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Paper 44
Date: February 17, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HALLIBURTON ENERGY SERVICES, INC.,
Petitioner,

v.

U.S. WELL SERVICES, LLC,
Patent Owner.

IPR2021-01316
Patent 10,280,724 B2

Before LYNNE H. BROWNE, GEORGE R. HOSKINS, and SEAN P. O'HANLON, *Administrative Patent Judges*.

O'HANLON, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Denying Patent Owner's Motion to Amend
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background

Halliburton Energy Services, Inc. ("Petitioner") filed a Petition for *inter partes* review of claims 1–17 ("the challenged claims") of U.S. Patent No. 10,280,724 B2 (Ex. 1001, "the '724 patent"). Paper 2 ("Pet."), 2. U.S. Well Services, LLC ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp."). On February 22, 2022, we instituted an *inter partes* review of the challenged claims on all grounds raised in the Petition. Paper 9, 43.

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 19, "PO Resp."), Petitioner filed a Reply to the Patent Owner Response (Paper 28, "Pet. Reply"), and Patent Owner filed a Sur-reply to Petitioner's Reply (Paper 30, "PO Sur-reply").

Patent Owner also filed a Motion to Amend (Paper 18, "Motion" or "MTA"), to which Petitioner filed an opposition (Paper 27, "MTA Opp."). We issued Preliminary Guidance (Paper 29, "MTA PG") concerning the Motion to Amend. Following the Preliminary Guidance, Patent Owner filed a Reply to the Opposition to the Motion to Amend (Paper 31, "MTA Reply"), and Petitioner filed a Sur-reply to Patent Owner's Reply (Paper 35, "MTA Sur-reply").

An oral hearing was held on December 8, 2022. A transcript of the hearing has been entered into the record. Paper 43.

In our Scheduling Order, we notified the parties that "any arguments not raised in the [Patent Owner] response may be deemed waived." *See* Paper 10, 7; *see also* Patent Trial and Appeal Board Consolidated Trial Practice Guide 66 (Nov. 2019) ("The patent owner response . . . should

identify all the involved claims that are believed to be patentable and state the basis for that belief.").[1]

For the reasons that follow, we conclude that Petitioner has proven by a preponderance of the evidence that claims 1–17 of the '724 patent are unpatentable. We further conclude that Petitioner has proven by a preponderance of the evidence that proposed substitute claims 18–34 are unpatentable.

B. Real Parties in Interest

Petitioner identifies itself, Halliburton Co., and Halliburton Holdings LLC as the real parties in interest. Pet. 1.

Patent Owner identifies itself and ProFrac Holding Corporation as real parties in interest. Paper 5, 1; Paper 42, 1.

C. Related Matters

The parties indicate that the '724 patent has not been the subject of any district court proceeding. Pet. 1; Paper 5, 1. The parties note other petitions for *inter partes* review filed by Petitioner and challenging patents owned by Patent Owner. Pet. 1; Paper 5, 1.

D. The Challenged Patent

The '724 patent relates to hydraulic fracturing in oil and gas wells, which entails pumping pressurized fluid into underground formations. Ex. 1001, 1:8–28. Typically, this pumping is performed by large diesel-powered pumps, and a system of hydraulics is typically used to drive smaller

[1] *Available at* https://www.uspto.gov/TrialPracticeGuideConsolidated.

ancillary devices such as augers, chemical pumps, mixing paddles, water pumps, and cooling fans. *Id.* at 1:29–40, 2:37–41. The '724 patent purports to improve upon known fracturing systems and methods by using a plurality of electric motors to operate the fracturing pumps and each ancillary unit in a hydraulic fracturing system. *Id.* at 2:45–47. Variable frequency drives ("VFDs") can be used to control the motors. *Id.* at 3:10–14. The '724 patent purports that using electric motors with variable frequency drives, rather than hydraulics, to power the ancillary units provides many advantages, including increasing the range of operating motor speed, eliminating the use of hydraulic fluid, reduced system weight, decreased noise, and a reduced number of interconnecting cables. *Id.* at 4:23–6:17.

Figure 1 shows a schematic view of the system and is reproduced below.

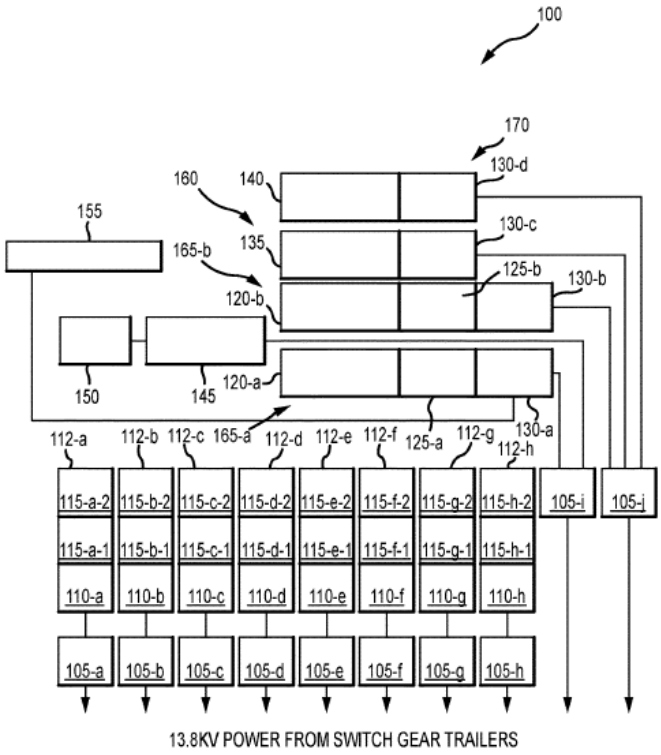

FIG.1

Figure 1 shows an overhead schematic view of hydraulic system 100. Ex. 1001, 7:15–17. Power supplied from switchgear (not shown) is provided to transformers 105-a–105-h. *Id.* at 7:17–21. The transformers supply stepped-down voltage to variable frequency drives 110-a–110-h, which control power provided to fracturing pumps 115-a-1–105-h-2. *Id.* at 7:21–30. Transformers 105-i, 105-j provide power received from switchgear (not shown) to sand equipment 145, hydration unit 160, blenders 165-a, 165-b, and chemical additive unit 170. *Id.* at 7:62–67. The blenders include slurry mixing units 102-a, 120-b, pumps 125-a, 125-b, and variable frequency drives 130-a, 130-b. *Id.* at 10:59–61.

E. The Challenged Claims

Petitioner challenges claims 1–17 of the '724 patent. Pet. 2, 9. Claims 1, 10, and 17 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below.

> 1. A hydraulic fracturing system for fracturing a subterranean formation comprising:
>
> an electric pump fluidly connected to a well associated with the subterranean formation, and configured to pump fluid into a wellbore associated with the well at a high pressure so that the fluid passes from the wellbore into the subterranean formation and fractures the subterranean formation;
>
> one or more ancillary units associated with the fluid pumped into the wellbore, the one or more ancillary units comprising a blender, the blender being positioned on a trailer and fluidly connected to an auger, wherein one or more second motors are positioned any of proximate a top elevation of the auger or proximate a bottom elevation of the auger, or a combination thereof, such that the one or more second motors provide power to drive the auger;
>
> a first motor electrically coupled to the electric pump to operate the electric pump;
>
> the one or more second motors comprising one or more electric motors, each of the one or more second motors electrically coupled to at least one of the one or more ancillary units to operate the at least one of the one or more ancillary units; and
>
> a plurality of variable-frequency drives (VFD), each VFD connected to at least one of the first motor or the one or more second motors to control the speed of the first motor or the one or more second motors.

Ex. 1001, 15:44–16:4.

F. Instituted Grounds of Unpatentability

The Petition relies on the following prior art references:

Name	Reference	Exhibit
Coli	US 9,140,110 B2, issued September 22, 2015	1004
Broussard	US 8,789,601 B2, issued July 29, 2014	1005
Payne	US 2016/0258267 A1, published September 8, 2016	1006

We instituted trial based on all asserted claims and grounds of unpatentability as follows:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–4, 6–8, 10–12, 14–17	102[2]	Coli
1–4, 6–8, 10–12, 14–17	103	Coli
4, 5, 12, 13	103	Coli, Broussard
9	103	Coli, Payne

Pet. 9. Petitioner submits declarations of Robert A. Durham, Ph.D. (Ex. 1003, "the Durham Declaration," Ex. 1027) in support of its contentions. Patent Owner submitted a declaration of Mr. Robert Schaaf (Ex. 2008) in support of its Preliminary Response. Patent Owner also submits a declaration of William D. Marscher, P.E. (Ex. 2015) and a declaration of Joel N. Broussard (Ex. 2016) in support of its Response.

[2] The application resulting in the '724 patent was filed on July 7, 2017, and is subject to the Leahy-Smith American Invents Act's ("AIA"), Pub. L. No. 112–29, 125 Stat. 284 (2011), revisions to 35 U.S.C. §§ 102, 103.

II. ANALYSIS

A. Principles of Law

1. Inter Partes *Review*

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). Petitioner bears the burden of persuasion to prove unpatentability of each challenged claim by a preponderance of the evidence. 35 U.S.C. § 316(e). This burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

2. Anticipation

"Under 35 U.S.C. § 102 a claim is anticipated 'if each and every limitation is found either expressly or inherently in a single prior art reference.'" *King Pharm., Inc. v. Eon Labs, Inc.*, 616 F.3d 1267, 1274 (Fed. Cir. 2010) (quoting *Celeritas Techs. Ltd. v. Rockwell Int'l Corp.*, 150 F.3d 1354, 1360 (Fed. Cir. 1998)). "Anticipation requires the presence in a single prior art disclosure of all elements of a claimed invention arranged as in the claim." *Therasense, Inc. v. Becton, Dickinson & Co.*, 593 F.3d 1325, 1332 (Fed. Cir. 2010) (quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983)).

A reference inherently discloses an element of a claim "if that missing characteristic is necessarily present, or inherent, in the single anticipating

reference." *Schering Corp. v. Geneva Pharm.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003) (citing *Cont'l Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991)). "Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing *may* result from a given set of circumstances is not sufficient." *Therasense*, 593 F.3d at 1332 (quoting *Cont'l Can*, 948 F.2d at 1269).

3. Obviousness

A patent claim is unpatentable under 35 U.S.C. § 103 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 the 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 skill in the art, and (4) when in evidence, any objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). "While the sequence of these questions might be reordered in any particular case" (*KSR*, 550 U.S. at 407), the Federal Circuit has explained that an obviousness determination can be made only after consideration of all of the *Graham* factors. *See, e.g.*, *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1360 (Fed. Cir. 2012).

B. Level of Ordinary Skill in the Art

The level of ordinary skill in the art is "a prism or lens" through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261

F.3d 1350, 1355 (Fed. Cir. 2001). The person of ordinary skill in the art is a hypothetical person 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). In determining the level of ordinary skill in the art, we may consider certain factors, including the "type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field." *Id.*

Petitioner contends that a person having ordinary skill in the art at the time of the invention ("POSITA") would have either "a Bachelor of Science in Mechanical Engineering, Electrical Engineering, Petroleum Engineering or an equivalent field as well as at least two years of academic or industry experience in the oil and gas industry, including well drilling, completion, or production," or "at least four years of industry experience in the oil and gas industry, including well drilling, completion, or production." Pet. 11.

Patent Owner asserts that it "uses Petitioners' proposed definition of a person of ordinary skill in the art." PO Resp. 5.

Based on the arguments presented and the cited references, we find Petitioner's uncontested definition of the level of ordinary skill reasonable and for purposes of this Decision adopt it as our own.

C. Claim Construction

In an *inter partes* review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b), including construing the claims in accordance with the ordinary and customary meaning of such claims as

understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b). "[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention" and "after reading the entire patent." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313, 1321 (Fed. Cir. 2005) (en banc). In addition to the specification and prosecution history, we also consider use of the terms in other claims and extrinsic evidence including expert and inventor testimony, dictionaries, and learned treatises, although extrinsic evidence is less significant than the intrinsic record. *Id.* at 1312–17. Usually, the specification is dispositive, and it is the single best guide to the meaning of a disputed term. *Id.* at 1315.

"The Board is required to construe 'only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.'" *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (alteration in original) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Neither Petitioner nor Patent Owner provides any explicit construction of any claim terms. Pet. 12; PO Resp. 5. Except to the extent that we explain how we interpret the claims in the analysis below, we decline to otherwise expressly construe any claim terms.

D. Overview of the Asserted Prior Art

1. Coli

Coli relates to hydraulic fracturing in hydrocarbon-bearing wells. Ex. 1004, 1:22–23. Coli recognizes drawbacks of the diesel motors typically

used in such drilling. *Id.* at 1:44–2:2. Coli purports to improve upon known fracturing systems by using electric motors and generators powered by natural gas to drive the pumps. *Id.* at 5:16–26. Coli purports that this use of electric components beneficially reduces the amount of infrastructure, is safer and easier to control than known diesel systems, facilitates syncing the equipment within the system, and reduces costs. *Id.* at 6:1–42.

Figure 2 is a schematic view of the fracturing site and is reproduced below.

