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Paper 40
Date: January 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.

IPR2021-01035
Patent 9,970,278 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
35 U.S.C. § 318(a)

Granting Patent Owner's Motion to Seal
37 C.F.R. § 42.14

I. INTRODUCTION

A. Background

Halliburton Energy Services, Inc. ("Petitioner") filed a Petition for *inter partes* review of claims 1–23 ("the challenged claims") of U.S. Patent No. 9,970,278 B2 (Ex. 1001, "the '278 patent"). Paper 2 ("Pet."). U.S. Well Services, LLC ("Patent Owner") filed a Preliminary Response. Paper 6. On January 18, 2022, we instituted an *inter partes* review of the challenged claims on all grounds raised in the Petition. Paper 12 ("Institution Decision" or "Inst. Dec."), 58.

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 16, "PO Resp."), Petitioner filed a Reply to the Patent Owner Response (Paper 26, "Pet. Reply"), and Patent Owner filed a Sur-reply to Petitioner's Reply (Paper 31, "PO Sur-reply"). An oral hearing was held on October 20, 2022. A transcript of the hearing has been entered into the record. Paper 38.

In our Scheduling Order, we notified the parties that "any arguments for patentability not raised in the [Patent Owner] response may be deemed waived." *See* Paper 13, 8; *see also* Patent Trial and Appeal Board Consolidated Trial Practice Guide ("CTPG") 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 1–23 of the '278 patent are unpatentable.

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

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 4, 1; Paper 39, 1.

C. Related Matters

The parties indicate that the '278 patent is the subject of the following district court proceedings:

> *US Well Services, Inc. v. Halliburton Co.*, No. 6-21-cv-00367 (W.D. Tex. filed Apr. 15, 2021) ("the Texas litigation"),
>
> *US Well Services, LLC v. Tops Well Services, LLC*, No. 3-19-cv-00237 (S.D. Tex. filed July 22, 2019), and
>
> *US Well Services, Inc. v. Tops Well Services, LLC*, No. 3-19-cv-00225 (S.D. Tex. filed July 3, 2019).

Pet. 1; Paper 4, 1. The parties also note other petitions for *inter partes* review filed by Petitioner and challenging patents owned by Patent Owner. Pet. 1–2; Paper 4, 2.

D. The Challenged Patent

The '278 patent relates to hydraulic fracturing in oil and gas wells, which entails pumping fluid into underground formations at high pressure. Ex. 1001, 1:17–31. Typically, this pumping is performed by large diesel-powered pumps. *Id.* at 1:32–34. The '278 patent purports to improve upon known fracturing systems and methods by using electric generators and motors to drive the pumps. *Id.* at 1:55–2:7. The '278 patent purports that

electric motors and generators can be loaded directly on a truck or trailer, increasing efficiency and lowering cost. *Id.* at 6:53–7:18.

Figure 1 shows a plan view of equipment used in the hydraulic fracturing operation and is reproduced below.

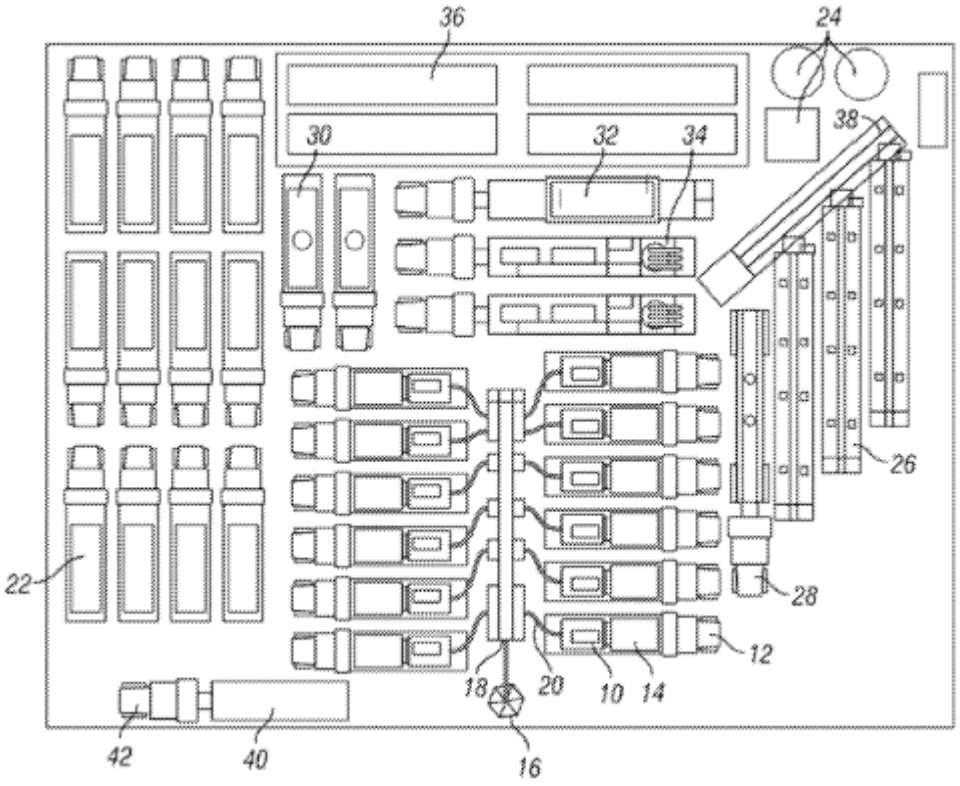

Figure 1 illustrates an overhead view of wellhead 16 fluidly connected to manifold trailer 18. Ex. 1001, 3:6–19, Fig. 1. Multiple pump trailers 12 are illustrated as trucks with attached trailers, located on both sides of manifold trailer 18. *Id.* Pump trailers 12 include pumps 10 and electric motors 14, both mounted on the pump trailers. *Id.* Electric generators 22, which may be natural gas turbines, provide power to electric motors 14 and are connected to the motors by power lines (not shown). *Id.* at 4:19–24, 4:37–39. Fracturing fluid lines 20 connect the pumps to the manifold trailer such that the manifold trailer is configured to deliver fracturing fluid from the pumps to the wellhead. *Id.* at 3:14–19.

Figure 1 also illustrates monitor/control data van 40 mounted on control vehicle 42. Ex. 1001, 5:7–20. The data van can be connected to the pumps and electric motors "to provide information to an operator and to allow the operator to control different parameters of the fracturing operation." *Id.* The data van "incorporate[s] various functions in a centralized location such that compressors and turbines spread across a plurality of trucks can be monitored by a single operator." *Id.* at 5:21–24. The data van further includes an emergency power off ("EPO"), which allows for the entire site to be shut off completely. *Id.* at 5:48–50. Switchgear 47 connects the data van to the turbines. *Id.* at 7:26–27, Fig. 3. "Upon activation of the EPO 43, breakers open in the switchgear 47, cutting power to the generator 22. The gas compression will turn off, cutting fuel to the turbine(s) 23." *Id.* at 7:31–34; *see also id.* at Fig. 3.

The '278 patent claims priority as a continuation-in-part of U.S. Patent Application No. 13/679,689 (Ex. 1001, code (63); Ex. 1002, 300), which issued as U.S. Patent No. 9,410,410 B2 ("the '410 patent") (Ex. 1010).

E. The Challenged Claims

Petitioner challenges claims 1–23 of the '278 patent. Pet. 11. Claims 1, 9, and 19 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below.

> 1. A system for hydraulically fracturing an underground formation in an oil or gas well to extract oil or gas from the formation, the oil or gas well having a wellbore that permits passage of fluid from the wellbore into the formation, the system comprising:

a plurality of electric pumps fluidly connected to the well, and 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;

a plurality of generators electrically connected to the plurality of electric pumps to provide electrical power to the electric pumps; and

a centralized control unit coupled to the plurality of electric pumps and the plurality of generators, wherein the centralized control unit is configured to:

monitor at least one of pressure and temperature of the plurality of electric pumps and the plurality of generators.

Ex. 1001, 21:37–54.

F. Instituted Grounds of Unpatentability

The Petition relies on the following prior art references:

Name	Reference	Exhibit
Coli	US 2012/0255734 A1, published October 11, 2012	1004
Birch	US 5,606,853, issued March 4, 1997	1005
Dykstra	US 2008/0236818 A1, published October 2, 2008	1006
Rusnak	US 2008/0288115 A1, published November 20, 2008	1007
Hunt	US 2010/0038907 A1, published February 18, 2010	1008

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

Claim(s) Challenged	35 U.S.C. §	Reference(s)
1–5, 9–14, 16, 19, 22, 23	103	Coli, Birch
1–5, 9–14, 16, 19, 22, 23	103	Coli, Birch, Dykstra
6, 15	103	Coli, Birch, Rusnak

Claim(s) Challenged	35 U.S.C. §	Reference(s)
6, 15	103	Coli, Birch, Dykstra, Rusnak
7, 8, 17, 18, 20, 21	103	Coli, Birch, Hunt
7, 8, 17, 18, 20, 21	103	Coli, Birch, Dykstra, Hunt

Pet. 11. Petitioner submits a declaration of Mark Ehsani, Ph.D. (Ex. 1003, "Ehsani Declaration") in support of its contentions. Patent Owner submitted a declaration of Mr. Robert Schaaf (Ex. 2005) in support of its preliminary responses. Patent Owner also submits a second declaration of Mr. Schaaf (Ex. 2050) and a declaration of Joel N. Broussard (Ex. 2016) in support of its Response.

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. 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: "(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems;

(4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field." *Best Med. Int'l, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022) (citations omitted). "The patent's purpose can also be informative." *Id.* (citation omitted).

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 "has used Petitioner's proposed definition of [a person of ordinary skill in the art]." PO Resp. 19.

Based on the arguments presented and the asserted references, we find Petitioner's 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)).

1. "high pressure"

Patent Owner acknowledges that the court in the Texas litigation found "high pressure" to be indefinite, but argues that the term would be understood by those of ordinary skill in the art. PO Resp. 17–18 (citing Ex. 2045). Patent Owner argues that "[h]ydraulic fracturing . . . involves pumping hydraulic fracturing fluid into a wellbore at various pressures—which includes pumping fluids into a wellbore at a high pressure or at a medium pressure and a high rate." *Id.* at 17 (citing Ex. 1004 ¶ 35). Patent Owner argues that, based on "the claim language surrounding the 'high pressure' term in each of the independent claims," an ordinarily skilled artisan would understand that "'high pressure' is referring to the pressure of

a fracturing fluid used during the 'stimulation' phase of a hydraulic fracturing operation." *Id.* at 17–18; *see also* PO Sur-reply 3–4.

Petitioner argues that "[Patent Owner] imports embodiments from the specification." Pet. Reply 5.

Patent Owner replies by arguing that its declarant, Mr. Schaaf, testified in other proceedings before the Board that an ordinarily skilled artisan would consider 8000 to 12,000 psi to be "high pressure." PO Sur-reply 4 (quoting Ex. 1022, 43:17–19).

We agree with Patent Owner that, as used in the challenged claims, "high pressure" refers to the pressure of the fracturing fluid used during the stimulation phase of a hydraulic fracturing operation. *See* PO Resp. 18. However, Patent Owner acknowledges that hydraulic fracturing also can be carried out at "medium pressure" (*id.* at 17) but does not explain the difference between "high" pressure and "medium" pressure; Patent Owner does not identify any disclosure in the '278 patent setting forth any values for the recited "high pressure."

For the purposes of this Decision, we interpret "high pressure" as suggested by Patent Owner to mean a pressure at which the fluid pumped into the wellbore will fracture the underground formation. *See* PO Resp. 17–18. We take no position on the definiteness of this term, and we note that indefiniteness under § 112 is not a basis on which claims may be determined unpatentable in an *inter partes* review. 35 U.S.C. § 311(b).

2. "configured to monitor" and "monitoring"

Patent Owner informs us that, in the Texas litigation, the parties agreed that the plain and ordinary meaning of "configured to[] monitor at

least one of pressure and temperature of the plurality of electric pumps and the plurality of generators" as used in claim 1 is "configured to monitor at least one of pressure and temperature of the plurality of electric pumps and configured to monitor at least one of pressure and temperature of the plurality of generators." PO Resp. 18 (citing Ex. 2044). Patent Owner similarly informs us that, in the Texas litigation, the parties also agreed that the plain and ordinary meaning of "monitoring at a centralized control unit at least one of pressure and temperature of the electrically powered pump and the generator" as used in claim 9 is "monitoring at a centralized control unit at least one of pressure and temperature of the electrically powered pump and monitoring at the centralized control unit at least one of pressure and temperature of the generator." *Id.* at 18–19 (citing Ex. 2044).

Petitioner does not address these terms. *See generally* Pet. Reply.

Patent Owner does not actually argue that we should interpret these terms in any specific manner. Nor does Patent Owner rely on its claim construction to attempt to distinguish the prior art at issue in this proceeding from the challenged claims. Accordingly, we decline to construe these terms.

D. Priority

Patent Owner argues that the claims of the '278 patent are entitled to priority to November 16, 2012, the filing date of the application that matured into the '410 patent. PO Resp. 5–16; PO Sur-reply 22–23.

Petitioner traverses Patent Owner's contentions. Pet. Reply 1–4; Pet. 5. Petitioner also notes that "all the asserted prior art . . . relied upon in

the Petition predates th[e] application" that matured into the '410 patent. Pet. Reply 2.

Patent Owner does not argue that its alleged priority date predates any of the asserted references, nor does that appear to be the case. *See* Pet. 5–10 (arguing that each of the asserted references is prior art). Thus, we need not determine for purposes of this Decision whether or not the challenged claims are entitled to the priority date asserted by Patent Owner. Accordingly, we decline to do so.

E. Overview of the Asserted Prior Art

1. Coli

Coli relates to hydraulic fracturing in hydrocarbon-bearing wells. Ex. 1004 ¶ 3. Coli recognizes drawbacks of the diesel motors typically used in such drilling. *Id.* ¶¶ 5, 8. Coli purports to improve upon known fracturing systems by using electric motors and generators powered by natural gas to drive the pumps. *Id.* ¶¶ 9–11, 38. Coli purports that this use of electric components beneficially reduces the amount of infrastructure, provides systems that are safer and easier to control than known diesel systems, facilitates syncing the equipment within the system, and reduces costs. *Id.* ¶¶ 39, 66–71, 73.

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

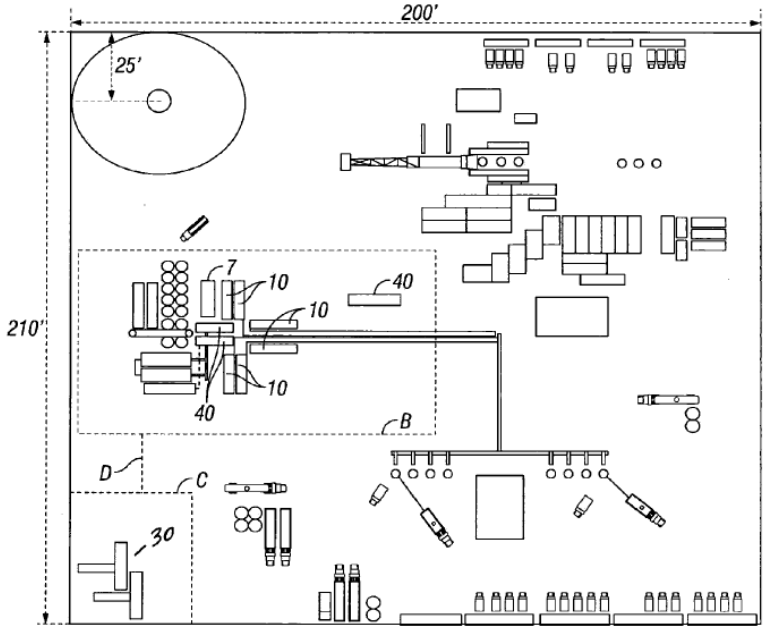

FIG. 2

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 ¶¶ 23, 38. 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.* ¶¶ 38, 46. One or more natural-gas powered turbine generators 30 are located in region C, separate from the fracturing modules for safety. *Id.* The turbine generators provide a dedicated source of on-site electric power. *Id.*

Figure 2 also illustrates control center 40 located in region B[2]. Ex. 1004 ¶ 72. The control center may include suitable controls and computer monitoring for the entire fracturing operation. *Id.* The control center may manage various operations through a communications link, including power generation and the delivery of treatment fluid to the pumps

[2] Coli refers to "control center 40" and "blender module 40," and labels two different boxes as "40" in Figure 2, both located in region B.

for delivery to the wellbore. *Id.* "Because [the] electric motors are controlled by variable frequency drives, absolute control of all equipment on location can be maintained from one central point." *Id.* ¶ 65. Coli discloses that accidental over-pressures are "quite common" in conventional drilling systems and can result in significant damage and shutdown interruptions. *Id.* ¶¶ 67–68. Coli purports that an electrical system "virtually eliminates" these scenarios, as the control system may set a maximum pressure value at the beginning of the operation, which is extrapolated to a maximum amount of power or current value set to the electric motor. *Id.* ¶ 69. The control system may then initiate a "near instantaneous" stop of the electric motors thereby immediately stopping the pumps. *Id.*

2. Birch

Birch discloses a gaseous fuel compression and control system for gas turbine engines. Ex. 1005, 1:9–10. The fuel compression system includes a screw compressor for compressing gaseous fuel supplied to the gas turbine engine. *Id.* at 1:60–62. An electric motor drives the screw compressor. *Id.* A power sensor senses the output power of the gas turbine engine. *Id.* at 1:62–67. The power sensor sends a control signal to control the speed of the electric motor through modulating means that control the frequency of electrical power supplied to the motor. *Id.*

Figure 1 illustrates a schematic view of the gas fuel compression system and is reproduced below.

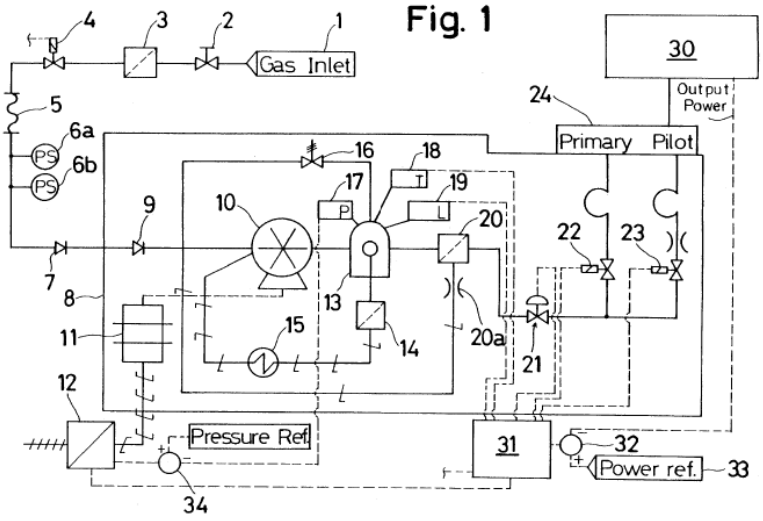

Figure 1 is a schematic view illustrating the gaseous fuel compression and control system. Ex. 1005, 2:4–6. Natural gas enters the system from mains supply 1 and travels through a series of valves (4, 7, 9) to compressor 10. *Id.* at 2:31–42. The compressor is driven by electric motor 11 and inverter device 12. *Id.* at 2:42–44. The compressor is connected to combustion chamber 24 of gas turbine 30 through separator tank 13, filter 20, control valve 21 and cut-off valves 23, 24. *Id.* at 2:59–3:22. The system includes controller 31, which sends a control signal to the control valve in response to an output signal of comparator 32. *Id.* at 3:23–28. The comparator compares the output power of the gas turbine engine with power reference 33 and sends the output signal to the controller. *Id.*

The gas fuel control system can operate continuously in a pressure feedback mode. Ex. 1005, 4:46–47. The controller "generates two signals in response to output power. One is the required gas flow rate and therefore positions the control valve accordingly and the other is the required gas pressure which therefore is the gas compression system set point pressure." *Id.* at 4:48–53. If the output power is higher than the power reference, the controller closes the control valve, causing a slight increase in gas pressure,

in turn causing the compressor to slow down. *Id.* at 4:54–60. If the output power is lower than the power reference, the controller opens the control valve, causing a slight decrease in gas pressure, in turn causing the compressor to accelerate. *Id.* at 4:61–67. In both scenarios, inverter device 12 slows or accelerates the compressor until a new equilibrium is reached. *Id.* at 4:59–60, 4:65–67.

3. Dykstra

Dykstra discloses a system for controlling the manufacturing of well treatment fluid in an oil or gas well. Ex. 1006 ¶¶ 2, 5. The system includes a central control system that controls, coordinates, and monitors the operations of various subsystems, including a pumping grid and a power unit. *Id.* ¶ 21. Each subsystem has its own controller. *Id.* ¶ 26. Dykstra refers to the combined subsystems as a "well treatment operations factory." *See id.* ¶ 14. The pumping grid includes one or more pumps that can be electric, gas, diesel, or natural gas powered. *Id.* ¶ 20. The power unit provides electrical power to all of the subunits within the well operations factory and "may comprise a single trailer with subunits, each subunit with the ability to operate independently." *Id.* ¶ 15. The power unit "can be powered by liquid fuel, natural gas, or other equivalent fuel and may optionally be a cogeneration power unit." *Id.*

The central control system receives analog or digital signals from sensors associated with the various components in the operations factory. Ex. 1006 ¶ 21. "The central control system may use all of the sensor data from all units and the drive signals from their individual subcontrollers to determine subsystem trajectories." *Id.* A desired property, such as well

treatment fluid flow rate, is provided and the control system drives the output rate of the fracturing operations factory to the desired rate. *Id.* ¶ 22. "The central control system can also be used to monitor equipment health and status." *Id.* ¶ 21.

4. Rusnak

Rusnak discloses a variable frequency drive ("VFD") based controller for controlling a pump using intelligent pump system monitors. Ex. 1007 ¶¶ 1, 20, 21. The controller operates the VFD to control flow, speed, or pressure of the pumping system and to identify and report pump system problems. *Id.* ¶ 20. The controller can be run in either a speed mode or a process mode. *Id.* ¶ 25. In speed mode, the controller maintains a specific motor speed entered by the user (the setpoint). *Id.* In process mode, the controller uses input from an external process sensor(s) as feedback and will continuously adjust speed to maintain the process variable setpoint(s). *Id.* ¶ 26. The user enters the maximum and minimum speeds for the pump. *Id.* ¶¶ 30–31. If the required setpoint cannot be attained within the maximum and minimum speed limits, the controller initiates a response action. *Id.* ¶ 37. Such actions include shutting down the pump or overriding the setpoint. *Id.* at Table 1. After a preset time delay, the controller will attempt to reestablish normal operation. *Id.* ¶ 80. If the controller is unable to reestablish normal operation after a preset number of attempts, an auto reset fault occurs. *Id.* The controller will automatically reset the faulted condition after a preset amount of time has elapsed. *Id.*

5. Hunt

Hunt discloses a power generation system for producing electrical energy from gas captured at a wellhead. Ex. 1008 ¶ 2. Hunt purports that "[c]apturing the gas at the wellhead and using it to generate power not only reduces the greenhouse gas emissions related to oil and natural gas production, but also prevents the waste of a natural resource by converting it into something useful." *Id.* ¶ 24. The system uses natural gas to fuel a generator, such as a gas turbine(s). *Id.* ¶ 25. Hunt discloses that "a gas turbine generator is less susceptible to damage resulting from brief instances of reverse power flow, i.e., such as when an insufficient amount of gas is available to maintain a positive torque on the generator." *Id.* The generated power can be used to power a local load, such as a pump for extracting oil from a wellhead, or supplied to a utility grid. *Id.* ¶¶ 27, 31, 37.

The system includes a multifunction control module ("MCM") that monitors the gas flow and generates control signals to produce the desired response. Ex. 1008 ¶ 33. The MCM monitors, adjusts, and controls the power generation system over a communications network. *Id.* ¶ 34. The MCM controls a switchgear, which is coupled to the generator power bus and the grid power bus. *Id.* ¶ 46. A switchgear control relay is connected to engage or disengage the switchgear, thus coupling or decoupling the power buses. *Id.*

F. Asserted Obviousness Based on Coli and Birch

Petitioner argues that claims 1–5, 9–14, 16, 19, 22, and 23 would have been obvious over Coli and Birch. Pet. 14–39. In support of its showing, Petitioner relies upon the Ehsani 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 claims 1–5, 9–14, 16, 19, 22, and 23 are disclosed by the combination of Coli and Birch 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.[3]

1. Independent Claim 1

a. The Preamble

Claim 1 recites "[a] system for hydraulically fracturing an underground formation in an oil or gas well to extract oil or gas from the formation, the oil or gas well having a wellbore that permits passage of fluid from the wellbore into the formation." Ex. 1001, 21:37–41. Petitioner argues that Coli discloses such a system. Pet. 18–19 (citing Ex. 1004 ¶¶ 9, 13; Ex. 1003 ¶ 72).

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" by "delivering fracturing fluid to a wellbore." Ex. 1004 ¶ 9.

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

[3] For convenience, we address the alleged objective evidence of nonobviousness in a single section (§ II.L) 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*.

b. The Pumps Recitation

Claim 1 recites "a plurality of electric pumps fluidly connected to the well, and 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." Ex. 1001, 21:42–45. Petitioner maps this recitation to Coli's fracturing modules 20. Pet. 19–20 (citing Ex. 1004 ¶¶ 5, 40, 75, 77, Fig. 2; Ex. 1003 ¶ 74).

Patent Owner argues that Coli does not disclose a pump configured to pump fluid into a wellbore at high pressure because "*Coli* is silent regarding the pressure at which the fluid is pumped into the wellbore." PO Resp. 21; *see also id.* ("*Coli* is silent regarding the pressure at which the fluid is pumped into the wellbore (*i.e.*, high pressure)" (citing Ex. 2050, 40–45)). According to Patent Owner, Coli only discloses "transferring a slurry (*i.e.*, fluid) into a formation at 'medium pressure and a high rate.'" *Id.* (citing Ex. 1004 ¶ 35). According to Patent Owner, "merely using 'high pressure discharging equipment' is not injecting fluid into the wellbore at high pressure." *Id.* at 22.

Petitioner argues that claim 1 merely requires the pump to be configured to pump fluid at high pressure. Pet. Reply 5. Petitioner argues that Coli's system includes high pressure pumps. *Id.* at 6–7 (citing Ex. 1004 ¶¶ 35, 45–46, 77, 83). Petitioner relies on Gardner[4] to provide details regarding the pump disclosed by Coli. *Id.* at 7–8.

Patent Owner concedes that "*Coli* may disclose 'high rate and pressure pumping equipment,' and specifically a SWGS-2500 well service

[4] Gardner Denver, *GD-2500Q Quintuplex Well Servicing Pump Operating and Service Manual*, 300FW996 Rev C, August 2005 (Ex. 1019).

pump," but argues that "*Coli* does not teach pumping fracturing fluid into a well in a formation with an electrically powered pump at a high pressure so that the fracturing fluid enters and cracks the formation, as claimed in the '278 Patent." PO Sur-reply 5 (emphases omitted).

Claim 1 is an apparatus claim that recites pumps that are "configured to pump" at high pressure. Ex. 1001, 21:42–45. Thus, claim 1 does not recite pumping the fluid at high pressure as suggested by Patent Owner. *See, e.g.*, PO Sur-reply 6.

We agree with Petitioner that Coli's pumps are configured to pump and are capable of pumping fracturing fluid at high pressure as recited in claim 1. 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 ¶ 46. Gardner is an operating and service manual published by Gardner Denver. Ex. 1019, 1.[5] The manual is for a well servicing pump, model GD-2500Q Quintuplex. *Id.* The GD-2500Q is a quintuplex pump with a stroke length of 8.0 inches and a variety of plunger diameters, including 4.5 inches. *Id.* at 20. The GD-2500Q has an input power of 2200 or 2500 bhp and a rated brake horsepower of 2500 bhp. *Id.* In a well stimulation application, the pump can achieve an output pressure as high as 17,800 psi. *Id.* We agree with Petitioner that Coli discloses a pump configured to pump fluid into a wellbore at high pressure as recited in claim 1.

Additionally, Coli discloses that its system includes "trailer 10 for housing one or more fracturing modules 20." Ex. 1004 ¶ 40, Fig. 3. "Each

[5] Our citations to Gardner refer to the exhibit pagination added by Petitioner.

fracturing module 20 can include an electric motor 21 and a fluid pump 22 coupled thereto. . . . Fracturing modules 20 utilize electric power from turbine generator 30 to pump the fracturing fluid directly to the wellbore." *Id.* ¶ 40. This pumping can include "high pressure discharges." *Id.* ¶ 77.

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

c. The Generators Recitation

Claim 1 recites "a plurality of generators electrically connected to the plurality of electric pumps to provide electrical power to the electric pumps." Ex. 1001, 21:46–48. Petitioner maps Coli's turbine generators 30 to the recited generators. Pet. 20–21 (citing Ex. 1004 ¶¶ 38, 40, Fig. 2; Ex. 1003 ¶¶ 76–77).

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

As noted above, each of Coli's fracturing modules 20 includes electric motor 21 coupled directly to fluid pump 22. Ex. 1004 ¶¶ 40, 52. Coli discloses that "electric motor 21 receives electric power from turbine generator 30, and is coupled directly to pump 22," and "[f]racturing modules 20 utilize electric power from turbine generator 30 to pump the fracturing fluid directly to the wellbore." *Id.* ¶¶ 40, 52.

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

d. The Control Unit Recitation

Claim 1 recites "a centralized control unit coupled to the plurality of electric pumps and the plurality of generators." Ex. 1001, 21:49–50.

Petitioner maps Coli's control system to the recited centralized control unit. Pet. 21–24 (citing Ex. 1004 ¶¶ 65, 67–69, 72, Fig. 2; Ex. 1003 ¶¶ 78–82).

Patent Owner acknowledges that "*Coli* . . . teaches the 'remote control operation' of a pump." PO Sur-reply 9. Patent Owner argues that Coli's control system is not coupled to its turbine generators. PO Resp. 22–24 (citing Ex. 1004 ¶¶ 38, 72, Fig. 2; Ex. 2050, 40–44). Patent Owner argues that "*Coli* does not teach monitoring or controlling the generators 30 located in Area C," noting that Coli discloses remotely controlling and monitoring "the power generation function in Area B." *Id.* at 23 (quoting Ex. 1004 ¶ 72); *see also* PO Sur-reply 8, 11 (advancing similar arguments).

Petitioner argues that "[Patent Owner] bases its entire argument on a typographical error." Pet. Reply 10 (citing PO Resp. 23). According to Petitioner, "[r]eading *Coli* as a whole shows that this [reference to Area B in paragraph 72] is a typographical error[,] as every other reference to 'power generation' in *Coli* refers to region/area C." *Id.* (citing Ex. 1004 ¶¶ 38, 44).

Coli discloses that its system includes a "control system . . . for regulating various equipment and systems within the electric powered fractioning operation." Ex. 1004 ¶ 65. Coli discloses that "the control system can regulate fracturing module 20 in delivery of treatment fluid from blender module 30 to pumps 22 for delivery to the wellbore" and its "electric motors are controlled by variable frequency drives," allowing for "absolute control of all equipment on location . . . from one central point." *Id.*

Coli further discloses that, "[w]hen 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." Ex. 1004 ¶ 65. The operator can also set a maximum pressure value, which

"is the maximum amount of power that can be sent to electric motor 21 for pump 22. By extrapolating a maximum current value from this input, electric motor 21 does not have the available power to exceed its operating pressure." *Id.* ¶ 69. Petitioner's declarant testifies that an ordinarily skilled artisan "would understand this to disclose that the control system is coupled to the generators" because "to effectuate a maximum amount of power limit to be output by the generators via the control system, the generators must be coupled to the control system." Ex. 1003 ¶ 79. We credit this testimony, which neither Patent Owner nor its declarant address squarely. *See* PO Resp. 22–24 (citing Ex. 2050, 40–44).

Furthermore, we agree with Petitioner that Coli includes an obvious typographical error, which contention Patent Owner does not address. Coli discloses in a section titled "Electrical Power Generation" that electricity is produced by a natural gas-powered turbine generator located in area C. Ex. 1004 ¶¶ 41–42, 44; *see also id.* ¶ 38 ("One or more natural gas-powered turbine generators 30 are located in region C on the site, which is located a remote distance D from region B where the trailers 10 and fracturing modules 20 are located, for safety reasons."), Fig. 2. We agree that Coli's single reference to power generation functions taking place in area B in paragraph 72 is a typographical error, with the intended reference being to region/area C. Notably, Patent Owner contradicts itself by characterizing Coli as disclosing that "natural gas-powered turbine generators 30 are located in region C" in a related proceeding. *See* IPR2021-01038, Paper 20 at 18 (Patent Owner Response).

We additionally note that Coli discloses that "controls and computer monitoring *for the entire fracturing operation* can take place at a single

central location," namely control center 40, further indicating that the turbine generators are controlled via the control center. Ex. 1004 ¶ 72 (emphasis added).

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

e. The Configured To Monitor Recitation

Claim 1 recites "wherein the centralized control unit is configured to: monitor at least one of pressure and temperature of the plurality of electric pumps and the plurality of generators." Ex. 1001, 21:50–54. Petitioner argues that, in order "to set and effectuate a maximum pressure value of the pumps, [Coli's] control system would monitor the pressure of the pumps." Pet. 23 (citing Ex. 1003 ¶ 79); *see also id.* at 25. Petitioner relies on Birch to teach monitoring pressure of a turbine generator. *Id.* at 25–27 (citing Ex. 1005, 1:60–67, 4:46–65, Fig. 1; Ex. 1003 ¶¶ 85–86). Petitioner argues that "the controller disclosed in *Birch* monitors and controls the compression (pressure) of the gas in a gas turbine engine." *Id.* at 26 (citing Ex. 1003 ¶ 86). Petitioner argues that Birch's turbine engine is a turbine generator. *Id.* (citing Ex. 1005, Fig. 1; Ex. 1003 ¶¶ 85–86).

Petitioner argues that it would have been obvious "to add the gas compression monitoring and control capabilities of the control system of *Birch* to the central control system of *Coli*." Pet. 17 (citing Ex. 1004 ¶¶ 38, 72). Petitioner argues that the modification would be

> the mere application of a known technique (i.e., monitoring and controlling the compression/pressure of natural gas in a gas turbine . . .) to a known system (e.g., a hydraulic fracturing system, including gas turbines, with a central control system for all components of the system) ready for improvement (i.e., to

> control and monitor gas turbines, specifically the fuel pressure of the gas turbines).

Id. at 18 (citing *KSR*, 550 U.S. at 416–18;[6] Ex. 1003 ¶¶ 68–71).

Patent Owner argues that Coli does not disclose monitoring the pressure of the pumps. PO Resp. 24–25. Patent Owner acknowledges that Coli calculates a maximum current available to the motors and argues, therefore, that Coli does not monitor the internal operations of the pump. *Id.* at 25 (citing Ex. 1004 ¶ 65; Ex. 2050, 40–44); *see also* PO Sur-reply 12–13 (advancing similar arguments).

Petitioner replies by reiterating its contentions in the Petition. Pet. Reply 13–14.

Patent Owner makes broad, generalized assertions, but does not address Petitioner's explanation regarding how an ordinarily skilled artisan would understand the teachings of Coli. As explained above regarding the control unit recitation, Coli discloses setting a maximum pressure value, and Dr. Ehsani testifies that an ordinarily skilled artisan would understand this to disclose that the control system is coupled to and monitors the pressure of the pumps. Ex. 1004 ¶ 69; Ex. 1003 ¶ 79. We credit this testimony of Dr. Ehsani, which neither Patent Owner nor Mr. Schaaf address squarely. *See* PO Resp. 24–25 (citing Ex. 2050, 40–44).

Next, Patent Owner argues that the combination of Coli and Birch as set forth in the Petition would render Coli's system unsuitable for its intended purpose of being a mobile, modular system. PO Resp. 25–29. Patent Owner argues that Birch's modulating device 12 "requires

[6] Petitioner cites to West's Supreme Court Reporter ("127 S.Ct. 1727, 1740") rather than the official United States Reports. Pet. 18.

'[e]lectrical power from the main electric source'" that is "outside of the 'gas turbine engine.'" *Id.* at 27 (citing Ex. 1005, 4:1–12; Ex. 2050, 54–56) (alteration in original); *see also* PO Sur-reply 15–17 (advancing similar arguments). Patent Owner argues that "*Coli's* system does not have a main electric power source." PO Resp. 27.

Petitioner argues that Patent Owner's interpretation that Birch requires an outside power source is factually incorrect and unsupported. Pet. Reply 15. Petitioner argues that Patent Owner's argument is "legally irrelevant[] because it applies a 'bodily incorporation' standard for obviousness." *Id.* at 15–16.

Patent Owner argues that modifying Coli to include Birch's gaseous fuel compression and control system, as proposed in the Petition, would require incorporation of Birch's "main electric source." *E.g.*, PO Resp. 26–27. Thus, Patent Owner argues that Birch's components could not be bodily incorporated in Coli's system. However, "[i]t is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements." *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (citations omitted); *see also In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983) ("[I]t is not necessary that the inventions of the references be physically combinable to render obvious the invention under review."); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . ."). Moreover, "[a] person of ordinary skill is also a person of ordinary creativity, not an automaton." *KSR*, 550 U.S. at 421.

Coli discloses that "natural gas is . . . used to drive a dedicated power source in the production of electricity," in which "the dedicated power source is an on-site turbine generator." Ex. 1004 ¶ 42. "[N]atural gas drives the turbine generator in the production of electrical power." *Id.* ¶ 10. Birch discloses a system that uses natural gas to drive a turbine by supplying the gas to the turbine's combustion chamber. *E.g.*, Ex. 1005, 2:31–33, 3:19–22. Thus, both Coli and Birch are directed to natural gas turbines, and we are persuaded that it would have been obvious to incorporate Birch's teachings regarding controlling gas pressure to achieve a desired turbine output into Coli's control system. Moreover, Petitioner's declarant testifies that "a POSITA would have understood *Birch's* Figure 1 to teach the various components of a turbine generator—i.e., Figure 1 in its entirety is an illustrated turbine generator." Ex. 1003 ¶ 86. We credit this testimony of Dr. Ehsani, which neither Patent Owner nor Mr. Schaaf address squarely. *See* PO Resp. 25–29 (citing Ex. 2050, 54–56).

Accordingly, for the foregoing reasons, Coli and Birch support Petitioner's contentions. We further determine that Petitioner has set forth reasoning with rational underpinning explaining why it would have been obvious to combine the teachings of Coli and Birch to arrive at the claimed subject matter. *See, e.g.*, Pet. 17–18.

f. Conclusion

For the foregoing reasons, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claim 1 are disclosed by the combination of Coli and Birch, 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.

2. Dependent Claims 2–5

Claim 2 depends directly from claim 1 and further recites "wherein at least some of the plurality of generators are powered by natural gas, and wherein the centralized control unit is further configured to monitor and control compression of the natural gas." Ex. 1001, 21:55–58. Claim 3 depends directly from claim 1 and further recites "wherein at least some of the plurality of generators are turbine generators and wherein the centralized control unit is further configured to monitor and control the turbine generators." *Id.* at 21:59–62. Petitioner relies on Coli to teach natural gas-powered turbine generators and on Birch to teach monitoring and controlling the pressure of a turbine generator in the same manner as asserted for claim 1. Pet. 27–30.

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

We find that Coli and Birch support Petitioner's contentions for the reasons provided in § II.F.1 above.

Claim 4 depends directly from claim 1 and further recites "a variable frequency drive that controls a speed of the electric pumps." Ex. 1001, 21:63–64. Petitioner argues that Coli discloses the use of variable frequency drives to control its electric motors, which "are 'coupled directly' to the pumps." Pet. 31 (citing Ex. 1004 ¶¶ 11, 52, 65, 69; Ex. 1003 ¶ 95).

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

Coli discloses that its "electric motors are controlled by variable frequency drives." Ex. 1004 ¶ 65. The "electric motor 21 receives electric power from turbine generator 30, and is coupled directly to pump 22." *Id.* ¶ 52.

Accordingly, on this record, Coli supports Petitioner's contentions.

Claim 5 depends directly from claim 1 and further recites "wherein the centralized control unit is coupled to the plurality of electric pumps and the plurality of generators via cabling or Ethernet." Ex. 1001, 21:65–67. Petitioner argues that Coli describes conventional drilling systems as sending signals via "hardwired cable" and argues that it would have been obvious to use the same cables or Ethernet in Coli's system. Pet. 31–32 (citing Ex. 1004 ¶¶ 66, 72; Ex. 1003 ¶¶ 96–97).

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

Coli discloses that conventional hydraulic fracturing systems use hardwired cables to transmit signals from component monitors to an operator console. Ex. 1004 ¶ 66. Coli's control system monitors and controls equipment throughout the entire fracturing operation. *Id.* ¶¶ 65, 72. Petitioner's declarant testifies that it would have been obvious for Coli's control system to be coupled to the monitored components via cabling or Ethernet. Ex. 1003 ¶ 96. We credit this uncontested testimony of Dr. Ehsani.

Accordingly, on this record, Coli supports Petitioner's contentions.

For the foregoing reasons, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 2–5 are disclosed by the combination of Coli and Birch, 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.

3. Independent Claim 9

Claim 9 recites a method comprising pumping fracturing fluid including a liquid component and a solid proppant into a well with an electrically powered pump, powering the pump with a generator, and monitoring at a centralized control unit the pressure or temperature of the pump and generator. Ex. 1001, 22:18–30. In large part, Petitioner refers to its contentions regarding claim 1 in arguing that claim 9 would have been obvious over the combination of Coli and Birch. *See* Pet. 33–34. Petitioner argues that Coli discloses using a fracturing fluid having a liquid component and a solid proppant such as sand. *Id.* (citing Ex. 1004 ¶¶ 5, 9, 35; Ex. 1003 ¶ 100).

Patent Owner does not challenge Petitioner's contentions regarding claim 9 apart from its arguments regarding the combination of Coli and Birch discussed in § II.F.1 above. *See generally* PO Resp.

We note that claim 9 is a method claim that recites "pumping fracturing fluid into a well in a formation with an electrically powered pump at a high pressure." Ex. 1001, 22:19–20. Thus, claim 9 does not merely require the pump be configured to pump at high pressure as interpreted by Petitioner. *See* Pet. Reply 5. However, Coli relates to hydraulic fracturing in hydrocarbon-bearing wells and discloses using high pressure discharges. Ex. 1004 ¶¶ 3, 34, 77. Thus, Coli discloses pumping fracturing fluid into a well at high pressure as recited in claim 9.

Coli further discloses that hydraulic fracturing involves pumping fluids mixed with proppants, such as sand, into a wellbore under pressure such that the sand remains in created fractures, thus propping them open and providing a path through which hydrocarbon fluids can be recovered. Ex. 1004 ¶¶ 5, 35. Thus, Coli supports Petitioner's contentions.

For the foregoing reasons and the reasons set forth in § II.F.1 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 Birch, 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.

4. Dependent Claims 10–14 and 16

Each of claims 10–14 and 16 depends directly from claim 9 and contains recitations substantially similar to those of claims 2–5. Ex. 1001, 22:31–44, 22:48–50. Petitioner relies on Coli and Birch as set forth in § II.F.2 above. Pet. 35–36.

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

For the reasons set forth in § II.F.2 above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 10–14 and 16 are disclosed by the combination of Coli and Birch, 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.

5. Independent Claim 19

Claim 19 recites a system comprising a fleet comprising a combination of electric powered pumps, turbine generators, and a centralized control unit coupled to the pumps and generators via cabling or Ethernet and configured to monitor and control one or more operating characteristics of the fleet.[7] Ex. 1001, 22:64–23:15. In large part, Petitioner refers to its contentions regarding claim 1 in arguing that claim 19 would have been obvious over the combination of Coli and Birch. *See* Pet. 36–38. Petitioner argues that Coli describes conventional drilling systems as sending signals via "hardwired cable" and argues that it would have been obvious to use the same cables or Ethernet in Coli's system. *Id.* at 31–32 (citing Ex. 1004 ¶¶ 66, 72; Ex. 1003 ¶¶ 96–97), 38 (citing Ex. 1003 ¶ 124).

Patent Owner does not challenge Petitioner's contentions regarding claim 19 apart from its arguments regarding the combination of Coli and Birch discussed in § II.F.1 above. *See generally* PO Resp.

Coli discloses that conventional hydraulic fracturing systems use hardwired cables to transmit signals from component monitors to an operator console. Ex. 1004 ¶ 66. Coli's control system monitors and controls equipment throughout the entire fracturing operation. *Id.* ¶¶ 65, 72. Petitioner's declarant testifies that it would have been obvious for Coli's control system to be coupled to the monitored components via cabling or

[7] Although claim 19 recites the combination of "one or more" enumerated components (including "electric powered pumps" and "turbine generators") and a centralized control unit, the wherein clause specifies that the system includes electric powered pumps and turbine generators. *See* Ex. 1001, 23:13–15.

Ethernet. Ex. 1003 ¶ 96. We credit this uncontested testimony of Dr. Ehsani.

For the foregoing reasons and the reasons set forth in § II.F.1 above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claim 19 are disclosed by the combination of Coli and Birch, 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.

6. Dependent Claims 22 and 23

Each of claims 22 and 23 depends directly from claim 19 and contains recitations substantially similar to those of claims 2–3. Ex. 1001, 23:27–32. Petitioner relies on Coli and Birch as set forth in § II.F.2 above. Pet. 39.

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

For the reasons set forth in § II.F.2 above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 22 and 23 are disclosed by the combination of Coli and Birch, 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.

G. Asserted Obviousness Based on Coli, Birch, and Dykstra

Petitioner argues that claims 1–5, 9–14, 16, 19, 22, and 23 would have been obvious over Coli, Birch, and Dykstra. Pet. 39–52. In support of its showing, Petitioner relies upon the Ehsani 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 claims 1–5, 9–14, 16, 19, 22, and 23 are disclosed by the combination of Coli, Birch, and Dykstra, 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.

1. Independent Claims 1 and 9

Regarding independent claim 1, Petitioner relies on Coli and Birch as set forth in § II.F above and relies on Dykstra for additional teaching of monitoring pumps and generators. Pet. 42–46. Petitioner maps Dykstra's central control system to the recited centralized control unit. *Id.* at 43–46 (citing Ex. 1006 ¶¶ 14–15, 20–21, 28; Ex. 1003 ¶¶ 136–137, 139–141). Petitioner relies on the same arguments regarding independent claim 9. *Id.* at 48–49.

Patent Owner does not challenge Petitioner's contentions apart from its arguments regarding the combination of Coli and Birch discussed in § II.F.1 above. PO Resp. 30–31.

Dykstra discloses a central control system for a fracturing operation that controls, coordinates, and monitors the operations of various subsystems, including a pumping grid and a power unit. Ex. 1006 ¶ 21. The pumping grid includes one or more pumps that can be powered by electricity generated in the centralized power unit using natural gas. *Id.* ¶¶ 15, 20. The power unit can include multiple, independently operated subunits that are powered by natural gas. *Id.* ¶ 15. Petitioner's declarant testifies that an

ordinarily skilled artisan would understand that each subunit of the power unit may be a natural gas generator. Ex. 1003 ¶ 136. We credit this uncontested testimony of Dr. Ehsani. Thus, Dykstra supports Petitioner's contentions. We further determine that Petitioner has set forth reasoning with rational underpinning explaining why it would have been obvious to include the functionality of Dykstra's central control system in Coli's control system. *See, e.g.*, Pet. 41 (arguing that the modification would be the "use of a known technique (i.e., the monitoring and control of pumps and generators by a central control system taught by *Dykstra*) to predictably improve a known system (i.e., the control center and hydraulic fracturing system taught by *Coli*) ready for improvement.").

For the foregoing reasons and the reasons set forth in § II.F above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 1 and 9 are disclosed by the combination of Coli, Birch, and Dykstra, 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.

2. Dependent Claims 2–4 and 10–14

Regarding dependent claims 2–4 and 10–14, Petitioner relies on Coli and Birch as set forth in § II.F above. Pet. 46, 49–50.

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

For the reasons set forth in § II.F.2 above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 2–4 and 10–14 are disclosed by the combination of Coli and Birch,

and 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.

3. Dependent Claims 5 and 16

Regarding claim 5, Petitioner relies on Coli and Birch as set forth in § II.F above and relies on Dykstra for additional teaching of connecting a centralized control unit to components via cabling or Ethernet. Pet. 47–48. Petitioner maps Dykstra's central control system to the recited centralized control unit. *Id.* Petitioner relies on the same arguments regarding claim 16. *Id.* at 50.

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

As discussed in § II.G.1 above, we are persuaded by Petitioner's arguments that Dykstra teaches monitoring and controlling pumps and generators via its central control system. Dykstra further discloses that the central control system is connected to various sensors via "any information connection, such as ethernet." Ex. 1006 ¶ 28. Petitioner's declarant testifies that it would have been obvious to also connect the central control system to the pumps and generators via ethernet. Ex. 1003 ¶ 149. We credit this uncontested testimony of Dr. Ehsani. Thus, Dykstra 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 such connection means in Coli's system. *See, e.g.*, Pet. 48 (arguing that the modification would be the "use of a known technique (i.e., coupling electronic components via cabling and/or ethernet cables) to predictably

improve a similar system (i.e., a control center of a hydraulic fracturing system that is coupled to components within a well site by using cables or Ethernet cables) [in] the same way.").

For the foregoing reasons and the reasons set forth in §§ II.F and II.G.1 above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 5 and 16 are disclosed by the combination of Coli, Birch, and Dykstra, 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.

4. Independent Claim 19

Regarding independent claim 19, Petitioner relies on Coli and Birch as set forth in § II.F above and relies on Dykstra as set forth in § II.G.3 above. Pet. 50–51.

Patent Owner does not challenge Petitioner's contentions apart from its arguments regarding the combination of Coli and Birch discussed in § II.F.1 above. PO Resp. 31.

For the reasons set forth in §§ II.F and II.G.3 above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claim 19 are disclosed by the combination of Coli, Birch, and Dykstra, 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.

5. Claims 22 and 23

Regarding claims 22 and 23, Petitioner relies on Coli and Birch as set forth in § II.F above. Pet. 51–52.

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

For the reasons set forth in § II.F.2 above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 22 and 23 are disclosed by the combination of Coli, Birch, and Dykstra, 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.

H. Asserted Obviousness Based on Coli, Birch, and Rusnak

Petitioner argues that claims 6 and 15 would have been obvious over Coli, Birch, and Rusnak. Pet. 52–55. In support of its showing, Petitioner relies upon the Ehsani 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 claims 6 and 15 are disclosed by the combination of Coli, Birch, and Rusnak, 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 6 recites "wherein the centralized control unit is further configured to reset a fault occurring in the variable frequency drive" (Ex. 1001, 22:1–3) and depends from claim 1 through claim 4, which recites

"a variable frequency drive that controls a speed of the electric pumps" (*id.* at 21:63–64). Claim 15 depends from claim 9 through claim 14 and contains substantially the same recitations as claim 6. *Id.* at 22:45–47. Petitioner maps Coli's variable frequency drive to the recited variable frequency drive (Pet. 31 (citing Ex. 1004 ¶¶ 11, 52, 65, 69; Ex. 1003 ¶ 95)) and the functionality of Rusnak's controller to the recited configured to reset a fault occurring in the variable frequency drive (*id.* at 55 (citing Ex. 1007 ¶¶ 20–21, 80; Ex. 1003 ¶ 187)).

Patent Owner argues that Petitioner has failed to set forth adequate reasoning to combine the teachings of Coli, Birch, and Rusnak because "*Coli* has an outward focus on overall system efficiency and performance, whereas *Dykstra* is concerned with the internal operations of the VFD." PO Resp. 31–32 (citing Ex. 2050, 58–59); *see also* PO Sur-reply 18–19.

Petitioner argues that, even if true, Patent Owner's assertions do not explain why Dykstra's teachings regarding a variable frequency drive could not be incorporated into Coli's variable frequency drive. Pet. Reply 16–17.

Coli discloses that its control system uses variable frequency drives to control its motors, which are coupled directly to the pumps. Ex. 1004 ¶¶ 52, 65. Rusnak discloses a variable frequency drive-based controller for controlling its pump. Ex. 1007 ¶¶ 1, 20, 21. If the controller determines a speed dictated by its feedback system is outside prescribed limits, the controller responds by, for example, overriding the input limits. *Id.* ¶ 37, Table 1. If the controller is unable to reestablish normal operation after a preset time and number of attempts, the controller initiates a reset fault. *Id.* ¶ 80. The controller will automatically reset the faulted condition after a preset amount of time has elapsed. *Id.* Thus, Coli and Rusnak support

Petitioner's contentions. We further determine that Petitioner has set forth reasoning with rational underpinning explaining why it would have been obvious to include the functionality of Rusnak's control system in Coli's control system. *See, e.g.*, Pet. 54 (arguing that the modification would be "the application of a known technique (i.e., the monitoring functionality of *Rusnak's* VFD) to a known device/system (i.e., the VFDs of *Coli* that also control pumps) ready for improvement to yield predictable results (i.e., to predictably implement a further monitoring functionality, including to reset a fault occurring in a variable frequency drive by the central control system)"). Patent Owner's arguments regarding the "focus" of the asserted references is unavailing to discredit Petitioner's arguments and reasoning.

For the foregoing reasons, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 6 and 15 are disclosed by the combination of Coli, Birch, and Rusnak, 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.

I. Asserted Obviousness Based on Coli, Birch, Dykstra, and Rusnak

Petitioner argues that claims 6 and 15 would have been obvious over Coli, Birch, Dykstra, and Rusnak. Pet. 55–56. In support of its showing, Petitioner relies upon the Ehsani 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 claims 6 and 15 are disclosed by the combination of Coli, Birch, Dykstra, and Rusnak, 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.

Petitioner relies on Coli, Birch, and Rusnak as set forth in § II.H above and relies on Dykstra as set forth in § II.G above. Pet. 55–56.

Patent Owner does not challenge Petitioner's contentions apart from its arguments regarding the combinations of Coli and Birch and Coli and Rusnak discussed in §§ II.F and II.H above. PO Resp. 32.

For the reasons set forth in §§ II.G and II.H above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 6 and 15 are disclosed by the combination of Coli, Birch, Dykstra, and Rusnak, 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.

J. Asserted Obviousness Based on Coli, Birch, and Hunt

Petitioner argues that claims 7, 8, 17, 18, 20, and 21 would have been obvious over Coli, Birch, and Hunt. Pet. 56–69. In support of its showing, Petitioner relies upon the Ehsani 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 claims 7, 8, 17, 18, 20, and 21 are disclosed by the combination of Coli, Birch, and Hunt, 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.

1. Claims 7, 17, and 20

Claim 7 depends directly from claim 1 and further recites "an emergency power off unit coupled to the centralized control unit, the plurality of electric pumps, and the plurality of generators, wherein the emergency power off unit is configured to substantially immediately cut power to the plurality of generators when activated." Ex. 1001, 22:4–9. Claims 17 and 20 depend directly from claims 9 and 19, respectively, and contain substantially the same recitations. *Id.* at 22:51–56, 23:16–20. Petitioner relies on the functionality of Hunt's multifunction control module and switchgear to teach these recitations. Pet. 61–62 (citing Ex. 1008 ¶¶ 25–29, 31, 33–34, 39, 46, 49–50, 52–54, 57–69, