varied in shape, length, and number of the pulses.” *Id.* at 4:4-5. Communication can take place either via wires or wirelessly. *Id.* at 4:11. Accordingly, *Adest* in combination with the implement of *Goldack* discloses the limitation “the watchdog unit is configured to determine irregularity in periodicity of the communication to determine whether the communication is interrupted.” Ex-1002, ¶¶249-251

10. Claims 14-16 and Claims 18-19

Adest discloses/suggests the features for claims 14-16 and claims 18-19 as discussed in Sections VIII.A.13 – VIII.A.17. Ex-1002, ¶¶252-265.

C. Ground 3: *Moine* and *Adest* Render Obvious Claims 1-5, 15-17

1. Claim 1

a. Claim [1A]

To the extent the preamble is limiting, *Moine* discloses/suggests this feature. Ex-1008, Abstract. For example, *Moine* discloses “a system for controlling an electric power production facility comprising a number of photovoltaic modules mounted in series and/or in parallel in order to constitute an electrical circuit for powering a storage battery or powering an electrical load” *Id.*, 3:11-14. Ex-1002, ¶266.

b. Claim [1B]

Moine discloses/suggests this feature. Ex-1002, ¶¶267-277. *Moine* discloses a **transmitter (7)** in the same configuration as with the **MMU** of the '218 patent and the understanding of a POSITA. Ex-1002, ¶¶281-283. *Moine*'s Figure 1 shows a “**receiver (5)**” controlling a “**switch (4)**,” a “**circuit (1)**,” a plurality of “**photovoltaic power modules (3)**,” and an “**inverter (6)**.” *See also*, Ex-1008, 4:33-5:27. **Transmitter (7)** is remote from **photovoltaic power modules (3)**.

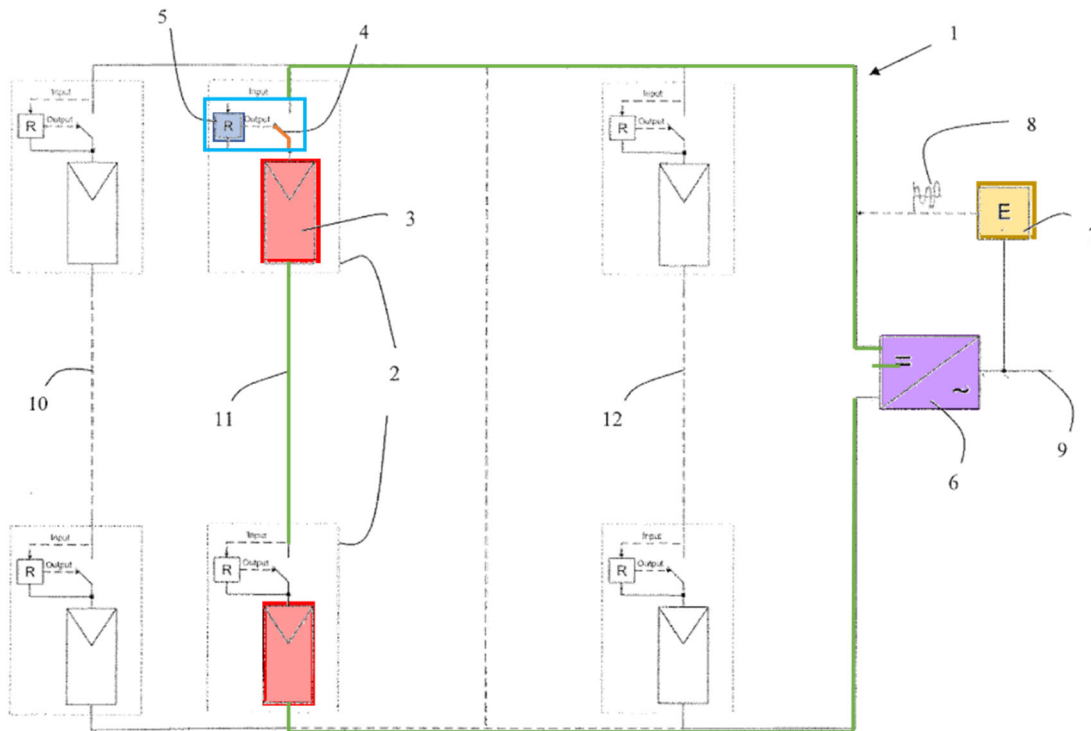


Figure 1

Ex-1008, Fig. 1.

In *Moine*, this signal is coded (in particular in frequency and / or in amplitude) and detected by the receiver (5). Ex-1008, 5:34-36. The **receiver (5)** is configured to monitor a “periodic transmission of [a] *coded alternating signal*” (**alternating signal 8**) from a **transmitter (7)**. *Id.*, 6:1-5. If the **transmitter (7)** detects the absence of current at the level of the domestic electrical network (9) or a fault at this level, it stops the periodic transmission of the alternative coded signal on the circuit (1), of which the absence identified by the receivers (5) induces the opening by the latter of the corresponding switches (4). *Id.*; Ex-1002, ¶¶271-273

Because **transmitter (7)** of *Moine* is configured to transmit a periodic (i.e., repeated) signal, a POSITA would have understood **transmitter (7)** of *Moine* to be

one of the configurations of the **MMU** described by the '218 patent. **Transmitter (7)** transmits the alternating signal “according to a set timing.” *Id.*, 7:1-4. *Moine* gives an example of one such “set timing” as five minutes. *Id.* If **transmitter (7)** stops transmitting the alternating signal, the **receiver (5)** is configured to identify the absence of the alternating signal. *Id.* Thus, **receiver (5)** is able to detect when communication with **transmitter (7)** has been interrupted. *Id.*, 6:1-5. **Transmitter (7)** causes the switches to close or open (*i.e.*, controls them) in a number of different scenarios (*e.g.*, when fees have not been paid or when a battery is full) by either transmitting or not transmitting a periodic signal. Ex-1008, 7:1-28. Ex-1002, ¶¶274-276.

Although the '218 patent does not describe the **central controller** in great detail, it provides exemplary configurations and states that a local “controller communicates with a central controller” Ex-1001, 16:49-50. Thus, a person of ordinary skill in the art would have understood **transmitter (7)** to be a “**MMU**”/“**central controller**.” Ex-1002, ¶277.

c. Claim [1C]

Moine discloses/suggests this feature. Ex-1002, ¶¶278-286. A POSITA would have understood that **receiver (5)** and **switch (4)** of *Moine* are together the claimed “**LMU (watchdog unit)**” of the '218 patent. In the '218 patent, the **LMU** receives input from the **MMU** and controls the operation of the solar panels. Ex-1001, 7:6-

10; 16:63-17:3; 18:29-36. Similarly, in *Moine*, the **receiver (5)** controls the operation of a transistor that opens and closes **switch (4)** based on signals that it receives from **transmitter (7)**. Ex-1008, 5:20-22, 6:1-5. (“the operation of this transistor is *controlled* by a **receiver (5)** capable of causing said **switch (4)** to open or close according to a coded signal”). Ex-1002, ¶¶280-281.

The **receiver (5)** of *Moine* is configured to monitor a “periodic transmission of [a] *coded alternating signal*” (**alternating signal 8**) from a **transmitter (7)**. Ex-1008, 6:1-5. Upon detecting the absence of the coded alternating signal, the **receiver (5)** causes **switch (4)** to open and thus “powers down” the circuit. *Id.* When the **switch (4)** is open, the **photovoltaic power module (3)** is no longer connected to the **circuit (1)**. *Id.*, 6:6-10. Thus, a POSITA would have understood that **receiver (5)** and **switch (4)** are together the claimed “**LMU (watchdog unit)**.” Ex-1002, ¶¶282-283.

As shown in the annotated Fig. 1 of *Moine*, the **LMU (watchdog unit)** of *Moine* is connected between a **photovoltaic power module (3)** and **circuit (1)**. The **photovoltaic power modules (3)** shown in Figure 1 “convert solar radiation into direct electrical current.” Ex-1008, 5:5-7. Thus, a POSITA would have understood that each **photovoltaic power module (3)** is a “**solar module**.” As shown in Figure 1, **circuit (1)** is a conductive path connecting multiple **photovoltaic power modules (3)** in series to an **inverter (6)**, thus a POSITA would have understood that **circuit**

(1) is the recited **power bus**. *Moine*'s transmitter sends a signal to a receiver which controls a switch. The receiver can receive signals by radio waves or wiring. Ex-1008, 3:27-30. Once the receiver opens the switch, the modules are no longer connected to the circuit. *Id.*, 6:7-10. When a receiver does not detect the periodic alternating signal either due to instruction or power failure, the switches open and the circuit is powered off. *Id.*, 7:6-9. Ex-1002, ¶284-285.

d. Claim [1D]

Moine discloses/suggests this feature. Ex-1002, ¶¶287-291. If *Moine*'s **transmitter(7) detects** the absence of current at the level of the domestic electrical network (9) or a fault at this level, it stops the periodic transmission of the alternating coded signal on the circuit (1). Ex-1008, 6:1-5. It also states that the **transmitter (7)** "receives signals indicating the charge level of said battery and if it detects that the battery is fully charged, it then opens the switches (4) and accordingly stops recharging said battery." *Id.*, 7:23-25. A POSITA would have understood that at least one sensor would be connected to the transmitter (7) for detecting the absence of current and/or battery charging.

e. Claim [1E]

Moine discloses/suggests or renders obvious this feature, either alone or with Adest. Ex-1002, ¶292-304. As discussed in Sections VIII.C.1.b and VIII.C.1.d, *Moine*, states that if the transmitter (7) **detects** the absence of current at the level of

the domestic electrical network (9) or a fault at this level, it stops the periodic transmission of the alternative coded signal on the circuit (1). Ex-1008, 6:1-5. The **receiver (5)** controls “**switch (4)** to open or close according to a coded signal sent as an alternating signal through the power circuit (1).” *Id.*, 5:19-21. In particular, as discussed above, in the absence of the signal (*i.e.*, when it is interrupted), the **receiver (5)** controls the switch to disconnect the solar module from the power bus. Accordingly, *Moine* discloses this feature. Ex-1002, ¶¶293-294

To the extent that Patent Owner or the Board disagrees that *Moine* discloses “detection of the anomaly by the sensor, the MMU sends a command to the LMU to alter the state of an associated solar module,” the combination with *Moine* and *Adest* discloses this feature. *Adest* discloses this feature in Sections VIII.A.1.e and VIII.A.10. Ex-1002, ¶296.

