Trials@uspto.gov
571-272-7822

Paper 46
Date: February 6, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

YANTAI JEREH PETROLEUM EQUIPMENT &
TECHNOLOGIES CO., LTD,
Petitioner,

v.

BJ ENERGY SOLUTIONS, LLC,
Patent Owner.

PGR2021-00103
Patent 10,815,764 B1

Before KEN B. BARRETT, PATRICK R. SCANLON, and JASON W. MELVIN, *Administrative Patent Judges*.

SCANLON, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 328(a)

ORDER
Dismissing Petitioner's Motion to Exclude
37 C.F.R. § 42.64(c)

I. INTRODUCTION

In this post-grant review, Yantai Jereh Petroleum Equipment & Technologies Co., Ltd. ("Petitioner") challenges claims 1–28 of U.S. Patent No. 10,815,764 B1 (Ex. 1001, "the '764 patent"), which is assigned to BJ Energy Solutions, LLC ("Patent Owner").

We have jurisdiction under 35 U.S.C. § 6, and this Final Written Decision is issued pursuant to 35 U.S.C. § 328(a). For the reasons that follow, we determine that Petitioner has not shown by a preponderance of the evidence that claims 1–28 the '764 patent are unpatentable.

A. Procedural History

Petitioner filed a Petition (Paper 2, "Pet.") requesting post-grant review of the challenged claims. Patent Owner filed a Preliminary Response (Paper 15).

We instituted a trial as to all challenged claims. Paper 16 ("Decision on Institution" or "Dec. Inst.").

After institution, Patent Owner filed a Patent Owner Response (Paper 29, "PO Resp."), Petitioner filed a Reply (Paper 33, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 37, "PO Sur-reply"). In addition, Petitioner filed a Motion to Exclude Evidence (Paper 39), Patent Owner filed an Opposition to the Motion to Exclude Evidence (Paper 40), and Petitioner filed a Reply to the Opposition (Paper 41).

A consolidated oral hearing for this proceeding and PGR2021-00102 was held on November 8, 2022. A transcript of the hearing is included in the record. Paper 45 ("Tr.").

B. Real Parties in Interest

Petitioner identifies itself as the real party in interest. Pet. 1. Patent Owner identifies itself as the real party in interest. Paper 4, 1. Patent Owner

indicates that "[s]ubstantially all of [Patent Owner] is owned by Kanaci Technologies, LLC (f/k/a BJ Energy Solutions Holdings, LLC), which in turn is primarily owned by CSL Completions Co-Invest, LLC, CSL Completions Co-Invest-A, LLC, and CSL Co-Invest Holdings, LLC." *Id.*

C. Related Matters

The parties indicate that there are no matters related to the '764 patent. Pet. 2; Paper 4, 1. Petitioner indicates it has filed another petition for post-grant review (PGR2021-00102) challenging related U.S. Patent No. 10,907,459, and Patent Owner has filed a petition for post-grant review (PGR2021-00060) challenging a patent owned by Petitioner. Pet. 2.

D. The '764 Patent

The '764 patent, titled "Methods and Systems for Operating a Fleet of Pumps," issued October 27, 2020, from U.S. Application 16/946,082, filed June 5, 2020. Ex. 1001, codes (54), (45), (21), (22). The '764 patent claims the benefit of U.S. Provisional Application 62/899,951, filed September 13, 2019. *Id.* at code (60), 1:7–11.

The '764 patent "relates to operating a fleet of pumps for hydraulic fracturing and, in particular, to systems and methods for operating a directly driven turbine fracturing pump system for hydraulic fracturing application." Ex. 1001, 1:15–18. In general, the invention includes a method of using a controller for operating a plurality of pumps. *Id.* at 5:59–62. The controller receives a demand hydraulic horsepower (HHP) signal, which may be a signal corresponding to the demanded power for pumping stimulation fluid associated with the fracturing process. *Id.* at 5:65–6:4. "When the demand HHP signal is received, the controller 330 directs operation of all available pump units 302*a* thru 302*j* at a first output power." *Id.* at 6:4–6. The first output power may be at or below the maximum continuous power (MCP)

level of the pumps, where the MCP is the maximum power at which individual pump units may sustain continuous operation without any performance or reliability penalties. *Id.* at 4:11–15, 6:7–8.

During operation, the controller monitors operation of the pump units. *Id.* at 6:21–23. Upon receiving a loss or power signal from one or more of the pump units, the controller may designate one or more of the pump units as a Reduced Power Pump Unit (RPPU) and designate the remaining pump units as Operating Pump Units (OPUs). *Id.* at 6:36–40. In this instance, the controller calculates a second output power at which the OPUs must operate to maintain the needed HHP in view of the reduced operating power of the RPPU(s). *Id.* at 6:41–45. The second output power is greater than the first output power and may be in the range of approximately 70% of the MCP level to approximately the maximum intermittent power (MIP) level, where the MIP is an elevated operating output level that the pump unit may operate intermittently throughout its operating life without excessive damage to the pump unit. *Id.* at 4:18–22, 6:45–48.

E. Challenged Claims

Petitioner challenges claims 1–28, of which claims 1 and 15 are independent. Claim 1, reproduced below, is illustrative.

> 1. A method of operating a plurality of pump units associated with a high-pressure, high-power hydraulic fracturing assembly, each of the pump units including a turbine engine, a driveshaft, a gearbox connected to the turbine engine and driveshaft for driving the driveshaft, and a pump connected to the driveshaft, the method comprising:
>
> receiving a demand hydraulic horse power (HHP) signal for operation of the hydraulic fracturing assembly;

based at least in part on the demand HHP signal, operating all available pump units of the plurality of pump units at a first output power to achieve the demand HHP;

receiving a loss of power signal for at least one pump unit of the plurality of pump units during operation of the plurality of pump units;

after receiving the loss of power signal, designating the one or more pump units as a reduced power pump unit (RPPU) and the remaining pump units as operating pump units (OPU); and

operating at least one of the OPUs at a second output power to meet the demand HHP signal for operation of the hydraulic fracturing assembly,

the first output power being in the range of approximately 70% to 100% of a maximum continuous power (MCP) level of the plurality of pump units, the second output power being greater than the first output power and being in the range of approximately 70% of the MCP level to approximately a maximum intermittent power (MIP) level of the plurality of pump units.

Ex. 1001, 10:66–11:26.

F. Instituted Grounds of Unpatentability

We instituted post-grant review of the challenged claims based on the following grounds of unpatentability asserted by Petitioner:

Claims Challenged	35 U.S.C. §	References/Basis
1–28	103	Mu,[1] Crowe[2]
1–28	103	Luharuka[3], API 674,[4] Karassik[5]

[1] WO 2020/097060 A2, published May 14, 2020 (Ex. 1007).
[2] US 10,415,557 B1, issued Sept. 17, 2019 (Ex. 1008).
[3] US 2017/0322086 A1, published Nov. 9, 2017 (Ex. 1009).
[4] American Petroleum Institute (2010). *Positive Displacement Pumps—Reciprocating*, API Standard 674, 3rd ed. (Ex. 1010).
[5] Karassik et al. (2008), *Pump Handbook*, McGraw-Hill, 4th ed. (Ex. 1012).

Claims Challenged	35 U.S.C. §	References/Basis
1–28	103	Apollo Turbine Release,[6] API 616,[7] Mu
1–28	112(a)	Lack of Enablement
1–28	112(b)	Indefiniteness

Dec. Inst. 33; Pet. 3–4.

In support of its challenges, Petitioner relies upon a declaration of William D. Marscher, P.E. Ex. 1003. In support of its Response, Patent Owner relies upon a declaration of Sarman Adnan, Ph.D. Ex. 2028.