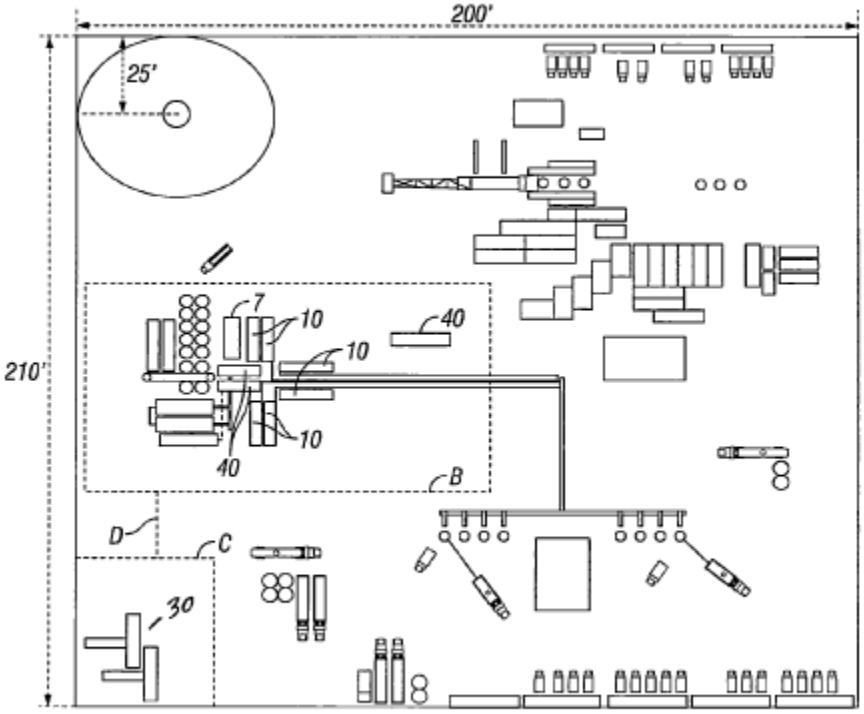

FIG. 2

Figure 2 illustrates a schematic diagram of a fracturing site, including dotted line boxes marking region B and region C, separated by distance D. Ex. 1004, 4:33–35, 6:1–3. Trailers 10 housing one or more fracturing modules, each module including an electric motor coupled to one or more pumps, are located in region B. *Id.* at 6:3–6, 6:43–47. One or more natural

gas-powered turbine generators 30 are located in region C, separated from the fracturing modules for safety. *Id.* at 6:6–9. The turbine generators provide a dedicated source of on-site electric power. *Id.* at 6:10–12. Electrically-powered blender units are located in region B. *Id.* at 8:58–64. Blender modules 40 are powered by the turbine generator and provide fracturing fluid to a pump for delivery to the wellbore. *Id.* at 9:4–8. Control center 40 includes suitable controls and computer monitoring for the entire fracturing operation. *Id.* at 12:19–28.

2. Broussard

Broussard relates to hydraulic fracturing in oil and gas wells, which entails pumping fluid into underground formations at high pressure. Ex. 1005, 1:17–30. Typically, this pumping is performed by large diesel-powered pumps. *Id.* at 1:31–34. Broussard purports to improve upon known fracturing systems and methods by using electric motors to drive the pumps. *Id.* at 1:51–64. Broussard purports that electric motors and generators can be loaded directly on a truck or trailer, increasing efficiency and lowering cost. *Id.* at 7:30–60. Figure 3 illustrates a portion of the system and is reproduced below.

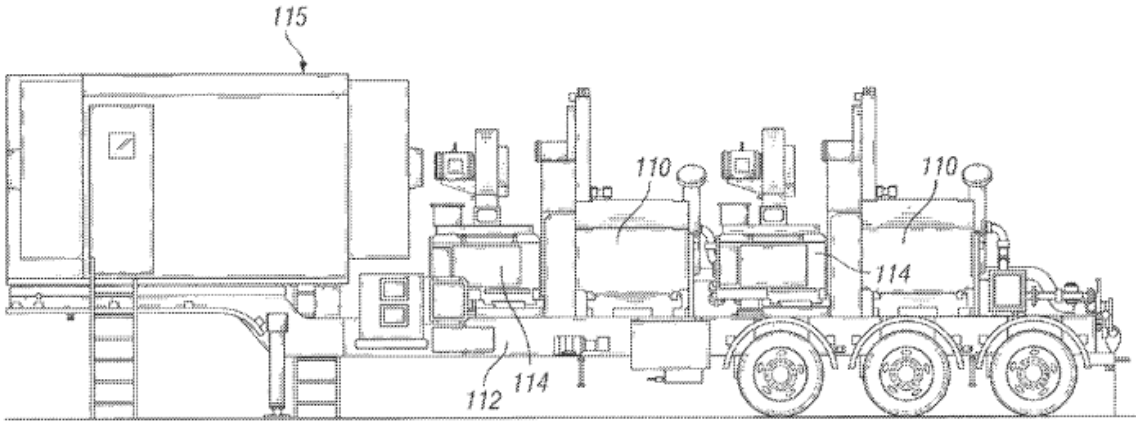

FIG. 3

Figure 3 is a left side view of the fracturing equipment mounted on a vehicle, showing trailer 112 carrying pumps 110, electric motors 114, and variable frequency drive 115. Ex. 1005, 3:18–20; 7:61–67. The variable frequency drive controls the speed of the electric motor and connected pumps. *Id.* at 4:4–11. Multiple vehicles, including trailers or trucks, may be combined as a fleet at one wellbore. *See id.* at 4:8–18, Fig. 1. However, the variable frequency drives can be discrete to each vehicle or pump, allowing independent control, so that if one pump or motor becomes incapacitated the remaining pumps and motors on the vehicle or in the fleet can continue to function. *Id.* The variable frequency drives can also provide "monitoring and protection of drive internal operations while communicating with an operator via one or more user interfaces. For example, motor diagnostics can be performed frequently (e.g., on the application of power, or with each start), to prevent damage to a grounded or shorted electric motor." *Id.* at 4:40–45.

3. Payne

Payne discloses a system for "remotely monitoring and controlling electrical motors in oil and gas well stimulation hydraulic fracturing applications." Ex. 1006 ¶ 3. Payne purports to improve upon conventional fracturing systems by using electrical motors in place of diesel engines. *Id.* ¶ 9. Payne purports that electrical motors advantageously allow for more precise, continuous speed control. *Id.* Payne additionally purports that AC motors are better suited for fracturing operations and that "VFD drive technology used with AC motors has advanced significantly in recent times to become more compact, reliable and cost-effective." *Id.* ¶ 11.

Payne's fracturing system includes fracturing pump trailers, transformer trailers, switchgear trailers, a blender unit trailer, a hydration unit trailer, and a system control center. Ex. 1006 ¶¶ 43–44, Fig. 1. Both the blender unit and hydration unit include electric motors, motor-drives, and programmable automation controllers that communicate with variable frequency drives. *Id.* ¶¶ 39–40, 71–72, 88–90.

E. Asserted Anticipation by Coli

Petitioner argues that claims 1–4, 6–8, 10–12, and 14–17 are anticipated by Coli. Pet. 12–38. In support of its showing, Petitioner relies upon the Durham Declaration. *Id.* (citing Ex. 1003). We have reviewed the parties' briefs and the evidence of record and determine that, for the reasons explained below, Petitioner has shown, by a preponderance of the evidence, that these claims are anticipated by Coli.

1. Independent Claims 1, 10, and 17

Independent claim 1 recites a system comprising an electric pump powered by a first motor to pump fracturing fluid into a well, ancillary units including a blender and an auger powered by second electric motors, and a plurality of variable frequency drives that control the speed of the pump or ancillary unit motors. Ex. 1001, 15:44–16:4. Independent claim 10 is identical to claim 1, except that it recites that the one or more second motors comprise "an electric motor" rather than "one or more electric motors." *Id.* at 16:42–17:2. Independent claim 17 recites a method of powering one or more ancillary units including steps that are substantially the same as the recitations of claim 10. *Id.* at 18:1–27. The parties advance substantially the same arguments for claims 10 and 17 as they advance for claim 1. Pet. 30–32, 34–38; PO Resp. 12–15. Our analysis focuses on claim 1 but applies equally to claims 10 and 17.

a. Preamble

Claim 1 recites "[a] hydraulic fracturing system for fracturing a subterranean formation." Ex. 1001, 15:44–45. Petitioner argues that Coli discloses such a system. Pet. 13 (citing Ex. 1004, 1:27–43, 2:6–21, 2:42–53, 6:43–59; Ex. 1003 ¶ 61).

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

Coli discloses "a system and method for hydraulic stimulation of underground hydrocarbon-bearing formations." Ex. 1004, 2:6–8.

Accordingly, for the foregoing reasons, to the extent the preamble is limiting, Coli supports Petitioner's contentions.

b. The Pump Recitation

Claim 1 recites "an electric pump fluidly connected to a well associated with the subterranean formation, and configured to pump fluid into a wellbore associated with the well at a high pressure so that the fluid passes from the wellbore into the subterranean formation and fractures the subterranean formation." Ex. 1001, 15:46–51. Petitioner maps this recitation to Coli's fluid pump 22 of its fracturing modules 20. Pet. 14 (citing Ex. 1004, 6:43–59, Fig. 3;[3] Ex. 1003 ¶ 63). Petitioner argues that Coli's pumps deliver fracturing fluid to a wellbore under high pressure for fracturing the wellbore. *Id.* (citing Ex. 1004, 1:27–43, 5:3–15, 6:43–59, 7:37–43, 13:16–37, 14:64–15:6, claim 12; Ex. 1003 ¶ 65).

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

Coli's discloses that its pumps are configured for high pressure applications. Indeed, Coli discloses that the pump may be a "a quintiplex or triplex plunger style pump, for example, the SWGS-2500 Well Service Pump sold by Gardner Denver, Inc." (Ex. 1004, 7:40–43) and that "[e]ach fracturing module 20 sits on trailer 10 which houses the necessary mounts and manifold systems for low pressure suctions and *high pressure discharges*" (*id.* at 13:19–22 (emphasis added)). Patent Owner does not dispute that such pumps are capable of or configured to operate at high pressure. Furthermore, claim 1 is directed to a system that only requires that the pump be "configured to" pump fluid at a high pressure; that is, the

[3] We understand Petitioner's citation to Exhibit 1009 to be an obvious typographical mistake, with the intended citation being to Exhibit 1004 (Coli). *See* Pet. 14.

recited operation is functional in nature. Because we find that the pump disclosed in Coli is a high-pressure pump designed to operate at "high pressure discharges" and rated at 2500 hp (*see id.* at 8:8–10), we determine that Petitioner has shown sufficiently that Coli discloses the pump "configured to pump fluid into a wellbore associated with the well at a high pressure so that the fluid passes from the wellbore into the subterranean formation and fractures the subterranean formation," as recited in claim 1.[4]

Accordingly, for the foregoing reasons, Coli supports Petitioner's contentions.

c. The Ancillary Units Recitation

Claim 1 recites,

> one or more ancillary units associated with the fluid pumped into the wellbore, the one or more ancillary units comprising a blender, the blender being positioned on a trailer and fluidly connected to an auger, wherein one or more second motors are positioned any of proximate a top elevation of the auger or proximate a bottom elevation of the auger, or a combination thereof, such that the one or more second motors provide power to drive the auger.

Ex. 1001, 15:52–60. Petitioner maps Coli's downsized blender units to the recited ancillary units, reproducing an annotated version of Coli's Figure 5B to illustrate its mapping. Pet. 15–17 (citing Ex. 1004, 3:41–45, 3:65–4:20,

[4] Although we determine that "high pressure" renders the proposed substitute claims indefinite, this determination does not preclude us from addressing Petitioner's obviousness challenges. *See, e.g.*, *Samsung Elecs. Am., Inc. v. Priusa Eng'g Corp.*, 948 F.3d 1342, 1355 (Fed. Cir. 2020). This is particularly so in this instance because, as explained above, Coli explicitly discloses high pressure discharges by its pumps.

8:57–9:19, 9:31–10:3, 10:8–16, 10:28–59, 10:63–66, 11:18–32, Figs. 5A, 5B; Ex. 1003 ¶¶ 67–70).

Patent Owner argues that Petitioner's reliance on Coli's downsized blender module is insufficient to evidence a blender on a trailer because, according to Patent Owner, Coli is not enabled because it does not explain how an ordinarily skilled artisan would reduce the size of the blender module. PO Resp. 12–13 (citing Pet. 16; Ex. 1004, 8:21–31, 10:8–15, Figs. 3, 5A; Ex. 2015 ¶¶ 18, 24, 43).

Petitioner argues that Coli discloses its blender being positioned on a trailer in multiple embodiments, including its "modular" and "downsized" embodiments. Pet. Reply 3 (citing Ex. 1004, 8:60–64,10:63–67). Petitioner argues that United States patents are presumed to be enabled and Patent Owner has not met its burden to prove that Coli is not enabled. *Id.* at 4–11.

Patent Owner replies by acknowledging that Coli discloses a "downsized blender module 40" but argues that "*Coli* provides no information, and Petitioner has not provided supporting evidence to supplement *Coli*, on how to reduce the conventional blender to fit within the footprint described with respect to the fracturing module 20." PO Sur-reply 3–4 (citing Ex. 1004, 10:63–67).