In Section VIII.A.1.e, the exemplary embodiment of *Adest*, as long as 100Hz signals are received by power module 405 from signaling mechanism 420, normal mode continues. Ex-1005, 9:34-49; 10:40-46. However, if power module 405 either 1) fails to receive 100Hz signals or 2) receives communication to stop normal operation or other warning condition present, the normal mode is typically ended and power modules is then typically turned off. *Id.*, 10:9-12; 10:59-62; Fig. 5A.

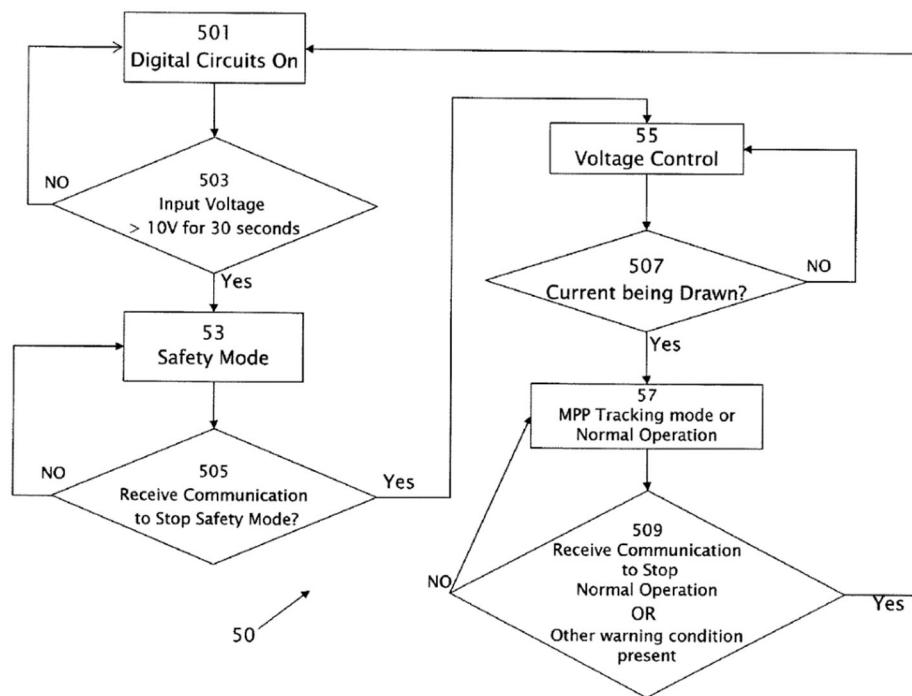


Fig. 5A

Ex-1005, Fig. 5A.

A POSITA would have been motivated to combine *Moine* with *Adest* to render this limitation obvious. In particular, *Moine* was known technique for improving the safety of photovoltaic power systems, which is the same as *Adest*. *Moine* recognizes safety issues inherent to photovoltaic power systems and in particular that the voltage “produced by photovoltaic modules, can easily exceed the normative value of 120 volts, which is a safety limit, and can easily reach several hundred volts, i.e., a voltage that is largely sufficient to electrocute” firefighters who may be on a roof. Ex-1008, 2:27-33. *Adest* is also directed to safety mechanisms for waking up and shutting down equipment in distributed power systems that has an operational safety mode. Ex-1005, Title, Figs. 5, 5A. A POSITA would have recognized that this

safety problem is equally present in *Moine* and *Adest*, would have applied some safety teachings of *Adest* to *Moine* for improvement, *e.g.*, receiving communication to stop normal operation or other warning condition present, the normal mode is typically ended, and power modules are then typically turned off. Ex-1002, ¶¶298-301

A POSITA would have had a reasonable expectation of success using the system of *Adest* to establish that an MMU sends a command to the LMU to alter the state of an associated solar module. As noted above, *Moine* uses the receiver (5) to control a switch (4) to disconnect the solar panel in the event that communication signal is no longer received from the transmitter (7). *Adest* utilizes a similar system to *Moine* in that in the interruption of a signal, normal operation ends. A POSITA would have a reasonable expectation of success of utilizing a similar system with modifications. Ex-1002, ¶302

In IPR2021-01287, the Board determined that it would be obvious to combine the teachings of *Moine* and another patent in the same *Adest* family (“*Adest* ’178”), which has a similar disclosure to *Adest*. See Ex-1010 at 46. For similar reasons to those adopted by the Board, a POSITA would have been motivated to combine *Adest* and *Moine*. Ex-1002, ¶¶303-304.

f. Claim [1F]

Moine discloses/suggests this feature as described in Sections VIII.C.1.b and VIII.C.1.e. Ex-1002, ¶¶305-306. To the extent that Patent Owner or the Board disagrees that *Moine* discloses “wherein upon receiving a command from the MMU, the LMU alters the state of the one or more solar modules in accordance with command,” the combination with *Moine* and *Adest* discloses this feature. *Adest* discloses/suggests this feature in Sections VIII.A.10 and VIII.C.1.e.

2. Claim 2

a. Claim 2

Moine discloses/suggests this feature as described in Sections VIII.C.1. Ex-1002, ¶¶307-309. In the event that “the transmitter (7) detects a lack of current in the domestic power supply network (9) or a failure thereof,” the periodic transmission of the coded signal ends, causing the switches to be opened and the circuit powers down. *Id.* at 6:1-5.

3. Claim 3

a. Claim 3

Moine discloses/suggests this feature as disclosed in Section VIII.C.1. Ex-1002, ¶¶310-313. To the extent that Patent Owner or the Board disagree that *Moine* discloses the sensor notifying the MMU of the anomaly, a POSITA would have understood that the sensor would notify the MMU of the anomaly, as it is a simple

logical conclusion of the function of a sensor. *Id.*, ¶311. To give effect to the use of one of *Moine*'s sensors, either a component must query the sensor for its results or the sensor must provide its results to a component. *Id.*, ¶312.