II. ANALYSIS

A. Eligibility for Post-Grant Review

The post-grant review provisions set forth in section 6(d) of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (September 16, 2011) ("AIA"), apply only to patents subject to the first-inventor-to-file provisions of the AIA. *See* AIA § 6(f)(2)(A) (stating that the provisions of Section 6(d) "shall apply only to patents described in section 3(n)(1)"). Patents subject to the first-inventor-to-file provisions are those that issue from applications "that contain[] or contained at any time . . . a claim to a claimed invention that has an effective filing date as defined in section 100(i) of title 35, United States Code, that is on or after" March 16, 2013. AIA § 3(n)(1). In addition, a petition for post-grant review of a

[6] Jereh Group, *Apollo 4500 Turbine Frac Pumper Finishes Successful Field Operation in China*, Yantai, China: Cision PR Newswire. Feb. 13, 2015, as available on Apr. 20, 2015. https://web.archive.org/web/20150420220625/https://www.prnewswire.com/newsreleases/jereh-apollo-4500-turbine-fracpumper-finishes-successful-field-operationin-china-300035829.html. (Ex. 1016).

[7] American Petroleum Institute (2011). *Gas Turbines for the Petroleum, Chemical, and Gas Industry Services*, API Standard 616, 5th ed. (Ex. 1011).

patent "may only be filed not later than the date that is 9 months after the date of the grant of the patent." 35 U.S.C. § 321(c).

In the Decision on Institution, we determined that the challenged claims of the '764 patent do not have an effective filing date earlier than March 16, 2013, under AIA § 3(n)(1). Dec. Inst. 7. We also determined that the Petition was filed within the 9-month statutory period for requesting post-grant review in accordance with 35 U.S.C. § 321(c). *Id.* Neither party has challenged either of these determinations during trial, and we maintain both determinations here.

B. Legal Standards

In post-grant reviews, the petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to the patent owner. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review). To prevail in this proceeding, Petitioner must support its challenge by a preponderance of the evidence. 35 U.S.C. § 326(e) (2018); 37 C.F.R. § 42.1(d) (2021). Accordingly, all of our findings and conclusions are based on a preponderance of the evidence standard.

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective

indicia of non-obviousness (also called secondary considerations), such as commercial success, long-felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We analyze grounds based on obviousness in accordance with the above-stated principles.

C. Level of Ordinary Skill in the Art

In determining whether an invention would have been obvious at the time it was made, 35 U.S.C. § 103 requires us to resolve the level of ordinary skill in the pertinent art at the time of the invention. *Graham*, 383 U.S. at 17. The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Factors that may be considered in determining the level of ordinary skill in the art include, but are not limited to, the types of problems encountered in the art, the sophistication of the technology, and educational level of active workers in the field. *Id.* In a given case, one or more factors may predominate. *Id.*

Relying on the testimony of Mr. Marscher, Petitioner submits that a person of ordinary skill in the art "would be expected to have a bachelor's degree in mechanical engineering, and at least 5 years of work experience in the design or manufacturing of reciprocating pumps and power pumps for industrial applications, including for use in the oil and gas industry." Pet. 12–13 (citing Ex. 1003 ¶ 20).

Patent Owner contends that a person of ordinary skill in the art "would have held a Bachelor's degree in electrical engineering and five years of work experience in control systems and control systems software for hydraulic fracturing in the oil and gas industry, though a greater level of specific work experience could have substituted for education." PO Resp. 20–21 (citing Ex. 2028 ¶ 29). Patent Owner argues that Petitioner's

definition is incorrect because "it fails to identify the specialized knowledge of control systems, particularly computerized control systems, that are at the heart of the claimed invention." *Id.* at 21 (citing Ex. 1001, cols. 1–2, 8:1–9:14, Fig. 7). Patent Owner also argues that the claimed invention requires knowledge of electrical engineering and control systems and is not the work of a mechanical engineer. *Id.*

In reply, Petitioner argues that the '764 patent's control system is not complex as there are no detailed algorithms, logic, or software. Pet. Reply 4. Instead, the control system merely raises or lowers power of the pumps in accordance with the demand HHP of the job design. *Id.* (citing Ex. 1036, 97:15–98:18, 98:21–99:25, 100:1–101:25, 102:2–7, 115:4–9, 115:24–116:4, 116:17–22; Ex. 1001, 5:2–6, 6:36–7:7, 10:4–64). According to Petitioner, this "rudimentary control concept" does not necessitate the higher skill level proposed by Patent Owner. *Id.* Petitioner further notes that Dr. Adnan testifies that "a mechanical engineer who has worked in the industry developing programming and control systems could fall within this definition," and the person of ordinary skill in the art "is 'just a specifier.'" *Id.* (quoting Ex. 2003 ¶ 22; Ex. 1036, 161:21–164:18).

Based on our review of the record before us, particularly the '764 patent's description and Dr. Adnan's testimony, we agree with Petitioner that the ordinary level of skill in the art does not require the high level of specialized knowledge of control systems suggested by Patent Owner. Moreover, we find that Petitioner's stated level of ordinary skill in the art is reasonable because it is consistent with the evidence of record, including the asserted prior art. Accordingly, for the purposes of this Decision, we apply Petitioner's definition, although our conclusions with respect to obviousness would be the same if we were to apply Patent Owner's definition.

D. Mr. Marscher's Qualifications

Patent Owner argues that, by his own admission, Mr. Marscher lacks experience with controlling pumps for hydraulic fracturing operations and is not a fracking operator. PO Resp. 21–23 (citing Ex. 2027, 30:14–23, 38:22–39:9, 42:5–12, 105:18–19, 107:24–25, 108:17, 109:8–14, 112:15–19, 112:25–113:3, 198:20–199:11). In view of this assertion, Patent Owner argues that exclusion of Mr. Marscher's testimony would be appropriate. *Id.* at 23–24 (citing *Kyocera Senco Indus. Tools Inc. v. Int'l Trade Comm'n*, 22 F.4th 1369 (Fed. Cir. 2022)). Patent Owner also argues that "[e]ven if his testimony is considered, Mr. Marscher's opinions about the perspective of a [person of ordinary skill in the art] should be given little weight." *Id.* at 24.

Petitioner argues that Mr. Marscher qualifies as a person of ordinary skill in the art, asserting that he has experience evaluating pumping equipment using OEM ratings. Pet. Reply 4–5 (citing Ex. 2027, 6:24–8:7, 30:14–23, 42:16–43:11, 169:11–170:14, 173:3–22). Petitioner also argues that Mr. Marscher has "'developed control algorithms' for fuel injection systems—overseeing 'control systems that were being applied to various types of pumps' that 'required a degree of control logic'—and engineered 'aircraft engine control systems.'" *Id.* at 5 (citing Ex. 2027, 212:19–215:8; Ex. 1004). Petitioner further contends that Patent Owner's expert, Dr. Adnan, is also not a fracturing operator. *Id.* at 4 (citing Ex. 1036, 113:8–25).

Based on the full record, we are not persuaded that Mr. Marscher is unqualified to serve as an expert in this proceeding. As noted above, a person of ordinary skill in the art is not required to have been a fracturing operator. Patent Owner's proposed definition does not even require experience as a fracturing operator. *See* PO Resp. 20–21. Furthermore,

Mr. Marscher testifies that he has extensive experience developing pumps for fracturing applications. Ex. 2027, 6:24–8:7. Mr. Marscher also testifies that he has experience with control systems relating to pumps and pumps units. *Id.* at 212:19–23. This testimony, as well as his declaration and *curriculum vitae*, show that Mr. Marscher has extensive education and experience in relevant fields. Ex. 1003 ¶¶ 8–17; Ex. 1004. Accordingly, we are not persuaded that Mr. Marscher's qualifications or experience provide reason to discount the weight associated with Mr. Marscher's testimony.

E. Claim Construction

We construe the claims using the same claim construction standard that is applied in civil actions under 35 U.S.C. § 282(b). 37 C.F.R. § 42.200(b) (2021); *see also Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). In so doing, we construe a claim "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." 37 C.F.R. § 42.200(b) (2021).

In the Decision on Institution, we preliminarily construed the terms "maximum continuous power" and "maximum intermittent power." Dec. Inst. 12–14. We address each of these terms below.

1. "maximum continuous power"

In the Decision on Institution, we preliminarily construed "maximum continuous power" as "the maximum power at which individual pump units may sustain continuous operation without any performance or reliability penalties," which is consistent with the definition for this term provided in the Specification. Dec. Inst. 12; *see also* Ex. 1001, 4:12–15 (providing definition). Neither party addressed this construction during trial. *See* PO Resp. 24–29; Pet. Reply 2–4. Thus, based on the full record, we maintain

our prior construction of "maximum continuous power" for this Final Written Decision.

2. "maximum intermittent power"

Petitioner argues that "maximum intermittent power" should be construed to mean "an elevated operating output level near or at the maximum power output value." Pet. 9. In support of this argument, Petitioner notes that "[t]he specification states '[t]he Maximum Intermittent Power ("MIP") level of a pump unit 302a thru 302j is an elevated operating output level that the pump unit may operate intermittently throughout its operating life without excessive damage to the pump unit.'"[8] *Id.* (citing Ex. 1001, 4:18–22). Petitioner then argues that "the thrust of the [Specification's] definition is that the MIP level is an 'elevated operating output level,'" and the Specification "qualifies that 'elevated' level, tying it to a level at which 'the pump unit may operate intermittently throughout its operating life without excessive damage to the pump unit.'" *Id.* at 10.

Patent Owner argues that "maximum intermittent power" is an elevated operating output level that the pump unit may operate intermittently throughout its operating life without excessive damage to the pump unit. PO Resp. 24 (citing Ex. 1001, 4:13–18; Dec. Inst. 13–14; Pet. 9). In the Decision on Institution, we preliminarily construed "maximum intermittent power" to mean "an elevated operating output level that the pump unit may operate intermittently throughout its operating life without excessive damage to the pump unit." Dec. Inst. 14. We determined that Petitioner did not explain sufficiently what a "maximum power output value" means in the

[8] We address Petitioner's assertion that "excessive damage" is an indefinite term of degree below in § II.I.1.

context of the '764 patent or why "maximum intermittent power" should be tied to the "maximum power output value." *Id.*

In its Reply, Petitioner argues that the maximum power output value is the pump unit's highest HHP output and one of ordinary skill in the art would have understood this value is the pump unit's output power in intermittent duty. Pet. Reply 2–3 (citing Ex. 1003 ¶¶ 71–72, 123–124; Pet. 9–10; Ex. 1036, 64:17–67:13, 119:17–120:11, 124:7–24, 198:9–200:9, 221:8–222:15). However, even if Petitioner is correct that the "maximum power output value" is near or equivalent to a pump unit's output power in intermittent duty, we are still not persuaded that the term "maximum intermittent power" should be tied to the "maximum power output value," in conflict with the definition provided in the Specification.

Petitioner also argues that Patent Owner's proposed construction is indefinite. Pet. Reply 3. For the reasons discussed below (*see supra* § II.I.1), we determine that Petitioner has not shown by a preponderance of the evidence that the term "maximum intermittent power," as defined in the Specification, is indefinite.

Thus, based on the complete record before us, we maintain our prior construction of "maximum intermittent power" for this Final Written Decision.

3. Additional Terms

We determine that we need not expressly construe any other claim terms to resolve the parties' disputes because doing so would have no effect on the analysis below. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) ("The Board is required to construe 'only those terms that . . . are in controversy, and only to the extent necessary to resolve the

controversy.'") (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

F. Asserted Obviousness Based on Luharuka, API 674, and Karassik

Petitioner contends the challenged claims are obvious over Luharuka, API 674, and Karassik. Pet. 55–80. Patent Owner provides arguments addressing this asserted ground of unpatentability. PO Resp. 30–49. We first summarize the references and then address the parties' contentions.

1. Luharuka

Luharuka relates to a method for monitoring wellsite equipment that uses thermal imaging to identify one or more equipment units. Ex. 1009, code (57). In one embodiment, the equipment unit is plunger pump 101 comprising prime mover 106 that drives a crankshaft through transmission 110 and driveshaft 112 that drives one or more plungers in the pump. *Id.* ¶ 21, Fig. 1. Thermal imaging device 150 is positioned a distance from equipment unit 101 and is in communication with computational device 160. *Id.* ¶¶ 22–23, Fig. 1. Computational device 160 processes thermal images generated by thermal imaging device 150 to identify one or more components or equipment units. *Id.* ¶ 23. Computational unit 160 may be in communication with control unit 170, which may activate or control one or more parameters of equipment unit 101. *Id.* ¶ 24. For instance, "[u]pon diagnosing a problem or undesired change in fluid flow conditions, the computational device may send a signal to the control unit of the equipment unit to alter the fluid flow conditions, including for example, shutting off one or more components in the equipment unit." *Id.*

Luharuka also discloses pumping system 200 for pumping fluid to wellbore 122 during a hydraulic fracturing operation. *Id.* ¶ 29, Fig. 2. "The amount of hydraulic horsepower needed from the pumping system in order

to carry out the fracturing operation may be determined based on an estimate of the well pressure and the fracturing fluid flow rate required to create the desired fractures in the wellbore." *Id.* ¶ 31. In one example, pump system 200 would need at least five plunger pumps rated at 2182 hydraulic horsepower to supply 10,000 hydraulic horsepower. *Id.* But each pump could be operated well under its maximum operating capacity to prevent overloads. *Id.* ¶ 32. "Operating pumps under their maximum operating capacity may also allow for one pump to fail and the remaining pumps to be run at a higher speed in order to make up for the absence of the failed pump." *Id.*

2. API 674

API 674 is a standard for "Positive Displacement Pumps—Reciprocating" from the American Petroleum Institute ("API"). Ex. 1010, 1. This edition was first published in 2010. *Id.* The document "covers the minimum requirements for reciprocating positive displacement pumps and pump units for use in the petroleum, petrochemical, and gas industry services." *Id.* at 7.

3. Karassik

Karassik is a text titled "Pump Handbook." Ex. 1012, 1. The text is intended to be a "comprehensive work on pumps" that presents sufficient information "to assist engineers in designing, analyzing, testing, and troubleshooting all sizes and configurations of these machines." *Id.* at 18.

4. Independent Claims 1 and 15

Petitioner contends that the combination of Luharuka, API 674, and Karassik discloses each limitation of independent claims 1 and 15. Pet. 59–70, 77–78. To support its arguments, Petitioner identifies certain passages in the cited references and explains the significance of each passage with

respect to the corresponding claim limitation. *Id.* Petitioner also articulates reasons to combine the relied-upon aspects of Luharuka, API 674, and Karassik. *Id.* at 56–59.

Claims 1 and 15 both recite the limitation:

> the first output power being in the range of approximately 70% to 100% of a maximum continuous power (MCP) level of the plurality of pump units, the second output power being greater than the first output power and being in the range of approximately 70% of the MCP level to approximately a maximum intermittent power (MIP) level of the plurality of pump units.