Patent Owner's arguments presume that the size of Coli's blender units must be reduced (*e.g.*, PO Resp. 12 ("the POSITA is provided with no guidance or information indicating how the blender module would be reduced in size such that it would fit on a trailer")), but Petitioner relies on Coli's downsized blender modules. *See* Pet. 16 (quoting Ex. 1004, 10:63–66) (discussing the "downsized blender module 40 [that] can replace one of the fracturing modules 20 on trailer 10"). In its Sur-Reply, Patent

Owner acknowledges that Coli discloses downsized blender modules. PO Sur-reply 3 (quoting Ex. 1004, 10:64–66). In fact, Coli discloses,

> In certain illustrative embodiments, blender module 40 can be scaled down or "downsized" to a single, compact module *comparable in size and dimensions to fracturing module 20* described herein. For smaller fracturing or treatment jobs requiring fewer than four fracturing modules 20, *a downsized blender module 40 can replace one of the fracturing modules 20 on trailer 10*, thus reducing operational costs and improving transportability of the system.

Ex. 1004, 10:60–67 (emphases added). Thus, Coli discloses a downsized blender module that is sized and dimensioned to be positioned on the trailer in place of a fracturing module. The size of Coli's downsized blender module, therefore, does not need to be reduced in order to fit on the trailer, as suggested by Patent Owner. Patent Owner's premise fails, and its arguments are therefore unavailing.

Moreover, Coli is an issued patent and, thus, enjoys a presumption of enablement. *E.g.*, *Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1354–55 (Fed. Cir. 2003). Patent Owner bears at least a burden of production (regardless of which party has the ultimate burden of persuasion, an issue which we do not need to decide here) to present argument and evidence to go forward on the issue of enablement. *Id.*; *see also Dynamic Drinkware*, 800 F.3d at 1378–81 (explaining that the patent owner bears a burden of production in an *inter partes* review concerning the issue of whether a prior art patent was entitled to the filing date of its provisional application, but the petitioner bears the ultimate burden of persuasion on that issue per 35 U.S.C. § 316(e)). Patent Owner has failed to meet its burden of production. Patent Owner does not discuss any of the recognized factors to

be considered in determining whether a disclosure would require undue experimentation (*see In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988)), instead merely asserting that "[an ordinarily skilled artisan] could not reasonably be able to reduce the size of the blender in *Coli* based on *Coli's* disclosure." PO Resp. 13 (citing Ex. 2015 ¶ 43). Patent Owner's declarant similarly fails to provide adequate support for substantially the same assertion. *See* Ex. 2015 ¶ 43.

Additionally, we note that Coli discloses that its system includes electrically-powered blender modules or units to generate the treatment fluid. Ex. 1004, 2:38–41, 8:58–60. The blender modules can include a dual configuration having two blender units 47a, 47b. *Id.* at 9:20–22, Fig. 5B. The blender units can be positioned on the same trailer as the fracturing modules. *Id.* at 8:60–64. The blender modules can also be compact, sized to have comparable dimensions as and replace fracturing modules on the trailer. *Id.* at 10:60–67. The blender units contain a plurality of electric motors, one of which powers auger 45a. *Id.* at 9:44–50. The electric motors can be positioned proximate a top elevation of the augers. *Id.* at Fig. 5B.

Accordingly, for the foregoing reasons, Coli supports Petitioner's contentions.

d. The First Motor Recitation

Claim 1 recites "a first motor electrically coupled to the electric pump to operate the electric pump." Ex. 1001, 15:61–62. Petitioner maps this recitation to Coli's electric motor 21 of its fracturing modules 20. Pet. 17–18 (citing Ex. 1004, 2:6–21, 2:42–53, 6:43–59, Fig. 4A; Ex. 1003 ¶ 71).

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

Coli discloses that its fracturing module 20 includes "an electric motor 21 coupled to one or more electric pumps 22." Ex. 1004, 7:38–40.

Accordingly, for the foregoing reasons, Coli supports Petitioner's contentions.

e. The Second Motors Recitation

Claim 1 recites "the one or more second motors comprising one or more electric motors, each of the one or more second motors electrically coupled to at least one of the one or more ancillary units to operate the at least one of the one or more ancillary units." Ex. 1001, 15:63–67. Petitioner relies on its showing made regarding the Ancillary Units Recitation. Pet. 18–19 (citing Ex. 1004, 8:57–9:3, 9:31–10:3, 10:28–59; Ex. 1003 ¶¶ 72–73).

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

As noted above, Coli discloses that its blender units contain a plurality of electric motors, one of which powers auger 45a. Ex. 1004, 9:44–50.

Accordingly, for the foregoing reasons, Coli supports Petitioner's contentions.

f. The Variable Frequency Drives Recitation

Claim 1 recites "a plurality of variable-frequency drives (VFD), each VFD connected to at least one of the first motor or the one or more second motors to control the speed of the first motor or the one or more second motors." Ex. 1001, 16:1–4. Petitioner argues that Coli discloses that both of

its pump motor and auger motor are controlled via variable frequency drives. Pet. 20–22 (citing Ex. 1004, 2:29–31, 6:43–59, 7:44–66, 8:57–9:36, 10:4–7, 11:2–17, Figs. 5A, 5B; Ex. 1003 ¶¶ 74–76).

Patent Owner advances two arguments regarding this recitation. PO Resp. 13–15. First, Patent Owner acknowledges that Coli discloses that its "electrical motor . . . can be an AC permanent magnet motor and/or a variable speed motor," but argues that "[t]here is no indication that the AC permanent magnet motor is capable of operating at variable speeds." *Id.* at 13 (quoting Ex. 1004, 2:29–31).

Patent Owner's argument is at odds with Patent Owner's concession that "*Coli* describes an 'electrical motor [that] can be an AC permanent magnet motor *and/or a variable speed motor*'" (PO Resp. 13 (alteration in original) (emphasis added)). The argument is further contradicted by Patent Owner's concession that "*Coli* may generically describe a control system where 'electric motors are controlled by variable frequency drives.'" *Id.* at 14. Moreover, Coli explicitly states that its "electric motors are controlled by variable frequency drives." Ex. 1004, 11:10–11. Thus, Coli discloses that its motors are capable of operating at variable speeds, as controlled by variable frequency drives, and Patent Owner's arguments are unavailing.

Second, Patent Owner argues that Coli does not disclose multiple variable frequency drives connected to a single motor (PO Resp. 14) or multiple instances of a variable frequency drive being connected to a singular motor associated with a singular pump (*id.* at 15).

Petitioner argues that the challenged "claims encompass one VFD connected to the first motor and one VFD connected to the second motor." Pet. Reply 11. According to Petitioner, "[t]he claims do not require multiple

VFDs connected to a single motor." *Id.* at 12. Continuing, Petitioner argues that Coli discloses two blender units, each unit including an auger that is powered by a motor that is controlled by a variable frequency drive. *Id.* at 12–15 (citing Ex. 1004, 2:29–31, 8:57–9:36, 10:4–7, 11:2–17, Figs. 5A, 5B; Ex. 1003 ¶¶ 75–76; Ex. 1027 ¶¶ 28, 31).

We agree with Petitioner that, by their plain language, the claims recite a plurality of variable frequency drives, with each of the variable frequency drive connected to either the first motor or a second motor. *See, e.g.*, Ex. 1001, 16:1–4; *see also* Ex. 2015 ¶ 48 (Patent Owner's declarant testifying that "the '724 [patent] claims indicate that the plurality of electric control VFDs need to be coupled to either the first motor or the second motors."). Coli discloses such an arrangement. Coli discloses that, "[b]ecause [its] electric motors are controlled by variable frequency drives, absolute control of *all equipment on location* can be maintained from one central point." Ex. 1004, 11:10–12 (emphasis added). Coli discloses that "[t]ypically, each fracturing module 20 will be associated with a drive housing for controlling electric motor 21 and pumps 22, as well as an electrical transformer and drive unit 50." *Id.* at 7:45–50. Petitioner's declarant testifies that "the drive unit is the variable frequency drive." Ex. 1003 ¶ 74. Coli discloses that "[b]lender module 40 can . . . include a control cabin 53 for housing equipment controls for first blender unit 47a and second blender unit 47b, and can further include appropriate *drives* and coolers as required." Ex. 1004, 10:4–7 (emphasis added). Petitioner's declarant interprets these "drives" to be variable frequency drives. Ex. 1003 ¶ 76. We credit this testimony of Dr. Durham, which neither Patent Owner nor its declarants address squarely.

Accordingly, for the foregoing reasons, Coli and Dr. Durham's testimony support Petitioner's contentions.

g. Conclusion

For the foregoing reasons, we conclude that Petitioner has shown, by a preponderance of the evidence, that claims 1, 10, and 17 are anticipated by Coli.

2. Dependent Claims 2–4, 6–8, 11, 12, and 14–16

Claim 2 depends directly from claim 1 and further recites "wherein the first motor is selected from the group consisting of any of an electric motor, a diesel motor, a natural gas motor, a gasoline motor, and a hydraulic motor, or a combination thereof." Ex. 1001, 16:5–8. Claim 11 depends directly from claim 10 and contains substantially the same recitation. *Id.* at 17:3–6. Petitioner maps these recitations to Coli's electric motor 21 of its fracturing modules 20. Pet. 21.

Patent Owner does not present arguments for the dependent claims apart from its contentions regarding claim 1 discussed in § II.E.1 above. PO Resp. 19.

As noted above regarding the First Motor Recitation of claim 1, Coli discloses that its fracturing module 20 includes "an electric motor 21 coupled to one or more electric pumps 22." Ex. 1004, 7:38–40.

Accordingly, for the foregoing reasons, Coli supports Petitioner's contentions.

Claim 3 depends directly from claim 1 and further recites "an electric generator, wherein the first motor is electrically coupled to the electric pump via the electric generator to generate electricity for use by the electric

pump." Ex. 1001, 16:9–12. Petitioner maps this recitation to Coli's natural gas-powered turbine generators 30. Pet. 23.

Patent Owner does not present arguments for the dependent claims apart from its contentions regarding claim 1 discussed in § II.E.1 above. PO Resp. 19.

Coli discloses that its system includes one or more natural gas-powered turbine generators 30 that provide a dedicated source of on-site electric power, including providing power to the fracturing modules. Ex. 1004, 6:6–12, 6:47–49, 6:57–59.

Accordingly, for the foregoing reasons, Coli supports Petitioner's contentions.

Claim 4 depends directly from claim 1 and further recites "wherein the electric motor is selected from the group consisting of any of a single-phase AC motor, a three-phase motor, and a DC motor." Ex. 1001, 16:13–15. Claim 12 depends directly from claim 10 and contains substantially the same recitation. *Id.* at 17:7–9. Petitioner argues that Coli's electric motor 21 necessarily is either an AC motor or a DC motor. Pet. 23–24. Continuing, Petitioner argues that an ordinarily skilled artisan would understand Coli's disclosure of AC permanent magnet motors to be either single-phase AC motors or three-phase motors. *Id.* at 24 (citing Ex. 1004, 2:29–31; Ex. 1003 ¶¶ 79–83.

Patent Owner does not present arguments for the dependent claims apart from its contentions regarding claim 1 discussed in § II.E.1 above. PO Resp. 19.

Coli discloses that electric motor 21 can be an AC permanent magnet electric motor. Ex. 1004, 8:45–48. Coli further states "[a] motor suitable for

this purpose is sold under the trademark TeraTorq® and is available from Comprehensive Power, Inc. of Marlborough, Mass." *Id.* at 8:51–54. Petitioner's declarant testifies that an ordinarily skilled artisan would understand this motor to be a three-phase AC motor. Ex. 1003 ¶ 80 (citing Ex. 1008, 16–19; Ex. 1009, 15–22). We credit this uncontested testimony of Dr. Durham.

Accordingly, for the foregoing reasons, Coli supports Petitioner's contentions.

Claim 6 depends directly from claim 1 and further recites "one or more trailer, wherein the one or more ancillary units are positioned on the one or more trailer, and wherein each VFD is positioned on the one or more trailer proximate each of the one or more ancillary units." Ex. 1001, 16:19–24. Claim 14 depends directly from claim 10 and contains substantially the same recitation. *Id.* at 17:14–19. Referencing its showing regarding the Ancillary Units and Variable Frequency Drives Recitations of claim 1, Petitioner argues that Coli's downsized blender modules are positioned on trailers. Pet. 25–26. Petitioner argues that Coli's downsized blender units include augers powered by electric motors that are controlled by variable frequency drives and that are positioned proximate a top elevation of the augers. *Id.* at 26–27.

Patent Owner does not present arguments for the dependent claims apart from its contentions regarding claim 1 discussed in § II.E.1 above. PO Resp. 19.

As noted above regarding the Ancillary Units Recitation of claim 1, Coli's blender units are positioned on trailers and contain a plurality of electric motors, one of which powers the auger and can be proximate a top

elevation of the augers. Ex. 1004, 8:60–64, 9:44–50, 10:60–67, Fig. 5B. As noted above regarding the Variable Frequency Drives Recitation of claim 1, Coli discloses that its blender modules include control cabins for housing equipment controls, including drives, for the blender units. *Id.* at 10:4–7. Petitioner's declarant interprets these "drives" to be variable frequency drives. Ex. 1003 ¶ 76. We credit this testimony of Dr. Durham, which neither Patent Owner nor its declarants address squarely.