4. Claim 4

a. Claim 4

Moine/Adest discloses/suggests this feature. Ex-1002, ¶¶314-319. The receiver (5) of *Moine* controls “switch (4) to open or close according to a coded signal sent as an alternating signal through the power circuit (1).” Ex-1008, 5:19-21. In particular, as discussed above, in the absence of the signal (*i.e.*, when it is interrupted), the receiver (5) controls the switch to disconnect the solar module from the power bus. *See* Sections VIII.C.1.b and VIII.C.1.e. *Adest* also discloses/suggests this feature. *See* Section VIII.A.4.a. A POSITA would have understood that the opening of the switch would cause a shutdown, disconnect, and alteration of the output of the module. Ex-1002, ¶¶316-318.

To the extent that Patent Owner or the Board disagrees that *Moine* discloses this feature, the combination with *Moine* and *Adest* discloses this feature. *Id.*, ¶¶319.

5. Claim 5

a. “The system of claim 1 wherein: the MMU is connected to a network; and the sensor is connected to a network.”

Moine discloses/suggests this feature. Ex-1002, ¶¶320-322. *Moine* discloses in a system for controlling an electric power production facility incorporating an

electric switch that a periodic signal that “control[s] the opening and closing of the circuit” “can be transmitted by radio waves.” Ex-1008, 3:11-28. The signal can also be transmitted by wiring. *Id.*, 3:30-32. In addition, *Moine* further disclosed that the transmitter of *Moine* is the same as the MMU of the ’218 patent, and is provided with means capable of receiving remote control signals, such as for example a radio wave receiver, or a switch of the telephone network. *Id.*, 4:13-17.

6. Claim 15

a. Claim [15A]

Moine discloses/suggests this feature. Ex-1002, ¶¶323-326. In *Moine*, it states that “[t]he invention relates to the general field of electric power production **by means** of photovoltaic panels or modules.” Ex-1008, 1:5-9. Also, *Moine* further discloses that “[i]t relates more specifically to an electric power generation facility. Such facilities **implement** said photovoltaic modules as electric generators, and furthermore incorporate one or several devices capable of storing the electricity thus produced, in particular one or several batteries, or can even be connected to the domestic power” via an inverter. Ex-1008, 1:11-15. Therefore, *Adest* discloses this limitation.

b. Claim [15B]

Moine discloses/suggests this feature as discussed in Section VIII.C.1.c. Ex-1002, ¶327.

c. Claim [15C]

Moine discloses/suggests this feature as discussed in Section VIII.C.1.d. Ex-1002, ¶328.

d. Claim [15D]

Moine/Adest discloses/suggests this feature as discussed in Sections VIII.C.1.d and VIII.C.1.e. Ex-1002, ¶¶329-330. To the extent that Patent Owner or the Board disagrees that *Moine* discloses this feature, the combination with *Moine* and *Adest* discloses this feature. *Adest* discloses this feature in Section VIII.A.10.

7. Claim 16

a. Claim 16

Moine discloses/suggests this feature as discussed in Sections VIII.C.1-VIII.C.3. Ex-1002, ¶331.

8. Claim 17

a. “The method of claim 15, wherein: the MMU is connected to a network; and the sensor is connected to a network.”

Moine discloses/suggests this feature as discussed in Section VIII.C.5. Ex-1002, ¶332.

D. Ground 4: *Moine*, *Adest*, and/or *Goldack* Render Obvious Claims 1-4, 6-14, and 18-19

It would have been obvious for a POSITA to combine the teachings of *Moine*, *Adest*, and *Goldack*, as each reference is directed to solar module handling and operational safety.

1. Claims 1-4

Adest discloses/suggests or renders obvious the features of these claims, as discussed in Sections VIII.A.1 – VIII.A.4. Ex-1002, ¶333.

2. Claim 6

a. Claim [6A]

Moine discloses/suggests this feature as discussed in Section VIII.C.1. To the extent that Patent Owner or the Board disagrees that *Moine* and knowledge of a POSITA disclose a “watchdog unit,” *Adest* discloses this feature. See Section VIII.A.5; Ex-1005, 2:30-32. It would have been obvious to a POSITA at the time of the invention to combine the teachings of *Adest* and *Moine*. Ex-1002, ¶¶334-335.

b. Claim [6B]

Moine in combination with *Adest* discloses/suggests this limitation. Particularly, *Adest* disclosed this limitation as discussed in Sections VIII.A.5.b. Ex-1002, ¶336-351. To the extent the Patent Owner or the Board disagrees that *Moine* in combination with *Adest* discloses “wherein if the communication is interrupted between the MMU and the respective LMU, the watchdog unit sends polls to the

MMU up to a specified number of times,” *Goldack* discloses this feature. *Goldack* discloses the transmission of “a first signal” from the interruption device (*e.g.*, the watch dog unit in the ’218 patent) via power line to the release device (*e.g.*, the MMU in the ’218 patent), which then interrupts energy transmission if the interruption device does not receive a second signal from the release device within a specified first period. Ex-1007, Abstract. The signals contain at least one pulse. *Id.* at 2:25-27. The code sent by the signal “can be varied in shape, length, and number of the pulses.” *Id.* at 4:4-5. Communication can take place either via wires or wirelessly. *Id.* at 4:11. Ex-1002, ¶337-339.