We focus our analysis on this limitation because it is dispositive as to claims 1 and 15.

Regarding the first output power portion of this limitation, Petitioner argues that "Luharuka discloses operating its plurality of pumps at a first output power to achieve the demand HHP where the pumps are operated at or near their 'maximum [hydraulic horsepower] rating.'" Pet. 66 (citing Ex. 1009 ¶ 31 (referring to Luharuka's example of operating five 2,182 HHP-rated pumps[9] at 2,000 HHP to supply 10,000 HHP)) (alteration in original). Petitioner also argues that one of ordinary skill in the art would have understood that the maximum HHP rating discussed in Luharuka corresponds to the MCP level. *Id.* at 66–67 (citing Ex. 1009 ¶ 31; Ex. 1003 ¶ 321).

Regarding the second output power portion of this limitation, Petitioner argues that "Luharuka also discloses a different operating range for its pump unit in terms of 'maximum operating capacity' so as to allow

[9] Luharuka explains that an *engine* with a maximum rating of 2,250 brake horsepower yields, after accounting for losses, a maximum of 2,182 hydraulic horsepower output by the driven *pump*. Ex. 1009 ¶ 31.

'one pump to fail and the remaining pumps to be run at a higher speed in order to make up for the absence of the failed pump.'" Pet. 67 (citing Ex. 1009 ¶ 32; Ex. 1003 ¶ 324). According to Petitioner, Luharuka discloses that "[o]peration of the remaining pumps at their maximum capacity would result in the pumps being run at a power that is higher than the 'maximum continuous power.'" *Id.*

This argument is not persuasive. First, it relies on the assertion that the "maximum operating capacity" of paragraph 32 is a different operating range than the "maximum rating" of paragraph 31. When taken in the context of paragraphs 31 and 32 together, it is not clear a "maximum rating" and the "maximum operating capacity" of the pump are intended in Luharuka to refer to different values of pump output despite the difference in terminology. Paragraph 31 describes an example of each engine having a maximum rating of 2250 brake horsepower, which is equivalent to about 2182 hydraulic horsepower output by the pump. Ex. 1009 ¶ 31. In this case, at least five pumps would be needed to supply 10,000 hydraulic horsepower. *Id.* Paragraph 32 discloses operating pumps at well under their maximum operating capacity to prevent an overload of the transmission and, in the event of a pump failing, to allow the remaining pumps to be run at a higher speed to make up for the failed pump. *Id.* ¶ 32. As an example, paragraph 32 describes using ten pumps "at about 1030 brake horsepower (about half of its maximum) in order to supply 1000 hydraulic horsepower individually and 10,000 hydraulic horsepower collectively." *Id.*

Thus, Luharuka indicates that the pumps described in paragraph 31 supply 2000 hydraulic horsepower, while the pumps described in paragraph 32 are operated at about half of their maximum to supply 1000 hydraulic horsepower, thereby suggesting that the pumps used in the two examples are

the same or at least very similar. That the pumps of paragraph 32 operating at about half of their "maximum operating capacity" are also operating at about half of the "maximum rating" of the pumps of paragraph 31 suggests that Luharuka does not distinguish a "maximum rating" from "maximum operating capacity" of the pumps. Furthermore, Luharuka describes the pumps of paragraph 32 as being operated at about half of their "maximum," rather than specifying either "maximum rating" or "maximum operating capacity." This usage of "maximum" alone further suggests that Luharuka does not distinguish "maximum rating" and "maximum operating capacity." In view of the above, we are not persuaded on the full record that "maximum rating" and "maximum operating capacity" refer to different hydraulic horsepower values as asserted by Petitioner.

Second, even if Petitioner is correct that "maximum rating" and "maximum operating capacity" represent different hydraulic horsepower values, we disagree that Luharuka actually discloses operating the remaining pumps *at* their maximum operating capacity. Rather, we agree with Patent Owner that Luharuka discloses operating pumps *well under* their maximum operating capacity to allow, in the event of a pump failing, the remaining pumps to be run at a higher speed to make up for the failed pump. PO Resp. 31 (quoting Ex.1009 ¶ 32); *see also id.* at 39 ("[T]he only disclosure of 'maximum operating capacity' in Luharuka is a command to operate the plunger pumps '***well under*** its maximum operating capacity.'"). Luharuka does not expressly disclose operating the remaining pumps at their maximum capacity, and neither the Petition nor Mr. Marscher explains sufficiently how Luharuka would suggest to one of ordinary skill in the art operating the remaining pumps at their maximum capacity. *See* Pet. 67; Ex. 1003 ¶ 324. The example provided in Luharuka uses ten pumps supplying

1000 hydraulic horsepower individually and 10,000 hydraulic horsepower collectively. Ex. 1009 ¶ 32. In this case, if one pump failed, each one of the remaining nine pumps would need to supply slightly more than 1111 hydraulic horsepower (which is well below the maximum operating capacity) to collectively supply the desired 10,000 hydraulic horsepower. *See* PO Resp. 37 (citing Ex. 2028 ¶ 92). Thus, although Luharuka discloses running the remaining pumps at a higher speed (and thus at increased power), we are not persuaded that Luharuka discloses operating the remaining pumps at their maximum operating capacity.

Next, Petitioner argues that one of ordinary skill in the art would have understood Luharuka's paragraph 32 to teach operating the remaining pumps in an intermittent duty operation or maximum intermittent power. Pet. 68 (citing Ex. 1003 ¶ 324). Petitioner adds that Karassik teaches different types of duty services, such as continuous and intermittent duty, for pumps and confirms that intermittent duty ratings can be higher than continuous duty ratings. *Id.* (citing Ex. 1012, 3.35, 3.21; Ex. 1003 ¶ 325).

Neither the Petition nor Mr. Marscher, however, adequately supports the assertion that Luharuka's disclosure of operating the remaining pumps at a higher speed teaches an intermittent duty operation. *See* Pet. 68; Ex. 1003 ¶ 324. Mr. Marscher testifies that Luharuka's paragraph 32 "discloses to a [person of ordinary skill in the art] a non-steady-state operation, or an intermittent duty application." Ex. 1003 ¶ 324. This testimony, however, is a conclusory statement not supported sufficiently by objective evidence or analysis. For this reason, we do not credit this testimony. *See* 37 C.F.R. § 42.65(a) ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight."); *see also Nobel Biocare Services AG v. Instradent USA, Inc.*, 903 F.3d 1365,

1382 (Fed. Cir. 2018) (explaining that the Board can reject arguments based on expert testimony that lacks specificity or detail). In addition, Karassik's teaching that intermittent duty ratings can be higher than continuous duty ratings does not establish that Luharuka discloses operating pumps at their maximum operating capacity. In fact, Petitioner indicated during the hearing that it is relying on Luharuka, not Karassik, to teach intermittent operation at the second output power. Tr. 16:19–17:1.

Accordingly, we are not persuaded on the full record that Luharuka teaches one of ordinary skill in the art to operate pumps at their maximum operating capacity. At best, Luharuka would have suggested to one of ordinary skill in the art that the pumps are *capable* of operating at their maximum operating capacity. However, a suggestion that a skilled artisan *could* have, rather than *would* have, operated the pumps at their maximum operating capacity to meet the demand HHP is insufficient to establish obviousness. *See Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) ("[O]bviousness concerns whether a skilled artisan not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention."); *see also* PO Resp. 33 n.4 ("[The] theoretical operation of a pump at rated capacity is not the same as Luharuka disclosing or suggesting operating a pump system with all, or all but one, of its pumps at their maximum rated capacity to meet a demand HHP" (citing Ex. 2028 ¶ 84).).