Accordingly, for the foregoing reasons, Coli supports Petitioner's contentions.

Claim 7 depends from claim 1 through claim 6 and further recites "wherein the one or more second motors are each positioned on the one or more trailers proximate each of the one or more ancillary units." Ex. 1001, 16:25–27. Claim 15 depends directly from claim 10 and contains substantially the same recitation. *Id.* at 17:20–22. Referencing its showing regarding the Ancillary Units and Second Motors Recitations of claim 1, Petitioner argues that, "[t]hrough its disclosure of a trailer-mounted blender module, *Coli* discloses, for example in Fig. 5B, two second motors 42a and 42b proximate each of the ancillary units comprising of (i) blender tubs 46a and 46b and (ii) augers 45a and 45b." Pet. 28–29.

Patent Owner does not present arguments for the dependent claims apart from its contentions regarding claim 1 discussed in § II.E.1 above. PO Resp. 19.

For the reasons provided above regarding claim 6, Coli supports Petitioner's contentions.

Claim 8 depends directly from claim 1 and further recites,

> wherein additional of the one or more ancillary units are selected from the group consisting of any of a blender, a hydration unit, a chemical additive unit, a small pump, a chemical pump, a water pump, a valve actuator, a cooling fan, an auger, a mixing paddle, a conveyor belt, and a blower, or any combination thereof.

Ex. 1001, 16:28–33. Claim 16 depends directly from claim 10 and contains substantially the same recitation. *Id.* at 17:23–28. Petitioner argues that Coli discloses this recitation in multiple ways. Pet. 30. Petitioner argues that Coli discloses the use of multiple blender modules, that each of Coli's blender modules includes two blender units, and that Coli's blender modules include additional ancillary units including chemical units and sand belts. *Id.* (citing Ex. 1004, 3:11–12, 3:28–31, 12:14–18).

Patent Owner does not present arguments for the dependent claims apart from its contentions regarding claim 1 discussed in § II.E.1 above. PO Resp. 19.

Coli discloses the use of multiple blender modules 40. *See, e.g.*, Ex. 1004, 3:11–12, 8:58–60, Fig. 2. Each blender module can include two blender units. *Id.* at 9:20–22, Fig. 5B. Each blender unit can also include a sand belt to provide sand to the blender tub. *Id.* at 8:66–9:3, 12:14–18.

Accordingly, for the foregoing reasons, Coli supports Petitioner's contentions.

For the foregoing reasons, we conclude that Petitioner has shown, by a preponderance of the evidence, that claims 2–4, 6–8, 11, 12, and 14–16 are anticipated by Coli.

F. Asserted Obviousness Based on Coli

Petitioner argues that claims 1–4, 6–8, 10–12, and 14–17 would have been obvious over Coli. Pet. 38–41. In support of its showing, Petitioner relies upon the Durham Declaration. *Id.* (citing Ex. 1003). We have reviewed the parties' briefs and the evidence of record and determine that, for the reasons explained below, Petitioner has shown, by a preponderance of the evidence, that the limitations of these claims are taught or suggested by Coli and that Petitioner has set forth reasoning with rational underpinning why it would have been obvious to modify Coli's system to arrive at the claimed subject matter.[5]

1. Claims 1–3, 6–8, 10, 11, and 14–17

Petitioner relies on Coli as set forth in § II.E above and advances obviousness arguments regarding the Variable Frequency Drives Recitation. Pet. 39–40. Petitioner argues that, to the extent Patent Owner argues that Coli does not disclose the Variable Frequency Drives Recitation, "it also would have been obvious to a POSITA—from *Coli's* discussion of 'variable frequency drives'—to use variable frequency drives to control the speed of motors 42a and 42b that power augers 45a and 45b." *Id.* at 39 (citing Ex. 1003 ¶ 114). Petitioner argues that an ordinarily skilled artisan would connect Coli's augers to a variable frequency drive because "a VFD improves energy efficiency, lowers noise, and reduces mechanical stress on machines." *Id.* (citing Ex. 1003 ¶ 114).

[5] For convenience, we address the alleged objective evidence of nonobviousness in a single section (§ II.I) below. To be clear, no ultimate conclusion of obviousness was reached prior to weighing all the pertinent evidence (including the asserted objective indicia), consistent with *Graham*.

Patent Owner contests Petitioner's showing. PO Resp. 15–19. First, Patent Owner reiterates its arguments advanced for the anticipation challenge (*id.* at 16), which we find unavailing for the reasons explained above.

Next, Patent Owner argues that Coli only discloses that its variable frequency drives are used to control a pressure associated with a hydraulic fracturing system, which, according to Patent Owner, is not applicable to blender modules. PO Resp. 16–17 (citing Ex. 1004, 11:10–17), 19. Patent Owner argues that Petitioner's challenge is based on hindsight because Coli does not disclose a problem that would require the use of a variable frequency drive. *Id.* at 17 (citing *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998)).

Petitioner argues that Patent Owner's reliance on *In re Rouffet* is misplaced because that case was overruled by *KSR*. Pet. Reply 19 (citing *In re Conrad*, 759 F. App'x 982, 985 (Fed. Cir. 2019)).

We disagree with Patent Owner's assertion that, in an obviousness challenge, the rationale to combine references must be based on a problem identified in the asserted references. Patent Owner's arguments appear to require that a teaching, suggestion, or motivation ("TSM") be disclosed expressly by the references. However, the Supreme Court has "reject[ed] th[is] rigid approach." *KSR*, 550 U.S. at 415; *see also id.* at 419 ("There is no necessary inconsistency between the idea underlying the TSM test and the *Graham* analysis. But when a court transforms the general principle into a rigid rule that limits the obviousness inquiry, . . . it errs."). Although TSM is one manner in which a rationale supporting obviousness can be established, it is not the only manner. Rather, the rationale for modifying or

combining reference teachings may arise from a number of sources, including the interrelated teachings of multiple prior art references. *See id.* at 415–21. As discussed above, the Petition sufficiently sets forth reasoning why an ordinarily skilled artisan would have modified Coli's system to control its auger motors with variable frequency drives.

Coli discloses that its

> control system can regulate fracturing module 20 in delivery of treatment fluid from blender module 30 to pumps 22 for delivery to the wellbore. Controls for the electric-powered operation described herein are a significant improvement over that of conventional diesel powered systems. Because electric motors are controlled by variable frequency drives, absolute control *of all equipment on location* can be maintained from one central point. When the system operator sets a maximum pressure for the treatment, the control software and variable frequency drives calculate a maximum current available to the motors. Variable frequency drives essentially "tell" the motors what they are allowed to do.

Ex. 1004, 11:4–17 (emphasis added). Thus, Coli discloses using variable frequency drives to control the blender module motors.

Accordingly, for the foregoing reasons, Coli supports Petitioner's contentions. We further determine that Petitioner has set forth reasoning with rational underpinning explaining why it would have been obvious to use variable frequency drives to control Coli's auger motors. *See, e.g.*, Pet. 39–40; *see also* Ex. 1003 ¶ 114.

For the foregoing reasons and those set forth in § II.E above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 1–3, 6–8, 10, 11, and 14–17 are disclosed, taught, or suggested by Coli, and that Petitioner has set forth reasoning with rational

underpinning why it would have been obvious to modify Coli's system to arrive at the claimed subject matter.

2. Claims 4 and 12

Claim 4 depends directly from claim 1 and recites "wherein the electric motor is selected from the group consisting of any of a single-phase AC motor, a three-phase motor, and a DC motor." Ex. 1001, 16:13–15. Claim 12 depends directly from claim 10 and contains substantially the same recitation. *Id.* at 17:7–9. Petitioner argues that, to the extent Patent Owner argues that Coli does not disclose this recitation, "it would have been obvious to a POSITA from *Coli's* disclosure of 'an AC permanent magnet motor and/or a variable speed motor' to use a single-phase AC motor, a three-phase motor, or a DC motor." Pet. 40 (citing Ex. 1003 ¶ 115). Petitioner argues that, "through its disclosure of an electric motor itself, a POSITA would have understood that *Coli* discloses an AC or a DC motor," and "through its disclosure . . . of an AC permanent magnet motor, which are AC motors, a POSITA would have understood the use of a three-phase or single phase motor in the system of *Coli*." *Id.* at 41 (citing Ex. 1003 ¶ 115).

Patent Owner does not present arguments for the dependent claims apart from its contentions regarding claim 1 discussed in § II.E.1 above. PO Resp. 19.

Coli discloses that its "electric motor can be an AC permanent magnet motor and/or a variable speed motor." Ex. 1004, 2:29–31. Petitioner's declarant testifies that "it would have been obvious to a POSITA to use a DC or an AC motor, given that there are only those two types of motors"

and "[f]urthermore, for AC motors, it would have been obvious for [a] POSITA to use a single or three phase motor, considering those are the only two types of AC motors used in industrial applications." Ex. 1003 ¶ 115. We credit this uncontested testimony of Dr. Durham.

Accordingly, for the foregoing reasons Coli and Dr. Durham's testimony support Petitioner's contentions. We further determine that, Petitioner has set forth reasoning with rational underpinning explaining why it would have been obvious to use of a single-phase AC motor, a three-phase motor, or a DC motor in Coli's system. *See, e.g.*, Pet. 40–41; *see also* Ex. 1003 ¶ 115.

For the foregoing reasons, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 4 and 12 are disclosed, taught, or suggested by Coli, and that Petitioner has set forth reasoning with rational underpinning why it would have been obvious to modify Coli's system to arrive at the claimed subject matter.

G. Asserted Obviousness Based on Coli and Broussard

Petitioner argues that claims 4, 5, 12, and 13 would have been obvious over Coli and Broussard. Pet. 42–48. In support of its showing, Petitioner relies upon the Durham Declaration. *Id.* (citing Ex. 1003). We have reviewed the parties' briefs and the evidence of record and determine that, for the reasons explained below, Petitioner has shown, by a preponderance of the evidence, that the limitations of these claims are disclosed by the combination of Coli and Broussard and that Petitioner has set forth reasoning with rational underpinning why it would have been obvious to

combine the teachings of these references to arrive at the claimed subject matter.

Claim 4 depends directly from claim 1 and recites "wherein the electric motor is selected from the group consisting of any of a single-phase AC motor, a three-phase motor, and a DC motor." Ex. 1001, 16:13–15. Claim 12 depends directly from claim 10 and contains substantially the same recitation. *Id.* at 17:7–9. Claim 5 depends directly from claim 1 and recites "wherein each VFD frequently performs electric motor diagnostics to prevent damage to the first motor or the one or more second motors." *Id.* at 16:16–18. Claim 13 depends directly from claim 10 and contains substantially the same recitation. *Id.* at 17:10–12. Petitioner relies on Coli as set forth in § II.E above and relies on Broussard to provide additional teaching regarding electric motors and diagnostics performed by variable frequency drives. Pet. 42–43. Petitioner argues that it would have been obvious to incorporate Broussard's teaching of diagnostics into Coli's variable frequency drives or to substitute Broussard's variable frequency drives in place of Coli's. *Id.* at 43–44. Petitioner also argues that it would have been obvious to use a three-phase induction motor, rather than a permanent magnet ("PM") motor in Coli's system. *Id.* at 44–45.

Patent Owner does not advance arguments for this challenge apart from its contentions regarding claim 1 discussed in § II.E.1 above. PO Resp. 20.

Petitioner argues that it would have been obvious to use a three-phase induction motor "because they are more readily available and less expensive to install." Pet. 44 (citing Ex. 1005, 3:55–65; Ex. 1003 ¶ 123). The cited portion of Broussard states,

> Use of induction motors, and in particular three-phase induction motors, allows for increased power output compared to other types of electric motors, such as permanent magnet (PM) motors. This is because three-phase induction motors have nine poles (3 poles per phase) to boost the power factor of the motors. Conversely, PM motors are synchronous machines that are accordingly limited in speed and torque. This means that for a PM motor to match the power output of a three-phase induction motor, the PM motor must rotate very fast, which can lead to overheating and other problems.

Ex. 1005, 3:55–65. Thus, Broussard provides explicit rationale for using a three-phase induction motor rather than a permanent magnet motor.

Broussard also discloses hydraulic fracturing pumps powered by electric motors controlled by variable frequency drives. Ex. 1005, 1:51–2:3. The variable frequency drive controls the speed of the electric motor and connected pumps. *Id.* at 4:4–11. The variable frequency drives can also provide "monitoring and protection of drive internal operations while communicating with an operator via one or more user interfaces. For example, motor diagnostics can be performed frequently (e.g., on the application of power, or with each start), to prevent damage to a grounded or shorted electric motor." *Id.* at 4:40–45.

Accordingly, for the foregoing reasons and those set forth in § II.E above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 4, 5, 12, and 13 are disclosed by the combination of Coli and Broussard, and that Petitioner has set forth reasoning with rational underpinning why it would have been obvious to combine the teachings of these references to arrive at the claimed subject matter. *See, e.g.*, Pet. 43–45.