A POSITA would be motivated to combine *Goldack* with *Moine* as all prior art is directed to solar module handling and operational safety. *Moine* is concerned with safety in voltage control for first responders. Ex-1008, 2:26-33. *Goldack* similarly deals with disabling power transfer in the absence of a solar module, *e.g.* the solar module was stolen. Ex-1007, 1:64-44; 2:47-50. Further, *Moine* discloses that it is also a theft solution. Ex-1008, 3:4-7. *Goldack* discloses further that it is used as a protection against theft or unauthorized use. Ex-1007, Abstract. The ’218 patent also focuses on absence of a solar module due to theft, stating that “the system would send an alarm indicating a possible security breach, such as a wire being cut or a panel being removed.” Ex-1001, 18:38-40. *Goldack* discloses a first signal initiates sending of the second signal and power transfer is disabled when the second

signal is not received. Ex-1007, 5:21-48, 4:64-5:14. A POSITA would have looked to *Moine* as a solar module safety-related patent that added sensor notification to the MMU described in *Goldack*. *Moine* and *Goldack* contemplate that a sensor notifies the MMU of the anomaly. Ex-1002, ¶¶340-346.

A POSITA would also have a reasonable expectation of success to have *Moine* in combination with *Goldack*. The addition of *Goldack* would have permitted the system comprising *Moine* to send polls to the MMU in the event of an absence of signal to verify if equipment is still operational. The pieces of prior art also contemplate that in the absence of a signal, that the system should be shut down, deactivated, or undergo a decrease in voltage, demonstrating that the addition of *Goldack* would not disrupt the execution of *Moine*. *Moine* possesses the requisite MMU, LMU, and watchdog unit. *Moine* and *Goldack* both monitor signals passing through a solar panel system. The receiver of *Moine* could integrate the polling feature of the solar module-sited disabling device of *Goldack* as both would be in the same location monitoring for signals. A POSITA would recognize that the inclusion of the polling into the receiver would permit for polling of the MMU as the solar module-sited disabling device polls the consumer-sited enabling device. Ex-1002, ¶¶347-348.

A POSITA could reasonably use the signal transmission process described in *Goldack* to accomplish polling with the MMU, LMU, and the watchdog unit of

Moine as described above to poll the MMU a specified number of times. Ex-1002, ¶349-351.

c. Claim [6C]

Moine in combination with *Adest* discloses/suggests this limitation as discussed in Sections VIII.C.1, VIII.C.4, and VIII.A.5. Ex-1002, ¶352.

3. Claim 7

a. Claim 7

Moine in combination with *Adest* discloses/suggests this limitation as discussed in Sections VIII.C.1 and VIII.A.6. Ex-1002, ¶353.

4. Claim 8

a. Claim 8

Moine in combination with *Adest* discloses/suggests this limitation as described in Sections VIII.C.1, VIII.C.4, VIII.C.6, and VIII.A.7. Ex-1002, ¶354.

5. Claim 9

a. Claim [9A]

Moine in combination with *Adest* discloses/suggests this feature as discussed in Sections VIII.C.1, VIII.A.1 and VIII.B.2.a. Ex-1002, ¶355.

b. Claim [9B]

Moine in combination with *Adest* discloses/suggests this feature as discussed in Sections VIII.C.1 and VIII.A.1. Ex-1002, ¶356.

c. Claim [9C]

Moine in combination with *Adest* discloses/suggests this limitation as discussed in Sections VIII.C.1, VIII.A.1, and VIII.B.5. Ex-1002, ¶¶357-361. Further, to the extent that Patent Owner or the Board disagree that *Moine* in combination with *Adest* discloses a “means to poll,” *Goldack* discloses this feature. *Id.*, ¶358.

Goldack discloses the transmission of “a first signal” via power line to the release device, which then interrupts energy transmission if the interruption device does not receive a second signal from the release device within a specified first period. Ex-1007, Abstract. The signals contain at least one pulse. *Id.* at 2:25-27. The code sent by the signal “can be varied in shape, length, and number of the pulses.” *Id.* at 4:4-5. Communication can take place either via wires or wirelessly. *Id.* at 4:11. Accordingly, *Moine* in combination with *Adest* and *Goldack* discloses “means to poll the central controller to determine if an interruption of the communication is transient.” It would have been obvious to a POSITA at the time of the invention to combine the teachings of *Adest* and *Goldack* with the teachings of *Moine*. Ex-1002, 359-361.

d. Claim [9D]

Moine in combination with *Adest* discloses/suggests this limitation described in Sections VIII.C.1, VIII.D.1, VIII.A.8. Ex-1002, ¶362.

e. Claim [9E]

Moine in combination with *Adest* discloses/suggests this limitation described in Sections VIII.C.1, VIII.D.1, VIII.A.8. Ex-1002, ¶363.

6. Claim 10

a. Claim 10

Moine in combination with the knowledge of a POSITA discloses/suggests this feature. Ex-1002, ¶¶364-371. As disclosed in Section VIII.A.9, a POSITA would understand that the watchdog unit has connectivity between the solar module and the power bus.

A POSITA would also understand that a junction box is an electrical enclosure that houses one or more wiring connections and the placement of the watchdog unit in a junction box would be immaterial as it would not alter the function of the watchdog unit. The placement of the watchdog unit would not increase its effectiveness or improve its ability to act to shut down the solar module. Accordingly, *Moine* in combination with the knowledge of a POSITA discloses this feature. Ex-1002, ¶¶364-367.

To the extent that Patent Owner or the Board disagrees that *Moine* in combination with the knowledge of a POSITA discloses the limitations of claim 10, it would be obvious for a POSITA to combine *Moine* with *Adest* and *Goldack*. *Goldack* discloses that the “disabling device may be arranged, for example, as a slim-

line assembly between the positive and negative leads in the laminate of the solar module or in or under the junction box where the leads are brought out directly from the laminate.” Ex-1007, 2:56-60; *see also* 4:51-55. Further, *Adest* discloses the limitation in Section VIII.A.9. Ex-1002, ¶¶368-371.

Accordingly, *Moine*, either in combination with the knowledge of a POSITA or *Adest* and *Goldack* discloses the limitations of claim 10. It would have been obvious to a POSITA at the time of the invention to combine the teachings of *Moine* with the general knowledge of a POSITA and/or the teachings of *Adest* and *Goldack*.

7. Claim 11

a. Claim 11

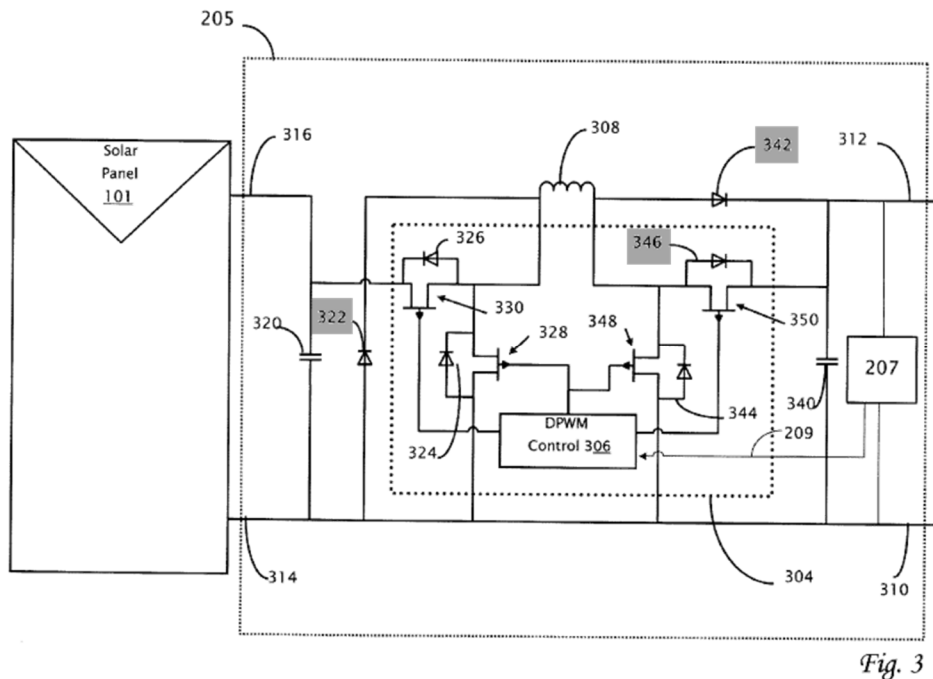
Moine in combination with *Adest* and *Goldack* discloses/suggests this feature as discussed in Section VIII.D.6. Ex-1002, ¶¶372-374. *Adest* discloses “to control a duty cycle of the switch to control an output voltage from the junction box; and the local controller is configured to operate using power from the solar module” as discussed in Section VIII.A.10.

8. Claim 12

a. Claim 12

Moine in combination with *Adest* and *Goldack* discloses/suggests this feature as discussed in Section VIII.D.5. Ex-1002, ¶¶375-378.

As discussed in Sections VIII.A.11, Fig. 3 of *Adest* discloses/suggests that “back-flow prevention diodes 322, 342,” and has multiple transistor switches. Ex-1005, 7:20-21, Fig. 3.



Ex-1005, Fig. 3.

Adest discloses that electrical components “have one or more bypass routes associated with them that carry the current in case of an electrical component failing within one of converters 205.” Ex-1005, 8:48-56. The “parasitic diodes” allow for bypassing any “current from the output 312 to backflow into solar panel 101.” *Id.*, 7:23-28; Ex-1002, ¶376.

A POSITA would understand that the presence of back-flow prevention diodes would create a bypass circuit to enable current to bypass the solar module. Therefore, *Moine* in combination with *Adest* and *Goldack* teaches this feature.

9. Claim 13

a. Claim 13

Moine discloses/suggests this feature. Ex-1002, ¶¶379-387. In *Moine*, this signal is coded (in particular in frequency and / or in amplitude) and detected by the receiver (5). Ex-1008, 5:34-36. As discussed in Sections VIII.C.1 and VIII.D.1, the **receiver (5)** is configured to monitor a “periodic transmission of [a] **coded alternating signal**” (**alternating signal 8**) from a **transmitter (7)**. Ex-1008, 6:1-5. As such, if the transmitter (7) detects the absence of current at the level of the domestic electrical network (9) or a fault at this level, it stops the **periodic transmission of the alternative coded signal** on the circuit (1), of which the absence identified by the receivers (5) induces the opening by the latter of the corresponding switches (4). *Id.* Accordingly, *Moine* discloses this limitation. Ex-1002, ¶¶380-382.

To the extent that Patent Owner or the Board disagrees that *Moine* discloses “wherein the watchdog unit is configured to determine irregularity in periodicity of the communication to determine whether the communication is interrupted,” the combination with *Moine* and *Goldack* discloses this feature. *Goldack* discloses the

transmission of “a first signal” via power line to the release device, which then interrupts energy transmission if the interruption device does not receive a second signal from the release device within a specified first period. Ex-1007, Abstract. The signals contain at least one pulse. *Id.* at 2:25-27. The code sent by the signal “can be varied in shape, length, and number of the pulses.” *Id.* at 4:4-5. Communication can take place either via wires or wirelessly. *Id.* at 4:11. *Goldack* states that a number of user-specified skips can take place. It would have been obvious to a POSITA at the time of the invention to combine the teachings of *Goldack* with the teachings of *Moine*. Ex-1002, ¶¶383-387.

10. Claim 14

a. Claim 14

Moine in combination with *Adest* and *Goldack* discloses/suggests this feature as discussed in Sections VIII.D.5, VIII.D.6, VIII.A.13. Ex-1002, ¶388.

11. Claim 18

a. Claim [18A]

Moine/Adest discloses/suggests this feature as discussed in Section VIII.C.6.a. Ex-1002, ¶¶389-393.

To the extent that Patent Owner or the Board disagrees that *Moine* discloses “[a] computer-implemented method comprising,” *Adest* discloses this feature as

discussed in Section VIII.A.16.a. It would have been obvious to a POSITA at the time of the invention to combine the teachings of *Moine* and *Adest*.

b. Claim [18B]

Moine/Adest discloses/suggests this feature as discussed in Sections VIII.C.1.b and VIII.C.1.c. Ex-1002, ¶¶394-395.

To the extent that Patent Owner or the Board disagrees that *Moine* discloses “[a] computer-implemented method comprising,” *Adest* discloses this feature as discussed in Sections VIII.A.1.b, VIII.A.1.c, and VIII.D.11.a. It would have been obvious to a POSITA at the time of the invention to combine the teachings of *Moine* and *Adest*.

c. Claim [18C]

Moine/Adest discloses/suggests this feature as discussed in Sections VIII.C.1.c, VIII.C.1.d, and VIII.D.11.a. Ex-1002, ¶396.

d. Claim [18D]

Moine in combination with *Adest* and *Goldack* discloses/suggests and renders obvious this feature as discussed in Sections VIII.D.2.b, VIII.D.2.c, VIII.D.5.b, VIII.D.5.c, and VIII.D.11.a. Ex-1002, ¶397.

e. Claim 18[E]

Moine in combination with *Adest* discloses/suggests or renders obvious this limitation as described in Sections VIII.D.5.d, VIII.D.1, VIII.C.6, VIII.A.8, and VIII.D.11.a. Ex-1002, ¶398.

f. Claim [18F]

Moine/Adest discloses/suggests this feature as discussed in Sections VIII.C.1, VIII.C.6, VIII.D.1, VIII.D.5, and VIII.D.11.a. Ex-1002, ¶399.

g. Claim [18G]

Moine/Adest discloses/suggests this feature as discussed in Sections VIII.C.1, VIII.C.6, VIII.D.1, VIII.D.5, and VIII.D.11.a. Ex-1002, ¶400.

12. Claim 19

a. Claim 19

Moine in combination with *Adest* and *Goldack* discloses/suggests or renders obvious this feature as discussed in Section VIII.C.1 and VIII.D.8. Ex-1002, ¶¶401-405.

IX. DISCRETIONARY FACTORS FAVOR INSTITUTING TRIAL

A. 35 U.S.C. § 314(a)

Although concurrent litigation involving the '218 Patent is ongoing,⁶ the weight of the factors articulated in *Apple, Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11, at 6 (Mar. 20, 2020) (precedential) favor institution. Accordingly, SMA respectfully submits that there is no reason for the Board to exercise its discretion under 35 U.S.C. § 314(a) to deny this Petition.

1. Any District Court Litigation Would Likely Be Stayed. SMA intends to seek a stay of the related district court proceedings. The Court and presiding Judge have exhibited a willingness to stay proceedings even before the Board has instituted trial, in cases where, as here, the district court has set a trial date more than 15 months from the filing of IPR petition. *Arch Chems., Inc. v. Sherwin-Williams Co.*, C.A. 18-2037-LPS, D.I. 48 (D. Del. Nov. 5, 2019).

⁶ Tigo alleged that Petitioner and SMA Solar Technology AG infringe the '218 Patent in *Tigo Energy Inc. v. SMA Solar Technology America LLC et al.*, 1-22-cv-00915 (D. Del. 2022). Although Tigo withdrew its '218-patent infringement contentions against Petitioner, Tigo has not withdrawn those allegations against SMA Solar Technology AG who has not yet appeared in the case.

2. Trial Date Relative to Final Written Decision Due Date. SMA diligently filed this Petition by the statutory bar date. *See, e.g., Apple, Inc. v. Seven Networks, LLC*, IPR2020-00156, Paper 10, at 9 & n.8 (June 15, 2020) (petitioner’s diligence supports factor 2). Under the Trial Practice Guidelines’ 18-month IPR schedule, the FWD decision will likely issue before appeal of the currently scheduled trial and may occur before trial if it is postponed at all (*e.g.*, to accommodate appearance by the other defendant that has not yet appeared)—*i.e.*, FWD Date: approximately January 2025; District Court Trial currently scheduled for: October 7, 2024. *See Ex-1013.*

The statistics show “time to trial” in the Delaware district court takes approximately 36 months on average. Ex-1011. The “time to trial” for presiding Judge Gregory B. Williams is approximately 41 months on average. Ex-1012. Therefore, even though the current trial date was tentatively set for October 2024, if trial eventually proceeds consistent with these averages, it will occur later than the January 2025 FWD date (*e.g.*, July or December 2025). Moreover, this does not take into account the time required to reach final judgement after for post-trial briefing, etc.

3. Investment in the Parallel Proceeding. As noted, SMA has been diligent and is filing this petition before the statutory bar date. As the Board recently

observed, “*Fintiv* considers a lack of delay in filing a petition as one type of fairness consideration under factor 3.” *Seven Networks*, IPR2020-00156, Paper No. 10, at 8.

Trial is 15 months or more away. Ex-1013. Fact Discovery is scheduled to close on December 1, 2023, and expert discovery is not scheduled to close until March 29, 2024. *Id.* The parties have just started claim construction, and the claim construction hearing is scheduled for October 3, 2023. By the time of anticipated institution, trial will still be months away. *Id.*

4. *Overlap of Issues.* The ’218 patent at issue here is just one of six total patents Tigo has asserted in the related litigation. SMA is challenging all claims of the ’218 Patent that Tigo could possibly assert in the parallel litigation. SMA has an interest in resolving the patentability of all challenged claims, which the Board will likely be in the best position to assess.

5. *Parties.* The related district court action and the trial here involve the same parties. *But see Cisco Sys., Inc. v. Ramot at Tel Aviv Univ. Ltd.*, IPR 2020-00122, Paper 15, at 10 (May 15, 2020) (APJ Crumbley, dissenting) (Weighing this factor against petitioner).

6. *Other Considerations.* Because in this case, “the merits ...raised in the petition seem particularly strong on the preliminary record ... institution of a trial may serve the interest of overall system efficiency and integrity....” *Fintiv*, IPR2020-00019, Paper 11, at 14-15 (addressing factor 6). As detailed in the instant

Petition (with reference to Mr. Dunton’s Declaration), the challenged claims were clearly disclosed or rendered obvious in the prior art. For at least this reason, to the extent the *Fintiv* factors are or become relevant, factor 6 should strongly favor institution. *See, e.g., Seven Networks*, IPR2020-00156, Paper 10, at 20-21 (*Fintiv* factor 6 weighed “strongly in favor of Petition” based on Petitioner’s “strong showing on the merits”).

SMA respectfully submits that the *Fintiv* factors favor institution and that discretionary denial of this Petition is neither appropriate nor equitable.

B. 35 U.S.C. § 325(d)

The Board likewise should not exercise its discretion under § 325(d) to deny institution of SMA’s petition. There are no other proceedings before the Office involving the ’218 patent.

X. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Parties-in-Interest

Petitioner is the only real party-in-interest. No unnamed entity is funding, controlling, or directing this Petition.

B. Related Matters

To SMA’s best knowledge, the ’218 patent is or has been involved in the following district court litigation:

Name	No.	Court	Filed
<i>Tigo Energy Inc. v. SMA Solar Technology America LLC et al.</i>	1-22-cv-00915	D. Del.	July 11, 2022

SMA has requested or is requesting *inter partes* review of other patents asserted in the above-identified related district court litigation, as follows:

Patent	IPR No.	Filed
USPN 9,584,021	IPR2023-00879	April 24, 2023
USPN 10,333,405	IPR2023-01133	June 27, 2023
USPN 9,966,848	IPR2023-1175	July 11, 2023 ⁷

The other two patents asserted in the related district court litigation, U.S. Patent Nos. 8,933,321 and 10,256,770 (both of which are related to the '218 patent), were the subject of prior IPR proceedings and are now part of pending appeals, as shown below.

⁷ Anticipated filing date.

Name	No.	Court	Patent	IPR
<i>SunSpec Alliance v. Tigo Energy, Inc.</i>	2023-1741	Fed. Cir.	8,933,321	IPR2021-01286
<i>SunSpec Alliance v. Tigo Energy, Inc.</i>	2023-1742	Fed. Cir.	10,256,770	IPR2021-01287

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D. Service Information

Please address all correspondence to lead and back-up counsel at the addresses shown above. Petitioner consents to electronic service by e-mail.

Date: July 10, 2023

Respectfully submitted,

/Philip W. Marsh/
Philip W. Marsh, Lead Counsel
Reg. No. 46,061

CERTIFICATE OF COMPLIANCE

The undersigned hereby certifies that the foregoing Petition for *Inter Partes* Review contains 13,842 words, excluding those portions identified in 37 C.F.R. § 42.24(a), as measured by the word-processing system used to prepare this paper.

/Philip W. Marsh/
Philip W. Marsh (Reg. No. 46,061)
Counsel for Petitioner

CERTIFICATE OF SERVICE

I certify that on July 10, 2023, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 8,823,218 and supporting exhibits to be served via overnight delivery on the Patent Owner at the following correspondence address of record as listed on PAIR:

Greenberg Traurig, LLP (SV)
c/o: Greenberg Traurig LLP - Chicago Office
77 West Wacker Drive, Suite 3100
Intellectual Property Department
Chicago IL 60601

A courtesy copy was also sent via electronic mail to Patent Owner's lead litigation counsel listed below:

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