Petitioner also points to Luharuka's first example as allegedly disclosing the claimed second output power range. Pet. 68. Specifically, Petitioner contends that

> Luharuka teaches using five pumps rated for 2,182 HHP to supply 10,000 HHP, such that each pump is operated at a

> minimum of 2,000 HHP, or approximately 91.66% of its MCP. In such a system, when one pump fails "and the remaining pumps [are] run at a higher speed in order to make up for the absence of the failed pump," four pumps would remain, operating at 2,500 HHP to meet the demanded 10,000 HHP—or approximately 114.57% of the MCP. 114.57% of the MCP rating is representative of an MIP level.

Id. (alteration in original) (internal citations omitted). This argument is not persuasive because we do not agree that Luharuka suggests that running the remaining pumps at a higher speed to make up for a failed pump applies to the five-pump example of Luharuka's paragraph 31. As discussed above, we agree with Patent Owner that Luharuka discloses operating pumps *well under* their maximum operating capacity to allow the remaining pumps to be run at a higher speed to make up for a failed pump. PO Resp. 31 (quoting Ex. 1009 ¶ 32); *see also id.* at 33–34 (arguing that Luharuka's disclosure of running the remaining pumps at a higher speed to make up for a failed pump "is expressly dependent on the pumps being operated **well under**—*e.g.*, about 50% of—their maximum operating capacity.").

Also, Petitioner fails to provide a sufficient basis to support that a skilled artisan would recognize that Luharuka's pumps, with a maximum rating of 2182 HHP, could be operated at 2500 HHP, which Petitioner indicates is approximately 114.57% of the MCP or maximum rating. According to Petitioner, API 674 discloses intermittent operation of a pump that is 10% higher than for continuous service speeds or 110% of MCP. Pet. 69 (citing Ex. 1010, Table 3, 6.1.10; Ex. 1003 ¶¶ 329–330); *see also* Tr. 17:2–4 ("API 674 confirms that [the pumps and pump units] have that additional 10% to give."). As such, we are not directed to any teaching in the prior art that the pumps could be operated at more than 110% of their maximum rating. Thus, the prior art does not support the argument that the

pumps could be operated, even in intermittent duty, at 114.57% of their maximum rating.

In addition, Petitioner contends that API 674's disclosure of an intermittent pump operation that is 10% higher than for continuous service speeds "confirms" Luharuka's disclosed operation. Pet. 69 (citing Ex. 1010, Table 3, 6.1.10; Ex. 1003 ¶¶ 329–330). We are not persuaded that API 674 provides any insight to Luharuka's disclosure. The fact that API 674 allegedly discloses intermittent operation at 110% of continuous operation does not establish that Luharuka discloses the same operation.

Moreover, although it is not clear that the Petition even proposes to modify Luharuka with this teaching from API 674 (*see* Tr. 15:21–17:4), we find that there is insufficient rationale provided for why one of ordinary skill in the art would have applied this teaching to Luharuka. In the "Motivation to Combine" section, Petitioner makes general statements, such as one of ordinary skill in the art "would have combined API 674 and Karassik with Luharuka" and "would have understood that API 674 and Karassik would provide implementation details relevant to the pumps being used in a particular implementation of the Luharuka system," that do not provide sufficient rationale for modifying Luharuka to operate the pumps at 110% of their maximum operating capacity as allegedly disclosed by API 674. *See* Pet. 56. Petitioner also contends that "API 674 explicitly provides for continuous operation and intermittent duty applications. (EX1003, ¶293). This teaching would have enabled the [person of ordinary skill in the art] to meet Luharuka's goal of running a set of remaining pumps at higher speeds to make up for a failed pump." Pet. 57. This statement, however, still does not convey that one of ordinary skill in the art would have modified Luharuka to operate the pumps at 110% of their maximum operating

capacity in order to meet the demand HHP. Specifically, API 674's disclosure of continuous operation and intermittent duty applications would not have caused one of ordinary skill in the art to make the modification.

Last, Petitioner provides two alternative arguments that we find unpersuasive. The first alternative argument is that the '764 patent admits

> that it was known in the prior art that the "MIP power level of the pump units . . . is typically an amount above the MCP level and may typically range from 101% of the rated MCP to 110% of rated MCP" and that "the pump units 302 a-302 j may operate in typical operating range of approximately 75% to 95% of MCP to deliver the required HHP of the fluid pumping system 400 for a particular well site."

Pet. 40, 69 (quoting Ex. 1001, 4:28–31, 4:37–41). Petitioner contends that similar statements describing "typical" features have been found to be Applicant Admitted Prior Art. *Id.* (citing *In re Cohen*, 767 F. App'x 985, 988 (Fed. Cir. 2019); *Hunting Titan, Inc. v. Dynaenergetics GmbH & Co. KG*, IPR2018-00600, Paper 42, *19–20 (PTAB Aug. 20, 2019)).

We do not find this argument persuasive. Rather, we agree with Patent Owner that the cited passages from the '764 patent are found in the Detailed Description and describe particular embodiments of the invention. *See* PO Resp. 77. Furthermore, as Patent Owner argues, the cases cited by Petitioner can be distinguished from this situation because those cases involved statements describing prior art and found in the background sections of the patents at issue. *See id.*at 76–77 (citing *Cohen*, 767 F. App'x at 987–88; *Hunting Titan*, at 26–27).

Petitioner's second alternative argument is that the claimed first and second output power ranges are not entitled to any patentable weight because one of ordinary skill in the art would have recognized these ranges as result-effective variables where the claimed result is meeting the demand

horsepower by running the pumps at the first output power and then meeting that same demand horsepower by running a subset of pumps at the second output power. Pet. 41, 70 (citing *In re Applied Materials, Inc*., 692 F.3d 1289, 1298 (Fed. Cir. 2012); *In re Aller*, 220 F.2d 454, 456 (CCPA 1955).

This argument is not persuasive because the first and second output power ranges as claimed are not variables that can be optimized through routine experimentation to achieve a desired result. Instead, claims 1 and 15 both require that all available pump units are operated initially at the first output power to achieve the demand HHP and then, after receiving the loss of power signal, the remaining operating pump units are operated at the second output power to achieve the demand HHP. Ex. 1001, 11:7–19, 12:7–19. As such, the first and second output powers must be set to achieve the demand HHP, which in large part is a function of the number of pumps available and the amount of demand. Accordingly, determining the appropriate first and second output powers is not a matter of optimizing the claimed ranges.

In view of the above, we determine that the combination of Luharuka, API 674, and Karassik does not disclose the claimed second output power range. Accordingly, we are not persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that independent claims 1 and 15 are unpatentable over the combination of Luharuka, API 674, and Karassik.

5. Dependent Claims 2–14 and 16–28

Claims 2–14 depend from claim 1, and each of these dependent claims thus contains all the limitations of claim 1. Claims 16–28 depend from claim 15, and each of these dependent claims thus contains all the limitations of claim 15. Petitioner's challenges to dependent claims 2–14 and 16–28 do

not overcome the deficiencies of the combination of Luharuka, API 674, and Karassik with respect to claims 1 and 15. *See* Pet. 70–77, 78–80. Accordingly, for the same reasons discussed above in connection with claims 1 and 15, we also determine Petitioner has not demonstrated, by a preponderance of the evidence that claims 2–14 and 16–28 are unpatentable over the combination of Luharuka, API 674, and Karassik.

G. Asserted Obviousness Based on Mu and Crowe and Apollo Turbine Release, API 616, and Mu

Petitioner contends the challenged claims are obvious over the combination of Mu and Crowe, and the combination of Apollo Turbine Release, API 616, and Mu. Pet. 14–55, 81–96. Patent Owner provides arguments addressing these asserted grounds of unpatentability. PO Resp. 50–76. We first summarize the references and then address the parties' contentions.

1. Mu

Mu relates to a system that includes one or more processors and a control interface that transmits control signals for controlling the pumps of a hydraulic fracturing operation. Ex. 1007, code (57). In one embodiment, Mu discloses a method 1610 that uses controller telemetry block 1612 for receiving data from a fleet of pumps 1630-1 to 1630-N. *Id.* ¶ 210, Fig. 16. The method uses control block 1622 to issue control signals for individually controlling one or more of pumps 1630-1 to 1630-N. *Id.* ¶ 213. Based on health scores, the method can ramp up or maintain the adjusted pumping rate for a period of time. *Id.* ¶ 215. The method also uses analytics block 1616 to compute an overall maximum power output value such that the control system can make determinations regarding the pumping rate. *Id.* ¶ 217. For example, "where the overall maximum power output value decreases to a

value that is less than a threshold, one or more notifications may be issued, which may call for action or actions (e.g., replanning of one or more hydraulic fracturing operations, etc.)." *Id.*

2. Crowe

Crowe relates to a pumping system that includes an array of pump-engine assemblies and a master controller coupled to each assembly. Ex. 1008, code (57). Each pump-engine assembly comprises a pump and a gas turbine engine that drives the pump. *Id.* Crowe discloses that the pump can be used for various applications, including hydraulic fracturing operations. *Id.* at 16:51–53.

3. Apollo Turbine Release

The Apollo Turbine Release is a press release titled "Apollo 4500 Turbine Frac Pumper Finishes Successful Field Operation in China." Ex. 1016, 1.

4. API 616

API 616 is a standard for "Gas Turbines for the Petroleum, Chemical, and Gas Industry Services" from the American Petroleum Institute ("API"). Ex. 1011, 1. This edition was first published in 2011. *Id.* The document "covers the minimum requirements for open, simple, and regenerative-cycle combustion gas turbine units for services of mechanical drive, generator drive, or process gas generation." *Id.* at 8.

5. Independent Claims 1 and 15

We focus our analysis on the claim 1 limitation "receiving a demand hydraulic horse power (HHP) signal for operation of the hydraulic fracturing assembly" and the corresponding claim 15 limitation "receive a demand hydraulic horse power (HHP) signal for the hydraulic fracturing assembly." This issue is dispositive as to claims 1 and 15.

For the Mu-Crowe ground, Petitioner asserts that Mu discloses the demand HHP signal limitation of claims 1 and 15. Pet. 22–24, 52. Specifically, Petitioner argues that Mu discloses computing "an overall maximum power output value" and that "real-time pumping capacity can be specified as hydraulic horsepower (HHP)." *Id.* at 22–24 (citing Ex. 1007 ¶¶ 217, 213, 367, Fig. 16). Thus, in Petitioner's view, Mu discloses receiving a demand HHP signal. *Id.* at 24 (citing Ex. 1003 ¶¶ 158–159). Petitioner adds that "Crowe *confirms*, disclosing what would have been well known to the [person of ordinary skill in the art], '[t]he master controller and any intermediate controllers are collectively programmed to respond to user input including a desired hydraulic output . . . .'" *Id.* (citing Ex. 1008, Abstract; Ex. 1003 ¶¶ 160–162) (second alteration in original) (emphasis added). Petitioner relies on the same reasoning with respect to this limitation for the ground based on the combination of Apollo Turbine Release, API 616, and Mu. *Id.* at 86, 93. For this ground, Petitioner also asserts "[c]onsistent with Mu, the Apollo Turbine Release in view of API 616 teaches a control system that receives a demand power input." *Id.* at 86 (Ex. 1011, 5.4.3.1; Ex. 1016, 1; Ex. 1003 ¶¶ 428–430).

Patent Owner argues that neither of Mu's "overall max power output value" or "real-time pumping capacity" are a demand HHP. PO Resp. 58. Patent Owner contends that the '764 patent explains that "the demand HHP signal may be a signal corresponding to the demanded power for pumping stimulation fluid associated with the fracturing process." *Id.* (citing Ex. 1001, 6:1–7). According to Patent Owner, one of ordinary skill in the art would have understood "that the demand HHP signal represents how much power is currently needed to operate the hydraulic fracturing assembly, as a whole, for a particular fracturing operation." *Id.* at 59 (citing

Dec. Inst. 29; Ex. 2028 ¶ 127). In contrast, Patent Owner argues that Mu's overall maximum power output value "is some undefined, theoretical calculation as to how much power the fleet of pumps can deliver, not the demanded power for a particular fracturing process." *Id.* (citing Dec. Inst. 29; Ex. 2028 ¶ 127; Ex. 1007 ¶ 217).

Patent Owner also argues that "Mu's 'real-time pumping capacity' is an estimated pumping capacity of 'each individual pump,'" and "can depend on real-time power output capacity of a corresponding pump diesel engine." *Id.* (citing Ex. 1007, Abstract). Thus, Patent Owner contends that Mu's real-time pumping capacity, like the overall maximum power output value, is "some calculation as to how much power the fleet of pumps can actually deliver, not the demanded power for a particular fracturing process." *Id.* at 59–60 (citing Ex. 2028 ¶ 128). For these reasons, Patent Owner asserts that Petitioner fails to establish that Mu discloses receiving a demand HHP signal, as required by claims 1 and 15. *Id.* at 60.

In reply, Petitioner argues that:

> The Petition combines Mu's "overall maximum power output value" ***with*** Crowe's teaching that "[t]he master controller and any intermediate controllers are collectively programmed to respond to user input including a desired hydraulic output . . . ." to demonstrate unpatentability of "receiving a demand [HHP] signal for operation of the hydraulic fracturing assembly."

Pet. Reply 14 (citing Pet. 22–24). Petitioner also points to Mr. Marscher's testimony that controllers are programmed to respond to user input including a desired hydraulic output. *Id.* at 14–15 (citing Ex. 1003 ¶ 160).

Patent Owner disagrees, arguing that the assertion of combining Mu's overall maximum power output value with Crowe's teaching of controllers that respond to user input of a desired hydraulic output is absent from the

Petition. PO Sur-reply 20. Patent Owner contends that the Petition only proposes modifying Mu to utilize Crowe's turbine and clearly states that Mu discloses receiving a demand HHP signal. *Id.* (citing Pet. 22, 24). Patent Owner also argues that "Petitioner fails to explain how [Mu's overall maximum power output] value would be combined with Crowe's teaching that 'master controller and any intermediate controllers are collectively programmed to respond to user input including a desired hydraulic output.'" *Id.* at 21.

The term "overall maximum power output value" refers to the maximum amount of power that can be produced by the fleet of pumps, rather than the power needed or desired for a particular fracturing operation. Indeed, Mu refers to "a desired overall rate and/or pressure" and "an overall desired pump rate"—not the overall maximum power output value—when discussing operating the pumps for a fracturing job. Ex. 1007 ¶¶ 281, 284. Similarly, we are persuaded that "real-time pumping capacity," as the name indicates, refers to a capacity, not the power needed or desired for a particular fracturing operation. Accordingly, we agree with Patent Owner that Petitioner has failed to show that Mu discloses receiving a demand HHP.

We also agree with Patent Owner that the Petition does not articulate combining Mu's overall maximum power output value with Crowe's teaching of controllers that respond to user input of a desired hydraulic output. *See* PO Sur-reply 21. The Petition merely asserts that Crowe *confirms* Mu's alleged teaching of receiving a demand HHP signal. Pet. 24. Neither the Petition nor Mr. Marscher adequately explains how or why one of ordinary skill in the art would have combined these teachings of Mu and Crowe. *See* Pet. 17–20, 22–24; Ex. 1003 ¶¶ 160–161). Instead, Mr.

Marscher testifies that it is his opinion that, to the extent it is argued that Mu does not disclose the demand HHP signal limitation, the combination of Mu and Crowe discloses the limitation. Ex. 1003 ¶ 161. This testimony, however, is a conclusory statement not supported sufficiently by objective evidence or analysis. For this reason, we do not credit this testimony. *See* 37 C.F.R. § 42.65(a); *Nobel Biocare*, 903 F.3d at 1382.

Petitioner also argues that Dr. Adnan confirms that one of ordinary skill in the art would have understood that the claimed HHP demand signal was well known. Pet. Reply 15 (citing Ex. 1036, 85:12–23, 97:15–98:18, 106:18–107:3, 109:9–17). According to Petitioner, Dr. Adnan further confirms that Mu's system would have necessarily received a demand HHP because it uses a received demand HHP graph provided by the FracCADE program. *Id.* at 15–16 (citing Ex. 1036, 58:12–61:15, 100:2–101:25, 101:12–102:7).

We do not find this argument persuasive. Rather, we agree with Patent Owner that this is a new theory not advanced in the Petition. *See* PO Sur-reply 22. Notably, the Petition fails to advance the theory that Mu's system would have necessarily received a demand HHP because it uses the FracCADE program.

In view of the above, we determine that neither the combination of Mu and Crowe nor the combination of Apollo Turbine Release, API 616, and Mu discloses the claimed demand HHP signal limitation. Accordingly, we are not persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that independent claims 1 and 15 are unpatentable over the combination of Mu and Crowe or the combination of Apollo Turbine Release, API 616, and Mu. Because we are not persuaded Petitioner has demonstrated sufficiently that the combination of Mu and

Crowe or the combination of Apollo Turbine Release, API 616, and Mu render claims independent 1 and 15 obvious, we need not reach Patent Owner's assertions that Mu does not qualify as prior art. *See* PO Resp. 50–55.

6. Dependent Claims 2–14 and 16–28

Claims 2–14 depend from claim 1, and each of these dependent claims thus contains all the limitations of claim 1. Claims 16–28 depend from claim 15, and each of these dependent claims thus contains all the limitations of claim 15. Petitioner's challenges to dependent claims 2–14 and 16–28 do not overcome the deficiencies of the combination of Mu and Crowe and the combination of Apollo Turbine Release, API 616, and Mu with respect to claims 1 and 15. *See* Pet. 41–48, 52–55, 89–92, 94–96. Accordingly, for the same reasons discussed above in connection with claims 1 and 15, we also determine Petitioner has not demonstrated, by a preponderance of the evidence that claims 2–14 and 16–28 are unpatentable over the combination of Mu and Crowe or the combination of Apollo Turbine Release, API 616, and Mu.

H. Asserted Lack of Enablement

Petitioner argues that independent claims 1 and 15 are not enabled under 35 U.S.C. § 112(a) "because the specification would not have taught a [person having ordinary skill in the art] how to make and use the full scope of the claimed invention without undue experimentation." Pet. 96. Specifically, Petitioner argues that "[t]he claims require that an unspecified 'pump' be operated across a range of output powers," and one of ordinary skill in the art "could not have practiced the claimed invention without undue experimentation because the specification does not contain sufficient information to enable a [person having ordinary skill in the art] to make and

use the full scope of the claimed ranges for all pumps." *Id.* at 97 (citing Ex. 1003 ¶¶ 543–547). Petitioner contends that the Specification discloses only a single example of a pump assembly in which the intermittent power rating of the helical gearbox is only 106.36% of the constant running power and, thus, not commensurate with the scope of the claims that recite intermittent power levels as high as 107% of the continuous power level. *Id.* at 97–98 (citing Ex. 1001, 9:54–57; Ex. 1003 ¶¶ 545–546).

Patent Owner argues Petitioner fails to provide a systematic analysis of the factors set forth in *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988). PO Resp. 79 (citing Pet. 97). Patent Owner further argues that Petitioner's arguments relate to only the third *Wands* factor (the presence or absence of working examples), and reliance on a single factor is insufficient to establish lack of enablement. *Id.* (citing *ALZA Corp. v. Andrx Pharm., LLC*, 603 F.3d 935, 940 (Fed. Cir. 2010). In addition, Patent Owner argues that "[t]he specification provides more than sufficient direction to allow a [person of ordinary skill in the art] to practice the claimed output power ranges without undue experimentation." *Id.* at 80 (citing Ex.1001, 4:27–51, Fig 4).

Petitioner argues in reply that the claims are not enabled because Dr. Adnan admits to not understanding the concept of the claimed output powers before reading the '764 patent. Pet. Reply 23 (citing Ex. 1036, 118:13–119:16, 171:17–172:11). Petitioner also argues that Dr. Adnan indicated that MIP in the '764 patent is different than intermittent duty capacity. *Id.* 23–24 (citing Ex. 1036, 214:11–18). In addition, Petitioner argues that Dr. Adnan was unfamiliar with or unclear about several aspects of the '764 patent's invention. *Id.* at 24 (citing Ex. 1036, 138:12–139:17, 141:15–25, 182:20–183:16, 239:10–240:23). According to Petitioner, this

testimony by Dr. Adnan proves lack of enablement based on at least *Wands* factors 1–4. *Id.*

Patent Owner disputes these arguments in its Sur-reply. First, Patent Owner asserts that Petitioner relies on an incorrect standard in arguing that Dr. Adnan did not understand the concept of MIP before seeing the '764 patent. PO Sur-reply 6. Specifically, Patent Owner argues that enablement is not determined on a skilled artisan's knowledge before reading the patent; instead, enablement "is met when at the time of filing the application one skilled in the art, ***having read the specification***, could practice the invention without undue experimentation." *Id.* (quoting *Cephalon, Inc. v. Watson Pharms., Inc.*, 707 F.3d 1330, 1336 (Fed. Cir. 2013)).

On the full record, we are not persuaded that the Petition shows, by a preponderance of the evidence, that claims 1 and 15 are not enabled by the Specification. "[T]o be enabling, the specification of a patent must teach those skilled in the art how to make and use *the full scope of the claimed invention* without undue experimentation." *Trs. of Boston Univ. v. Everlight Elecs. Co.*, 896 F.3d 1357, 1362 (Fed. Cir. 2018) (alteration in original) (emphasis added). We consider certain factors to determine whether a disclosure satisfies the enablement requirement, including:

> (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims.

In re Wands, 858 F.2d at 737.

First, we agree with Patent Owner that Petitioner fails to provide a systematic analysis of the *Wands* factors in the context of this case.

Although Petitioner contends that its reply arguments lack of enablement based on at least *Wands* factors 1–4, the Petition fails to explain how this is so or even discuss the *Wands* factors at all. At best, Petitioner's arguments relate to factors 2 and 3 above.

Second, we do not find these arguments persuasive. For instance, the Specification explains that the pumps "may operate at approximately 80% MCP to deliver the 41,000 HHP required for the fluid pumping system 400." Ex. 1001, 4:15–18. The Specification also states that:

> The MIP power level of the pump units 302a thru 302j is typically an amount above the MCP level and may typically range from 101% of rated MCP to 110% of rated MCP. In an embodiment of the disclosure, the MIP level may be set at 107% of rated power. In other embodiments, the MIP level may be greater than 110% of rated MCP without departing from the disclosure.

Id. at 4:28–34. Furthermore, the Specification also states that:

> As indicated in FIG. 4, the pump units 302a-302j (as an example, 5000 HP pump units are shown) may operate in typical operating range of approximately 75% to 95% of MCP to deliver the required HHP of the fluid pumping system 400 for a particular well site. The corresponding percentage of MCP of the pump units 302a-302j is indicated by the 75%, 85%, and 95% lines that are parallel to the 100% MCP line. Any operation of the pump unit 302a thru 302j beyond the 100% MCP curve should be an intermittent occurrence to avoid damage to the pump unit. In one example, the MIP is indicated at 110% MCP, but the MIP may be other percentages to the right of the 100% MCP line without departing from the disclosure.

Id. at 4:37–49. These disclosures provide adequate guidance regarding the output power of the pumps to enable one of ordinary skill in the art to practice the invention without undue experimentation.

In view of the above, we are not persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 1 and 15 (and the claims depending therefrom) lack enablement.

I. Asserted Indefiniteness

Petitioner argues that claims 1 and 15 are indefinite because they recite the term "maximum intermittent power," which is defined in the Specification using only an indefinite term of degree: "an elevated operating output level that the pump unit may operate intermittently throughout its operating life without ***excessive damage*** to the pump unit." Pet. 98–99 (citing Ex. 1001, 4:18–22; *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014)). According to Petitioner, "[t]he term 'excessive damage' provides insufficient notice of its scope as it depends 'on the unpredictable vagaries of any one person's opinion.'" *Id.* at 99 (citing *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014), *cert. denied*, 577 U.S. 913 (2015)). Petitioner also argues that "[t]here is no standard provided by which to measure the relative 'damage' term and the patent provides no objective boundaries to allow the [person of ordinary skill in the art] to determine what constitutes 'excessive damage,' let alone what would objectively constitute 'damage.'" *Id.* (citing Ex. 1003 ¶¶ 548–549).

In response, Patent Owner argues that "terms of degree are problematic only where 'their baseline is unclear to those of ordinary skill in the art' such that the term does not 'inform those skilled in the art about the scope of the invention with reasonable certainty to meet the definiteness requirement.'" PO Resp. 26 (citing *Liberty Ammunition, Inc. v. United States*, 835 F.3d 1388, 1395 (Fed. Cir. 2016); *Interval Licensing LLC v. AOL, Inc*., 766 F.3d 1364, 1378 (Fed. Cir. 2014)). Patent Owner also argues that there are reasons to conclude that one of ordinary skill in the art would

understand the scope "excessive damage." For instance, Patent Owner contends that one of ordinary skill in the art would understand from the claim language that the second output power must allow the operating pumps to continue the met the demand HHP, so that operating the OPUs at a level that caused damage preventing the OPUs from completing the hydraulic fracturing job would be excessive. *Id.* (citing Ex. 2028 ¶ 74). Also, Patent Owner asserts that Mr. Marscher indicated that one of ordinary skill in the art would understand the practical limits of excessive damage. *Id.* at 81 (citing Ex. 2027, 115:17–116:22). Patent Owner adds that both Mr. Marscher and Dr. Adnan were able to understand the distinction between tolerable damage and pump failure. PO Sur-reply 8 (citing Ex. 2027, 115:24–117:25; Ex. 1036, 185:15–188:22).

In addition, Patent Owner contends that the term "MIP" has an established, sufficiently objective meaning in the art, and one of ordinary skill in the art would have no difficulty understanding MIP. *Id.* at 27. Patent Owner further argues that the Specification provides guidance and examples to enable a skilled artisan to determine the scope of the claims. *Id.* at 27–28 (citing Ex. 1001, 4:29–35, 4:49–58; Ex. 2026 ¶ 76).

Petitioner replies that Patent Owner's response arguments add confusion and rely on circular logic. Pet. Reply 25–26. Petitioner further argues that Patent Owner relies on manufacturers' ratings in arguing that "excessive damage" is understood, but these ratings cannot render MIP definite without rendering MIP obvious. *Id.* at 26 (citing PO Resp. 26–28; Ex. 1036, 119:17–120:11, 216:3–13). Petitioner also contends that Dr. Adnan exhibited a lack of knowledge regarding MIP. *Id.* (citing Ex. 1036, 214:4–216:13, 222:3–9, 140:1–16, 182:20–183:16, 144:5–145:18,

147:7–148:6, 158:24–160:7, 173:4–174:22, 216:3–13, 129:17–130:24, 236:11–238:2).

The crux of the challenge in the Petition is that MIP is defined in the Specification using the indefinite term of degree "excessive damage." Pet. 98–99. But, as Patent Owner notes, "terms of degree are [not] inherently indefinite. ***Claim language*** employing terms of degree has long been found definite where it provided enough certainty to [a person of ordinary skill in the art] when read in the context of the invention." PO Resp. 26 (quoting *Interval Licensing*, 766 F.3d at 1378). Furthermore, "a patentee need not define his invention with mathematical precision in order to comply with the definiteness requirement." *Oakley, Inc. v. Sunglass Hut Int'l*, 316 F.3d 1331, 1341 (Fed. Cir. 2003).

Based on the full record, we are persuaded that, when read in the context of the invention, one of ordinary skill in the art would have a sufficient understanding of "excessive damage." In particular, Dr. Adnan testifies that "[o]perating the OPUs at a level that caused damage severe enough to prevent the OPUs from meeting the demand HHP or the overall system from completing the hydraulic fracturing job would be 'excessive.'" Ex. 2028 ¶ 74. We credit Dr. Adnan's testimony on this point, which we find well reasoned and persuasive. Furthermore, we disagree with Petitioner's assertion the Patent Owner's response argument based on this testimony is confusing and relies on circular logic. *See* Pet. Reply 25–26. Rather, Dr. Adnan's testimony is consistent with Mr. Marscher's testimony that pump capacity could be increased a certain amount, such as ten or fifteen percent beyond the performance map, without undue distress as distinguished from pump failure. Ex. 2027, 115:21–116:3.

In view of the above, we determine that the term "excessive damage" informs those skilled in the art about the scope of the invention with reasonable certainty. Accordingly, we are not persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 1 and 15 (and the claims depending therefrom) are indefinite.

J. Petitioner's Motion to Exclude

Petitioner moves to exclude Exhibit 2029. Paper 39, 1. We do not rely, however, on Exhibit 2029 as a basis to make any findings adverse to Petitioner in this Decision. In fact, because we do not reach Patent Owner's assertions that Mu does not qualify as prior art, we do not rely on Exhibit 2029 at all in rendering our decision. We, therefore, dismiss Petitioner's Motion to Exclude as moot.

III. CONCLUSION

In summary:

Claims	**35 U.S.C. §**	**Reference(s)/Basis**	**Claims Shown Unpatentable**	**Claims Not shown Unpatentable**
1–28	103	Mu, Crowe		1–28
1–28	103	Luharuka, API 674, Karassik		1–28
1–28	103	Apollo Turbine Release, API 616, Mu		1–28
1–28	112(a)	Lack of Enablement		1–28
1–28	112(b)	Indefiniteness		1–28
Overall Outcome				1–28

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–28 of U.S. Patent No. 10,815,764 B1 are not determined to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

FOR PETITIONER:

Christopher TL Douglas
ALSTON & BIRD LLP
christopher.douglas@alston.com

FOR PATENT OWNER:

Eagle Robinson
Chad Wallis
NORTON ROSE FULBRIGHT US LLP
eagle.robinson@nortonrosefulbright.com
chad.wallis@nortonrosefulbright.com