H. Asserted Obviousness Based on Coli and Payne

Petitioner argues that claim 9 would have been obvious over Coli and Payne. Pet. 48–57. In support of its showing, Petitioner relies upon the Durham Declaration. *Id.* (citing Ex. 1003). We have reviewed the parties' briefs and the evidence of record and determine that, for the reasons explained below, Petitioner has shown, by a preponderance of the evidence, that the limitations of this claim are disclosed by the combination of Coli and Payne and that Petitioner has set forth reasoning with rational underpinning why it would have been obvious to combine the teachings of these references to arrive at the claimed subject matter.

Claim 9 depends directly from claim 1 and recites,

> wherein the one or more ancillary units comprise the hydration unit, the hydration unit being positioned on a trailer, the trailer further comprising a VFD, wherein the one or more second motors are positioned any of between the hydration unit and the VFD, or below the VFD, or a combination thereof, and wherein the one or more second motors provide power to the hydration unit via the VFD.

Ex. 1001, 16:34–41. Petitioner relies on Coli as set forth in § II.E above and relies on Payne to teach use of a hydration unit. Pet. 48–57. Petitioner argues that Coli discloses that its blender module includes a hydration unit because it blends fluids received from a fluid additive source and chemicals to generate fracturing fluid. *Id.* at 54 (citing Ex. 1004, 3:11–17, 5:3–15, 8:57–9:3, 9:20–36, 10:17–27; Ex. 1003 ¶ 140). Petitioner argues that Payne discloses a hydration unit that contains electric motor drives, which Petitioner argues are variable frequency drives, with the motor, pumps, and control system for the hydration unit positioned on a single trailer. *Id.* at 54–55 (citing Ex. 1006 ¶¶ 44–45, 89, claim 2, Fig. 8; Ex. 1003 ¶ 141).

Petitioner argues that it would have been obvious to incorporate the motor and variable frequency drive of Payne's hydration unit, or the entirety of Payne's hydration unit, into Coli's hydration unit. *Id.* at 51–52.

Patent Owner does not advance arguments for this challenge apart from its contentions regarding claim 1 discussed in § II.E.1 above. PO Resp. 20.

Coli discloses that its blender module uses electric power "to effect blending of a fluid from the fluid source with a fluid additive from the fluid additive source to generate the fracturing fluid," and that its "electric blending operation permits greater accuracy and control of fracturing fluid additives." Ex. 1004, 3:14–17, 8:64–66. Petitioner's declarant interprets this discussion to disclose a hydration unit. Ex. 1003 ¶ 140. Payne discloses a fracturing system with a hydration unit including an electric-motor drive and a programmable automation controller (PAC). Ex. 1006 ¶¶ 88–89. Payne discloses that its programmable automation controllers communicate with variable frequency drives. *Id.* ¶ 39. Petitioner's declarant interprets Payne's electric-motor drive to be a variable frequency drive. Ex. 1003 ¶ 141. Petitioner argues that it would have been obvious to include these features of Payne's hydration unit in Coli's system "because such an improvement represents the use of a known technique (i.e., the VFD-controlled and trailer-mounted hydration unit) to predictably improve a similar system (i.e., the system of *Coli*) in the same way." Pet. 51 (citing Ex. 1003 ¶ 138; *KSR*, 550 U.S. at 416–18[6]).

[6] Petitioner cites to West's Supreme Court Reporter ("127 S.Ct. 1727, 1740") rather than the official United States Reports. Pet. 51.

Accordingly, for the foregoing reasons and those set forth in § II.E above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claim 9 are disclosed by the combination of Coli and Payne, and that Petitioner has set forth reasoning with rational underpinning why it would have been obvious to combine the teachings of these references to arrive at the claimed subject matter. *See, e.g.*, Pet. 51.

I. Alleged Objective Evidence of Nonobviousness

Notwithstanding what the teachings of the prior art would have suggested to one skilled in the art, objective evidence of nonobviousness (so called "secondary considerations") may lead to a conclusion that the challenged claims would not have been obvious. *In re Piasecki*, 745 F.2d 1468, 1471–72 (Fed. Cir. 1984). Objective evidence of nonobviousness "may often be the most probative and cogent evidence in the record" and "may often establish that an invention appearing to have been obvious in light of the prior art was not." *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling USA, Inc.*, 699 F.3d 1340, 1349 (Fed. Cir. 2012) (citing *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983)).

1. Petitioner's Asserted Failure to Address Evidence of Nonobviousness in the Petition

Patent Owner argues that Petitioner's challenges to the '724 patent "are improper" because "Petitioner failed to address the critical evidence of the objective indicia of nonobviousness presented during prosecution of" U.S. Patent No. 9,410,410 ("the '410 patent"). PO Resp. 21. Patent Owner argues that during the examination of the '410 patent, it submitted evidence

of secondary considerations, which Patent Owner asserts included "evidence of copying, industry praise, long-felt need, and commercial success related to the claimed technology." *Id.* at 22. Patent Owner argues that the Petition therefore fails to set forth "a *prima facie* case of obviousness." *Id.*

In this proceeding, we determined there was good cause to allow additional pre-institution briefing to address Patent Owner's asserted objective indicia of nonobviousness. *See* Ex. 1013 (Board email authorizing additional preliminary briefing); Paper 7, 6–10 (Petitioner presenting arguments regarding a lack of nexus); Paper 8, 6–10 (Patent Owner presenting additional arguments regarding asserted objective evidence of nonobviousness). To the extent that Patent Owner requests that we reconsider our determination that good cause existed to allow the additional briefing, we decline to consider such an untimely request. *See* 37 C.F.R. § 42.71(d) (setting a request for rehearing time limit of 14 days after entry of a non-final decision or a decision to institute a trial).

Additionally, the '724 patent does not claim priority to the '410 patent (*see* Ex. 1001, cover page; Ex. 1002, 4). Patent Owner does not explain persuasively why a party should be obligated to consider asserted objective evidence of nonobviousness submitted in an unrelated patent application.

Furthermore, to the extent Patent Owner argues for a per se rule that a Petitioner's failure to address known secondary considerations in a petition is unconditionally fatal to the petition (*see* PO Resp. 22), we decline to adopt such a rule. Notably, Patent Owner has cited no authority supporting such an interpretation. *See id.* And, as noted below, objective evidence is only relevant to the obviousness inquiry if there is a nexus between it and the claimed invention, and Patent Owner bears the burden on the nexus inquiry.

This suggests that it is not necessarily true that a petition is defective for not preempting argument on matters not yet made of record in the proceeding by Patent Owner.

2. Nexus

"In order to accord substantial weight to secondary considerations in an obviousness analysis, 'the evidence of secondary considerations must have a "nexus" to the claims, *i.e.*, there must be "a legally and factually sufficient connection" between the evidence and the patented invention.'" *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) (citing *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332 (Fed. Cir. 2019)). "The patentee bears the burden of showing that a nexus exists . . . ." *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999). Nexus is a legally and factually sufficient connection between the objective evidence and the claimed invention, such that the objective evidence should be considered in determining nonobviousness. *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988). A nexus is presumed when "the patentee shows that the asserted objective evidence is tied to a specific product and that product 'embodies the claimed features, and is coextensive with them.'" *Fox Factory*, 944 F.3d at 1373 (quoting *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018)). "A finding that a presumption of nexus is inappropriate does not end the inquiry into secondary considerations," as "the patent owner is still afforded an opportunity to prove nexus by showing that the evidence of secondary considerations is the

'direct result of the unique characteristics of the claimed invention.'" *Id.* at 1373–74 (citing *In re Huang*, 100 F.3d 135, 140 (Fed. Cir. 1996)).

Patent Owner argues that a nexus should be presumed because its "Clean Fleet® technology embodies the features of the Challenged Claims of the '724 Patent." PO Resp. 26. Continuing, Patent Owner argues that there is a nexus between the asserted evidence of copying and the invention claimed in the '724 patent because "both of the competing systems embody the claimed Clean Fleet® elements claimed in '724 Patent."[7] *Id.* at 24.

Petitioner argues that a presumption of nexus is not warranted in this proceeding because "[Patent Owner] merely asserts in conclusory fashion that '[Patent Owner's] Clean Fleet® technology embodies the features of the Challenged Claims of the '724 Patent,'" but "offers no evidence (e.g., claim chart)" to support its assertions. Pet. Reply 22. Continuing, Petitioner argues that "[Patent Owner] points to the *same* Clean Fleet® product for non-obviousness across *sixteen* patents." *Id.* at 22–23 (citing *Fox Factory*, 944 F.3d at 1377). Petitioner argues that the Clean Fleet product cannot be coextensive with the '724 patent because Patent Owner's other patents include features not recited in the '724 patent claims, including a heater, a pump down pump, capturing real-time images, and a weight monitoring system. *Id.* at 23.

Petitioner also argues that Patent Owner has not established a nexus because "[Patent Owner] does not tie the secondary considerations to the '724 Patent or show shown that Clean Fleet® embodies the claimed

[7] It is not clear what Patent Owner means by "competing systems," as Patent Owner does not identify any competing systems or products. *See* PO Resp. 23–24.

combination." Pet. Reply 24. Petitioner argues that Coli discloses "'pumps driven by electric motors and electric blending units'—the purported nexus," and "[t]here is no nexus when the claimed feature tied to secondary evidence was 'indisputably known in the prior art.'" *Id.* (citing *Norvatis AG v. Torrent Pharm. Ltd.*, 853 F.3d 1316, 1331 (Fed. Cir. 2017); *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 33 at 33 (PTAB Jan. 24, 2020) (designated precedential)).

Finally, Petitioner argues that the '410 patent "is prior art to the '724 Patent under [35 U.S.C.] §[§]102(a)(1)-(a)(2)" and, thus, any objective indicia of nonobviousness presented during prosecution of the '410 patent is attributable to the prior art rather than to the '724 patent. Pet. Reply 21 n.3.

Patent Owner bears the burden of showing that a nexus exists. *WMS Gaming*, 184 F.3d at 1359. Patent Owner has not established persuasively that it is entitled to a presumption of nexus. Patent Owner does not provide details regarding its Clean Fleet product, and, thus, fails to establish persuasively that the Clean Fleet product "embodies the claimed features, and is coextensive with them." *Fox Factory*, 944 F.3d at 1373 (quoting *Polaris*, 882 F.3d at 1072). Thus, on this record, Patent Owner has not shown sufficiently that it is entitled to a presumption of nexus.

For the same reasons, Patent Owner also has not satisfied its burden to establish a nexus, absent a presumption, between the claims of the '724 patent and the asserted evidence of nonobviousness. Patent Owner does not provide details regarding its Clean Fleet product, and, thus, fails to establish persuasively that the asserted evidence of secondary considerations is the "direct result of the unique characteristics of the claimed invention." *Fox Factory*, 944 F.3d at 1373–74.

Moreover, to the extent Patent Owner asserts that it is simply the use of an electric motor, electric pumps, and electric blenders in hydraulic fracturing that corresponds to objective indicia of nonobviousness (*see* PO Resp. 24, 26–27), the evidence of record establishes that the prior art discloses the use of such equipment. *See* Ex. 1004, 6:10–12, 6:43–47, 8:58–64; *In re Kao*, 639 F.3d at 1069 ("there must be a nexus to some aspect of the claim not already in the prior art").

Nor has Patent Owner addressed meaningfully the fact that it asserts that the same Clean Fleet product is embodied by several of its patents. *See Fox Factory*, 944 F.3d at 1378 ("The same evidence of secondary considerations cannot be presumed to be attributable to two different combinations of features."). Patent Owner does not address in any manner the other patents for which it asserts its Clean Fleet product embodies the claims. Notably, Patent Owner does not address the components noted by Petitioner as being claimed in others of Patent Owner's patents that are not recited in the '724 patent. *See* Pet. Reply 23. We additionally note that, in other proceedings, Patent Owner ascribed commercial success to features unrecited in the '724 patent. *See, e.g.*, IPR2021-01238, Paper 22 at 48–49 (touting "[Patent Owner's] PowerPath® features" and the "use of switchgear on both sides of the high voltage highline cables").

Thus, for at least the foregoing reasons, Patent Owner fails to establish a nexus between its Clean Fleet product and the claims of the '724 patent.

3. Patent Owner's Asserted Evidence

Even if we were to find that Patent Owner had proven nexus, we find that Patent Owner's evidence of objective indicia is entitled to little weight, as discussed below.

a. Copying

"Copying may indeed be another form of flattering praise for inventive features." *Crocs, Inc. v. ITC*, 598 F.3d 1294, 1311 (Fed. Cir. 2010). Copying "requires evidence of efforts to replicate a specific product." *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010). "This may be demonstrated either through internal documents; direct evidence such as disassembling a patented prototype, photographing its features, and using the photograph as a blueprint to build a virtually identical replica; or access to, and substantial similarity to, the patented product (as opposed to the patent)." *Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) (internal citations omitted). "We note, however, that a showing of copying is only equivocal evidence of nonobviousness in the absence of more compelling objective indicia of other secondary considerations." *Ecolochem, Inc. v. S. Cal. Edison Co.*, 227 F.3d 1361, 1380 (Fed. Cir. 2000); *see also In re GPAC*, 57 F.3d at 1580 ("[M]ore than the mere fact of copying by an accused infringer is needed to make that action significant to a determination of the obviousness issue." (quoting *Cable Elec. Prods. v. Genmark, Inc.*, 770 F.2d 1015, 1028 (Fed. Cir. 1985))).

Patent Owner argues that "there is evidence that Petitioner copied [Patent Owner's] claimed Clean Fleet® system because Petitioner had access to the claimed invention and Petitioner's product is substantially

similar." PO Resp. 23 (citing Ex. 2016, 15; Ex. 2008, 29).[8] Patent Owner asserts that "[a] comparison of the competing products shows that the competing products are substantially similar." *Id.* (citing Ex. 2019).

Petitioner argues that "[Patent Owner's] alleged evidence of copying is . . . insufficient" because "[Patent Owner's] copying allegations are not tied to the Challenged Claims." Pet. Reply 25.

Patent Owner references "[a] comparison of [Petitioner's] competing products [that] shows that the competing products are substantially similar" to Patent Owner's Clean Fleet Product. PO Resp. 23 (citing Ex. 2019). Patent Owner also references a "detailed" comparison between Petitioner's and Patent Owner's products. *Id.* at 23–24 (citing Ex. 2019) ("As detailed below, Petitioner's 'All Electric Fracturing Fleet' is substantially similar to [Patent Owner's] claimed Clean Fleet® product and electric-fracturing fleet technology."). However, Patent Owner does not present any such comparisons. *See generally* PO Resp. Nor does the cited exhibit provide such a comparison. To the contrary, Exhibit 2019 appears to be marketing materials for Petitioner's electric fleet of fracturing products. Patent Owner's reliance on such unproduced comparisons is unavailing.

Patent Owner's reliance on the declaration of Joel N. Broussard (Ex. 2016) is also problematic. *See* PO Resp. 23 (citing Ex. 2016 ¶¶ 15–16).

[8] We note that Patent Owner's citations to Exhibit 2016 appear to refer to paragraph numbers, as there are only ten pages in this exhibit. Patent Owner's citations to Exhibit 2008 appear to be in error, as Exhibit 2008 is the Declaration of Mr. Schaaf, which does not appear to address objective evidence of nonobviousness. Additionally, the pages of Exhibit 2008 cited by Patent Owner in its Response are within Mr. Schaaf's Curriculum Vitae rather than in his testimony.

Mr. Broussard is Patent Owner's President and Chief Executive Officer. Ex. 2016 ¶ 2. Thus, Mr. Broussard is not an unbiased declarant, and it is not clear that his declaration qualifies as *objective* evidence. Furthermore, the cited portions of Mr. Broussard's declaration consist entirely of unsupported assertions, to which we ascribe little weight. Although Mr. Broussard provides citations in footnotes, notably neither of the footnotes for the cited paragraphs identify any exhibits in this proceeding. *See id.* at 7 n.10, 8 n.11.

The additional exhibits cited by Patent Owner in support of its assertions of copying are also inadequate evidence. For example, Patent Owner cites Exhibit 2005 in support of its assertion that its Clean Fleet product was deployed to "widespread industry praise and recognition," presumably to suggest that Petitioner knew of Patent Owner's products. PO Resp. 22 (citing Ex. 2005, 143–99). Exhibit 2005 is an excerpt of the '410 patent prosecution history (PO Resp. iii) and contains only fifty-seven pages. To the extent Patent Owner relies on the discussion of asserted objective indicia of nonobviousness, Exhibit 2005 consists almost entirely of unsupported attorney assertions rather than evidence (*see Icon Health & Fitness, Inc. v. Strava, Inc.*, 849 F.3d 1034, 1043 (Fed. Cir. 2017) ("Attorney argument is not evidence.")) and the declaration of a biased party (Jared Oehring, Patent Owner's Vice President of Technology). We do not find such evidence to be objective or persuasive of nonobviousness of the challenged claims.

Finally, in arguing that Petitioner copied its Clean Fleet system, Patent Owner asserts that Petitioner had access to its system because Patent Owner's "product had been in the market since 2014." PO Resp. 23. Patent Owner does not identify any evidence that Petitioner actually did have

access to Patent Owner's Clean Fleet product. Rather, Patent Owner merely surmises that Petitioner had access because Patent Owner's product had been used in public. Such a mere assertion is not evidence of copying. *See Iron Grip Barbell Co.*, 392 F.3d at 1325.

Accordingly, for at least the foregoing reasons, we find Patent Owner's evidence of copying to be weak.

b. Commercial Success

"When a patentee can demonstrate commercial success, usually shown by significant sales in a relevant market, and that the successful product is the invention disclosed and claimed in the patent, it is presumed that the commercial success is due to the patented invention." *J.T. Eaton & Co. v. Atl. Paste & Glue Co.*, 106 F.3d 1563, 1571 (Fed. Cir. 1997) (citing *Demaco*, 851 F.2d at 1392–93). However, "the asserted commercial success of the product must be due to the merits of the claimed invention beyond what was readily available in the prior art." *Id.* (citing *Richdel, Inc. v. Sunspool Corp.*, 714 F.2d 1573, 1580 (Fed. Cir. 1983)).

Patent Owner argues that its Clean Fleet product is commercially successful due to its inclusion of, "among other features, the electric blenders of the '724 Patent." PO Resp. 25 (citing Ex. 2021). Patent Owner contends that its "all-electric fleets comprise approximately 33% of the current [electric fleet] market." *Id.* at 25 (citing Ex. 2017; Ex. 2018). Patent Owner asserts that it has licensed its technology. *Id.* at 26 (citing Ex. 2018).

Petitioner argues that "[Patent Owner's] purported evidence of commercial success is insufficient" because "[Patent Owner] presents no

sales or revenue information indicating any actual commercial success." Pet. Reply 25.

Patent Owner presents no analysis to support its contentions, instead relying on conclusory assertions. Nor does Patent Owner discuss its cited exhibits in any detail to explain how the asserted exhibits support Patent Owner's conclusory assertions. For example, Patent Owner cites to Exhibit 2021 as support for its contention that the alleged commercial success of its Clean Fleet product is due to its included electric blenders. PO Resp. 25. Exhibit 2021 purports to be Patent Owner's "Full-Year and Fourth Quarter 2021 Financial and Operational Results," but this exhibit does not appear to discuss blenders. It is not clear, and Patent Owner does not explain, how Exhibit 2021—or the other exhibits cited by Patent Owner—support its assertions of commercial success.

Patent Owner also relies heavily on Exhibits 2017 and 2018 in support of its contentions. PO Resp. 24–26. We discuss each reference in turn.

Exhibit 2017 appears to be a printout of a Natural Gas Intelligence website post. While the post mentions Patent Owner in conjunction with "an entirely gas-powered fleet" (Ex. 2017, 5–6), Patent Owner does not explain adequately how the post relates to its assertions of commercial success. For at least this reason, we do not find Exhibit 2017 persuasive of commercial success.

Exhibit 2018 appears to be a printout of an S&P Global Market Intelligence website post. While the post states that CNX Resources Corporation outlined a three-year agreement with Patent Owner for an electric fracturing fleet (Ex. 2018, 2), no details of the agreement or how it might relate to the '724 patent are provided. Patent Owner relies on this

exhibit in support of its assertion that ProFrac licensed its "claimed technology." PO Resp. 26. Exhibit 2018, however, does not appear to mention ProFrac or any such licensing. Moreover, Patent Owner has not entered the asserted license(s) into the record in this proceeding. Therefore, we are unable to evaluate the veracity of Patent Owner's assertions or determine if the '724 patent is included in the asserted license. Moreover, Patent Owner's attempt to establish that the purported license includes the '724 patent without making the license of record in this proceeding violates the best evidence rule. *See* Fed. R. Evid. 1002 ("An original writing, recording, or photograph is required in order to prove its content unless these rules or a federal statute provides otherwise."); 37 C.F.R. § 41.152(a) ("Except as otherwise provided in this subpart, the Federal Rules of Evidence shall apply to contested cases."). For at least these reasons, we do not find Exhibit 2018 persuasive of commercial success.

Accordingly, for at least the foregoing reasons, we find Patent Owner's evidence of commercial success to be weak.

4. Conclusion

For at least the reasons explained above, Patent Owner's asserted objective evidence of nonobviousness is weak and lacks a nexus to the claims of the '724 patent.

J. Ultimate Conclusion of Obviousness

Petitioner has shown that the individual limitations of claims 1–17 of the '724 patent are disclosed by various combinations of prior art references, and Petitioner provides persuasive arguments regarding why a person of ordinary skill in the art would have modified and combined those teachings.

Patent Owner's objective indicia is comparatively weak. When considering all of the evidence of obviousness and nonobviousness together (*see In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Patent Litig.*, 676 F.3d 1063, 1079 (Fed. Cir. 2012)), we conclude Petitioner has demonstrated by a preponderance of the evidence that these challenged claims would have been obvious over the prior art in each of the Petition's obviousness challenges.

III. PATENT OWNER'S MOTION TO AMEND

Patent Owner's Motion to Amend is contingent on a determination of unpatentability of one or more challenged patent claims. MTA 1. Having determined that Petitioner has shown by a preponderance of the evidence that original claims 1–17 of the '724 patent are unpatentable, we proceed to address Patent Owner's Motion. Patent Owner proposes substitute claims 18–34 to replace challenged patent claims 1–17. *Id.* A listing of the proposed substitute claims is provided by Patent Owner in Appendix A of the Motion.

For the reasons discussed below, Patent Owner has shown that proposed substitute claims 27–34 meet the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121. However, Patent Owner has failed to make such a showing for proposed substitute claims 18–26. Additionally, for the reasons discussed below, Petitioner has proven by a preponderance of the evidence that proposed substitute claims 18–34 are indefinite.

Therefore, we *deny* Patent Owner's Motion to Amend.

A. Principles of Law

In an *inter partes* review, amended claims are not added to a patent as of right, but rather must be proposed as a part of a motion to amend claims. 35 U.S.C. § 316(d). Ordinarily, the petitioner "bears the burden of persuasion to show, by a preponderance of the evidence, that any proposed substitute claims are unpatentable." 37 C.F.R. § 42.121(d)(2); *Lectrosonics*, Paper 15, 3–4 (PTAB Feb. 25, 2019) (designated precedential); *Bosch Auto. Serv. Sols. LLC v. Matal*, 878 F.3d 1027, 1040 (Fed. Cir. 2017).

But before considering the patentability of the substitute claims, we first must determine whether the motion to amend meets the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121. *Lectrosonics*, Paper 15 at 4. In that regard, Patent Owner bears the burden of persuasion to show that: (1) the amendment proposes a reasonable number of substitute claims; (2) the amendment responds to a ground of unpatentability involved in the trial; (3) the amendment does not seek to enlarge the scope of the claims of the patent or introduce new subject matter; and (4) the original disclosure sets forth written description support for each proposed substitute claim. *Id.*; 35 U.S.C. § 316(d); 37 C.F.R. § 42.121(d)(1).

B. The Proposed Substitute Claims

Patent Owner proposes to amend the '724 patent by adding new claims 18–34 as respective substitutes for original claims 1–17. *See* MTA 2, App. A. Claim 18 is proposed as a substitute for original claim 1, and is reproduced below. Underlined language reflects subject matter added to

original claim 1, and double-bracketed language reflects subject matter omitted from original claim 1.

> 18. A hydraulic fracturing system for fracturing a subterranean formation comprising:
>
> an electric pump fluidly connected to a well associated with the subterranean formation, and configured to pump fluid into a wellbore associated with the well at a high pressure so that the fluid passes from the wellbore into the subterranean formation and fractures the subterranean formation;
>
> one or more ancillary units associated with the fluid pumped into the wellbore, the one or more ancillary units comprising a blender, the blender being positioned on a trailer and fluidly connected to an auger, wherein one or more second motors are positioned any of proximate a top elevation of the auger or proximate a bottom elevation of the auger, or a combination thereof, such that the one or more second motors provide power to drive the auger;
>
> a first motor electrically coupled to the electric pump to operate the electric pump;
>
> the one or more second motors comprising one or more electric motors, each of the one or more second motors electrically coupled to at least one of the one or more ancillary units to operate the at least one of the one or more ancillary units; [[and]]
>
> a plurality of variable-frequency drives (VFD), each VFD connected to at least one of the first motor or the one or more second motors to control the speed of the first motor or the one or more second motors<u>; and</u>
>
> <u>a plurality of transformers supplying power at a stepped-down voltage to the blender</u>.

Id. at App. A (pgs. 1–2). Claim 27 is proposed as a substitute for original claim 10, and is reproduced below. Underlined language reflects subject matter added to original claim 10.

27. A hydraulic fracturing system for fracturing a subterranean formation comprising:

an electric pump fluidly connected to a well associated with the subterranean formation, and configured to pump fluid into a wellbore associated with the well at a high pressure so that the fluid passes from the wellbore into the subterranean formation and fractures the subterranean formation;

one or more ancillary units associated with the fluid pumped into the wellbore, the one or more ancillary units comprising a blender, the blender being positioned on a trailer and fluidly connected to an auger, the blender further comprising a secondary power unit, separate from the one or more second motors, to drive operation of a hopper of the blender prior to electrical power being provided to the one or more second motors, wherein one or more second motors are positioned any of proximate a top elevation of the auger or proximate a bottom elevation of the auger, or a combination thereof, such that the one or more second motors provide power to drive the auger;

a first motor electrically coupled to the electric pump to operate the electric pump;

the one or more second motors comprising an electric motor, and each of the one or more second motors electrically coupled to at least one of the one or more ancillary units to operate the at least one of the one or more ancillary units; and

a plurality of variable-frequency drives (VFD), each VFD connected to at least one of the first motor or the one or more second motors to control the speed of the first motor or the one or more second motors.

Id. at App. A (pgs. 5–6). Claim 34 is proposed as a substitute for original claim 17, and is reproduced below. Underlined language reflects subject matter added to original claim 17.

34. A method for powering one or more ancillary units associated with a hydraulic fracturing system, the method comprising:

fluidly connecting an electric pump to a well associated with a subterranean formation, the electric pump configured to pump fluid into a wellbore associated with the well at a high pressure so that the fluid passes from the wellbore into the subterranean formation and fractures the subterranean formation;

fluidly connecting the one or more ancillary units with the fluid pumped into the wellbore, the one or more ancillary units comprising a blender, the blender being positioned on a trailer and fluidly connected to an auger, wherein one or more second motors are positioned any of proximate a top elevation of the auger or proximate a bottom elevation of the auger, or a combination thereof, such that the one or more second motors provide power to drive the auger, the blender further comprising electrically actuated valves associated with a manifold crossover and operable via a secondary power source to bypass one or more components of the blender;

electrically coupling a first motor to the electric pump to operate the electric pump;

electrically coupling the one or more second motors to each of the one or more ancillary units to operate the one or more ancillary units, the one or more second motors comprising an electric motor; and

connecting each of a plurality of variable-frequency drives (VFD) to at least one of the first motor or the one or more second motors to control the speed of the first motor or the one or more second motors.

Id. at App. A (pgs. 8–9). Proposed substitute claims 19–26 and 28–33 correspond to original claims 2–9 and 11–16, respectively, and are amended only to change their dependencies. *Id.* at App. A (pgs. 2–8).

C. Statutory and Regulatory Requirements

1. Reasonable Number of Substitute Claims

A motion to amend must "propose a reasonable number of substitute claims." 35 U.S.C. § 316(d)(1)(B); *see also* 37 C.F.R. § 42.121(a)(3) ("A motion to amend may cancel a challenged claim or propose a reasonable number of substitute claims."). "There is a rebuttable presumption that a reasonable number of substitute claims per challenged claim is one (1) substitute claim." *Lectrosonics*, Paper 15 at 4; *see also* 37 C.F.R. § 42.121(a)(3).

Patent Owner proposes no more than one substitute claim for each challenged claim. MTA 2, App. A. Petitioner does not contend that Patent Owner proposes more than a reasonable number of substitute claims. *See generally* MTA Opp. We determine that Patent Owner has proposed a reasonable number of substitute claims.

2. Responsive to a Ground of Unpatentability

"A motion to amend may be denied where . . . [t]he amendment does not respond to a ground of unpatentability involved in the trial." 37 C.F.R. § 42.121(a)(2)(i). The Petition asserts that claims 1–17 are unpatentable over prior art. As shown above, through the Motion to Amend, Patent Owner has sought to change the substantive features of all challenged independent claims (claims 1, 10, and 17). The proposed amendments to the other challenged dependent claims make them depend, directly or indirectly, on the proposed substitute independent claims. Petitioner does not contend that the proposed amendments fail to respond to a ground of unpatentability in this trial. *See generally* MTA Opp. We determine that the proposed

amendments are responsive to a ground of unpatentability involved in this trial.

3. Scope of the Claims

An amendment may not enlarge the scope of the claims of the patent. 35 U.S.C. § 316(d)(3); 37 C.F.R. §§ 42.121(b)(1), 42.121(b)(2). Patent Owner asserts that proposed substitute independent claims 18, 27, and 34 each recite additional limitations relative to the claims they substitute and therefore do not enlarge the scope of the challenged claims. MTA 3–4. Petitioner does not contend that any proposed substitute claim enlarges the scope of any challenged patent claim. *See generally* MTA Opp. We determine that each proposed substitute claim includes narrowing limitations and does not violate the statutory and regulatory prohibition of enlarging the scope of patent claims.

4. Support in the Original Disclosure

An amendment may not introduce new matter. 35 U.S.C. § 316(d)(3); 37 C.F.R. §§ 42.121(b)(1), 42.121(b)(2). New subject matter is any addition to the claims that lacks sufficient support in the subject patent's original disclosure. *See TurboCare Div. of Demag Delaval Turbomach. v. Gen. Elec. Co.*, 264 F.3d 1111, 1118 (Fed. Cir. 2001) ("When [an] applicant adds a claim . . . , the new claim[] must find support in the original specification."). Patent Owner also is required to show written description support in "the original disclosure of the patent for each claim that is . . . amended," and in "an earlier-filed disclosure for each claim for which benefit of the filing date of the earlier filed disclosure is sought." 37 C.F.R. § 42.121(b).

a. Proposed Substitute Claims 18–26

Proposed substitute claim 18 recites the added limitation of "a plurality of transformers supplying power at a stepped-down voltage to the blender." MTA App. A (pg. 2). Patent Owner indicates that this amendment is supported by paragraphs 48, 49, and 51 and Figure 1 of the original specification filed as Application No. 15/644,487 ("the '487 application"), which matured into the '724 patent. *Id.* at 5; *see also* Ex. 1002, 32 (Figure 1), 48–50 (¶¶ 48–49, 51).

Petitioner argues that the added language requires "two or more transformers supplying stepped-down power to a single blender." MTA Opp. 1–2. Petitioner argues that the '487 application does not provide support for this limitation. *Id.* at 2.

We agree with Petitioner. The portions of the '487 application cited by Patent Owner disclose a number of transformers 105-a–105-j. Transformers 105-a–105-h supply stepped-down voltage to variable frequency drives 110-a–110-h, which control power provided to fracturing pumps 115-a-1–105-h-2. Ex. 1002, 32, 48. Transformer 105-i provides power to sand equipment 145 and blender 165-a, and transformer 105-j provides power to hydration unit 160, blender 165-b, and chemical additive unit 170. *Id.* at 32, 49. Thus, the '487 application discloses two transformers (105-i, 105–j) that each supply power to a separate blender. However, the '487 application does not appear to disclose a plurality of transformers supplying power to a single blender as recited in proposed substitute claim 18. *See* MTA Opp. 1–2.

In its Reply, Patent Owner argues "the '724 Patent provides alternative configurations where the [transformers] 105-i, 105-j 'can include

connections for two or more pieces of equipment.'" MTA Reply 2 (citing Ex. 1001, 8:46–60). Patent Owner argues that "the '724 Patent explicitly indicates a desire to 'provide redundancy such that if one switchgear, turbine, or transformer has a failure, the other blender will still be operational.'" *Id.* (citing Ex. 1001, 8:40–45). Patent Owner concludes by asserting that "the '724 Patent does not preclude a configuration where each of the transformers 105-i and 105-j are coupled to each of the blenders 165-a and 165-b." *Id.*

We are not persuaded by Patent Owner's arguments. Initially, we note that Patent Owner cites to the '724 patent rather than to the '487 application as required by our rules. *See* 37 C.F.R. § 42.121(b). Nonetheless, it appears that the language relied upon by Patent Owner appears in paragraphs 55 and 56 of the '487 application. *Compare* Ex. 1001, 8:40–60, *with* Ex. 1002, 51. Paragraph 55 explains that it is the connection of the blender units to *separate* transformers that provides blender redundancy touted by Patent Owner. Ex. 1002, 51. Additionally, as noted above, the connections to "two or more pieces of equipment" noted by Patent Owner relates to providing power to sand equipment 145 and blender 165-a with transformer 105-i and providing power to hydration unit 160, blender 165-b, and chemical additive unit 170 with transformer 105-j. *Id.* at 32, 49. And, of course, Patent Owner's assertion that the arrangement recited in proposed substitute claim 18 is not precluded by the '487 application specification does not satisfy Patent Owner's burden to provide written description support for the proposed substitute claim, which Patent Owner has failed to do.

For the foregoing reasons, we conclude that Patent Owner has failed to meet its burden of showing that proposed substitute claim 18 and its proposed substitute dependent claims 19–26 have support in the original disclosure of the '724 patent. Accordingly, we deny the Motion to Amend the '724 patent as to these claims.

b. Proposed Substitute Claims 27–33

Proposed substitute claim 27 recites the added limitation of "the blender further comprising a secondary power unit, separate from the one or more second motors [(that are electrically coupled to and operate the ancillary units comprising the blender)], to drive operation of a hopper of the blender prior to electrical power being provided to the one or more second motors." MTA App. A (pg. 5). Patent Owner indicates that this amendment is supported by paragraphs 10–12, 24–25, 32, 62, 66, and 69–73 and Figures 1–5 of the '487 application. *Id.* at 7; *see also* Ex. 1002, 32–35 (Figures 1–5), 39–43 (¶¶ 10–12, 24–25), 45 (¶ 32), 53–59 (¶¶ 62, 66, 69–73).

Petitioner argues that "'secondary power unit' does not appear in the . . . '487 Application." MTA Opp. 2–3. Petitioner notes that "[t]he acronym 'SPU' does appear," but argues that, "[t]o the extent 'SPU' even is a secondary power unit, the '487 Application does not disclose the SPU driving operation of the hopper or how the SPU is 'separate from the one or more second motors.'" *Id.* at 3 (citing Ex. 1027 ¶ 42).

The '487 application discloses that

> blenders 165-a, 165-b can . . . include a battery powered electric hopper raise/lower system to facilitate "spotting" the blender during rig-in. This raise/lower system can allow a proppant

> hopper to be lowered into place before turbine power is connected, so that operators can see where the hopper will rest in relation to a sand conveyor.

Ex. 1002, 55. Thus, the '487 application discloses a blender (blender 165-a, blender 165-b) comprising a secondary power unit (which is battery powered) separate from the second motors (which are turbine powered) that drives operation of a hopper (raise/lower system) prior to electrical power being provided to the second motors, as recited in proposed substitute claim 27.

Accordingly, Patent Owner has sufficiently identified adequate written description support for proposed substitute claim 27 and its proposed substitute dependent claims 28–33.

c. Proposed Substitute Claim 34

Proposed substitute claim 34 recites the added limitation of "the blender further comprising electrically actuated valves associated with a manifold crossover and operable via a secondary power source to bypass one or more components of the blender."[9] MTA App. A (pg. 8). Patent Owner indicates that this amendment is supported by paragraphs 10–12, 24–25, 32, 62, 66, and 69–73 and Figures 1–5 of the '487 application. *Id.* at 9; *see also* Ex. 1002, 32–35 (Figures 1–5), 39–43 (¶¶ 10–12, 24–25), 45 (¶ 32), 53–59 (¶¶ 62, 66, 69–73).

[9] We note Patent Owner's Claims Appendix (*see* MTA App. A (pg. 8)) contains an error in that the limitation "electrically actuated valves associated with" is added in proposed substitute claim 34 but is not underlined. *See also* MTA Reply 1 n.1 (Patent Owner acknowledging its mistake).

Petitioner argues that "electrically actuated valves" appears only in paragraph 66 of the '487 application and the valves are associated with the hopper raise/lower system, not the manifold crossover. MTA Opp. 3. Petitioner also argues that there is no support for the added "secondary power source." *Id.* at 3–4.

The '487 application discloses that the electrically-powered hopper raise/lower system can be tied-in to the battery system of the electrically actuated valves. Ex. 1002, 55 ("With the introduction of electrically actuated valves according to the present disclosure, the raise/lower system can be tied into that battery system."). The '487 application explains that the electrically actuated valves "can allow the blender operator to open a manifold crossover in the event of an electrical failure (e.g., turbine shutdown, ground fault, cable disconnection, breaker opening, etc.)." *Id.* The '487 application further explains that "[t]he manifold crossover can be a pipe that spans from the suction manifold to the discharge manifold, bypassing the mixing tub, discharge pump, and metering instrumentation." *Id.*

Thus, the '487 application discloses a blender comprising electrically actuated valves associated with a manifold crossover and operable via a secondary power source (battery powered) to bypass one or more components of the blender (mixing tub, discharge pump, metering instrumentation), as recited in proposed substitute claim 34.

Accordingly, Patent Owner has sufficiently identified adequate written description support for proposed substitute claim 34.

D. Petitioner's Assertions of Unpatentability

Petitioner contends that the proposed substitute claims are indefinite. MTA Opp. 4–7. Petitioner also contends that the proposed substitute claims are unpatentable under 35 U.S.C § 103 as being obvious in view of the following combinations of references:

Claim(s) Challenged	Reference(s)
18–21, 23–26, 34	Coli, Payne
27–29, 31–33	Coli
27–29, 31–33	Coli, Fisher[10]
21, 22	Coli, Payne, Broussard
29, 30	Coli, Fisher, Broussard

Id. at 8.

1. Asserted Indefiniteness

Petitioner notes that each substitute claim recites an electric pump "configured to pump fluid into a wellbore associated with the well at a high pressure" and argues that each substitute claim is indefinite because "[t]he term 'high pressure' is a subjective term of degree that changes based on several other parameters, and the intrinsic record does not 'provide objective boundaries for those of skill in the art.'" MTA Opp. 4 (quoting *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2018)). Petitioner argues that "high pressure" as used in the proposed substitute claims "is 'purely subjective' and depends 'on the unpredictable vagaries of any one person's opinion,' and is thus indefinite." *Id.* at 5 (quoting

[10] US 6,808,303 B2, issued October 26, 2004 (Ex. 1026).

Intellectual Ventures I LLC v. T-Mobile USA, Inc., 902 F.3d 1372, 1381 (Fed. Cir. 2018)). Petitioner argues that the "surrounding claim language does not resolve the indefiniteness of 'high pressure'" because "whether 'the fluid passes from the wellbore into the subterranean formation and fractures the subterranean formation' depends on the fluid, the formation, and a large set of other operational parameters beyond just the 'pressure.'" *Id.* Petitioner argues that Patent Owner's experts do not agree on the definition of "high pressure" (*id.* at 6 (citing Ex. 1020, 111:1–112:21; Ex. 1022, 43:6–46:1; Ex. 1024)) and the specification of the '724 patent does not provide guidance regarding the meaning of "high pressure" (*id.* at 7 (citing Ex. 1001, 11:28–33, 13:16–18)). Finally, Petitioner argues that "[t]he specification of the '724 Patent does not provide any 'objective baseline' to enable a POSITA to differentiate 'high pressure' from non-high pressure." *Id.* at 7 (citing Ex. 1027 ¶¶ 49–50).

In the Preliminary Guidance, we interpreted "high pressure" to mean "pressure needed for the fluid that passes from the wellbore into the subterranean formation and to fracture the subterranean formation." MTA PG 9. We based our preliminary interpretation[11] on the stated purpose of the '724 patent to fracture subterranean formations and its consistent reference to the pressure necessary to perform this hydraulic fracturing as "high pressure," as well as the functional language of the claims reciting this purpose ("so that the fluid passes from the wellbore into the subterranean formation and fractures the subterranean formation"). *Id.* (citing Ex. 1001, 2:48–57, 3:48–55, 4:3–11).

[11] *See* MTA PG 2 ("In this Preliminary Guidance, we provide information indicating our initial, preliminary, non-binding views . . . .").

Petitioner replies that "[t]he term 'high' (in 'high pressure') is not a nonce word and should be given meaning." MTA Sur-reply 3. According to Petitioner, "there would be no need for the claim to specify that the pump be configured to pump fluid at 'high pressure' (instead of any other level of pressure, such as 'medium pressure' or simply 'pressure'), because the remaining language in the claim already provides this requirement." *Id.*

Patent Owner argues that Petitioner's arguments "attempt to remove the term 'high pressure' from the context of the claims, namely, hydraulic fracturing operations." MTA Reply 5. Patent Owner relies on the testimony of its declarants to "provide[] ranges that the POSITA would recognize are associated with 'high pressure' pumping operations for hydraulic fracturing," noting that "Mr. Marscher identified a range of 'between 5,000 and 15,000 psi' as being high pressure" and "Mr. Schaaf identified a range of '8,000 to 12,000 psi.'" *Id.* (citing Ex. 1020, 111:3–5; Ex. 1022, 43:17–19).

"Claim language employing terms of degree has long been found definite where it provided enough certainty to one of skill in the art when read in the context of the invention." *Interval Licensing*, 766 F.3d at 1370. However, "[t]erms of degree are problematic if their baseline is unclear to those of ordinary skill in the art." *Liberty Ammunition, Inc. v. United States*, 835 F.3d 1388, 1395 (Fed. Cir. 2016). The '724 patent states that the purpose of its system is to fracture subterranean formations and consistently refers to the pressure necessary to perform this hydraulic fracturing as "high pressure." *See* Ex. 1001, 2:48–57, 3:48–55, 4:3–11, code (57). However, Patent Owner concedes that hydraulic fracturing can be performed using "medium pressure." Prelim. Resp. 33–34 (arguing that although "*Coli* does

teach pumping pressurized fluid into the wellbore at *medium pressure and high rate*, *Coli* is silent about an electric pump . . . configured to pump fluid into a wellbore associated with the well at *high pressure*" (alterations in original)). Notably, both of Patent Owner's declarants agree that hydraulic fracturing can be performed at pressures other than "high" pressure. *See* Ex. 1020, 111:15–17 (Mr. Marscher testifying regarding "[v]ery high pressure"); Ex. 1022, 45:20–46:1 (Mr. Schaaf agreeing that "in some formations . . . the pressure needed to fracture those formations may not necessarily be high pressure"). Thus, the pressure needed for a fluid passing from a wellbore into a subterranean formation to fracture the formation is not necessarily "high pressure."

The intrinsic record does not "provide objective boundaries for those of skill in the art" to determine whether a given pressure is "high pressure" as recited in the proposed substitute claims. *See Interval Licensing*, 766 F.3d at 1371. Nor does the intrinsic record provide guidance to clarify the meaning of "high pressure." As noted above, the '724 patent refers only to "high pressure" without qualification or explanation as to how "high pressure" is determined. The prosecution history does not address "high pressure" in any meaningful way and, therefore, also fails to explain what pressures are "high" pressures. *See generally* Ex. 1002. Thus, the intrinsic record does not explain adequately what pressure(s) qualify as "high pressure," nor differentiate "high pressure" from other pressures at which hydraulic fracturing can be performed.

The extrinsic record also fails to define "high pressure." Patent Owner relies on the deposition testimony of its declarants to provide values to which an ordinarily skilled artisan would understand "high pressure" to

refer. MTA Reply 5 (citing Ex. 1020, 111:3–5; Ex. 1022, 43:17–19).[12]

Mr. Marscher testified as follows on June 21, 2022:

> Q. In the context of hydraulic fracturing pumps, what does high pressure mean?
>
> A. Well, ***typically a person in the art would say it's between 5,000 and 15,000 psi***. ***Maybe 10,000 psi would be a typical number these days***.
>
> I've also done work from time to time in the waterjet industry where you cut wood and fiberglass and even metal with a very high-pressure waterjet. And they use reciprocating pumps in that industry, too. My old company made some of them. In that case you've got to be up to at least 20,000 psi, and 40,000 is better. So it's very application dependent.
>
> And, you know, in the waterjet industry high pressure would be 20,000 to 40,000. Very high would be over 40,000. ***In the fracking industry, high pressure would be 5,000 to 15,000 in my opinion***. ***Very high would be over 15,000***. I think even today that's unusual. Might be needed from time to time in certain formations.
>
> In other industries, like in many chemical industries, we're using centrifugal pumps, single stage or, you know, two or three stages. High pressure would be considered anything over several hundred psi. So it depends on the application.
>
> But somebody who's a POSITA in the fracking industry would definitely think ***high pressure is 5,000 to 15,000 psi with an average value of 10 in my opinion***.

Ex. 1020, 2:1–3, 111:1–112:3 (emphases added).

[12] Although the depositions were taken in other Board proceedings, the parties agreed to use the deposition testimony in this proceeding. *See* Ex. 1024.

One week later, on June 29, 2022, Mr. Schaaf testified as follows:

Q. What rates of pressure would you consider high pressure?

A. Well, it's well-known to a person in -- in the industry what "high pressure" would mean.

Q. What does "high pressure" mean?

A. Well, to a POSITA the pressure is what -- they would understand what the "high pressure" is.

Q. I'm asking you [what] that understanding is.

A. Well, I think, generally, ***a POSITA would agree that 8,000 to 12,000 psi would be considered high pressure***.

Q. Would pressure above 12,000 psi be considered high pressure?

A. It could be considered, yes.

Q. Would pressure below 8,000 psi be considered high pressure?

A. To some people, you know, somewhat below it would be, you know, maybe the 7,500 psi, that would -- that would be considered high pressure. But, in general, it's -- ***it's agreed upon that 8,000 to 12,000 psi is high pressure***.

Q. Is it generally agreed upon that 5,000 to 15,000 psi is high pressure?

A. No.

Q. ***You would not consider 5,000 psi to be high pressure?***

A. ***Not when -- not when we're considering frac jobs, yeah***. ***That is correct.***

. . .

Q. . . . [L]et me know if this is correct. You would consider high pressure to be about 8,000 to 12,000 psi, but that

> certain fracturing jobs can take place at pressures that are not high pressure.
>
> A. Yes. And it's dependent on the formation itself, when the formation cracks or fractures. So the -- the hydraulic pressure or the pressure on the formations is what determines what it takes to fracture a well.

Ex. 1022, 1:12–14, 43:6–46:1 (emphases added).

As seen from this deposition testimony, however, Patent Owner's own witnesses cannot agree on a numerical definition of "high pressure." Mr. Marscher says high pressure is between 5,000 psi and 15,000 psi (*see* Ex. 1020, 111:1–112:3), whereas Mr. Schaaf says high pressure is between 8,000 psi and 12,000 psi and specifically disagrees with Mr. Marscher's testimony that high pressure can be below 8,000 psi (*see* Ex. 1022, 43:6–44:13). Although there are overlapping values in the witness testimony, we agree with Petitioner that the testimony does not evidence clear boundaries for how an ordinarily skilled artisan would interpret "high pressure." *See* MTA Sur-reply 6 (citing *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901–02 (2014); *Interval Licensing*, 766 F.3d at 1371). Thus, the testimony of Patent Owner's own witnesses is contrary to Patent Owner's position that an ordinarily skilled artisan would have understood the meaning of "high pressure."

Furthermore, neither Mr. Marscher nor Mr. Schaaf cites any objective evidence to support their respective notions of what "high pressure" might be, in the context of hydraulic fracturing. For example, neither witness cites to any published industry standards to support their respective opinions. This lack of objective evidentiary support weakens the persuasiveness of both witness's testimony on this issue, especially because their opinions

conflict with each other. We are instead persuaded by the testimony of Petitioner's witness, Dr. Durham, who testifies that "[t]here is [no] general consensus about the precise boundaries of the term 'high pressure,' and different engineers can reasonably come to different conclusions as to the meaning of the term absent further guideposts." Ex. 1027 ¶ 45; *see also id.* ¶ 47 ("There is no universally accepted definition of 'high pressure.'"). Dr. Durham further testifies that "what might be sufficiently 'high' pressure for one fracturing application and according to one POSITA may be *not* 'high' enough in another fracturing application and to another POSITA." *Id.* ¶ 46; *see also id.* ¶ 47 ("Merely stating that a pump fractures a formation says little to nothing about whether that pump should be deemed 'high pressure' or 'not high pressure.'").

Finally, we have reviewed the district court's opinion in litigation between the parties in which the court addressed substantially similar language as in the substitute proposed claims. *See* Ex. 1025, 8–18 (construing "electric pumps . . . configured to pump fluid into the wellbore at high pressure so that the fluid passes from the wellbore into the formation, and fractures the formation" as recited in claim 1 of the '410 patent). There, the court held that the term "high pressure" is fatally indefinite. *Id.* Our determination that "high pressure" as used in the proposed substitute claims is indefinite is not inconsistent with the district court's opinion.

Accordingly, for the foregoing reasons, we determine that "high pressure," when "viewed in light of the specification and prosecution history," fails to "inform those skilled in the art about the scope of the invention with reasonable certainty." *See Nautilus*, 572 U.S. at 910. Thus, Petitioner has shown, by a preponderance of the evidence, that the proposed

substitute claims are indefinite, and we accordingly deny the Motion to Amend.

2. Asserted Obviousness

We have already determined that proposed substitute claims 18–34 are unpatentable based on indefiniteness. We have also determined that proposed substitute claims 18–26 lack adequate written description support in the original disclosure of the '724 patent. Therefore, we need not, and to conserve the Board's resources we do not, reach Petitioner's art-based challenges to the proposed substitute claims.

IV. CONCLUSION[13]

Based on the evidence presented with the Petition, the evidence introduced during the trial, and the parties' respective arguments, Petitioner has shown, by a preponderance of the evidence, that claims 1–17 of the '724 patent are unpatentable. Petitioner has also shown, by a preponderance of the evidence, that proposed substitute claims 18–34 are unpatentable. In summary,

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

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–4, 6–8, 10–12, 14–17	102	Coli	1–4, 6–8, 10–12, 14–17	
1–4, 6–8, 10–12, 14–17	103	Coli	1–4, 6–8, 10–12, 14–17	
4, 5, 12, 13	103	Coli, Broussard	4, 5, 12, 13	
9	103	Coli, Payne	9	
Overall Outcome			1–17	

Motion to Amend Outcome	Claim(s)
Original Claims Cancelled by Amendment	
Substitute Claims Proposed in the Amendment	18–34
Substitute Claims: Motion to Amend Granted	
Substitute Claims: Motion to Amend Denied	18–34
Substitute Claims: Not Reached	

V. ORDER

Accordingly, it is:

ORDERED that claims 1–17 of the '724 patent have been shown to be unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Amend is *denied*; 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.

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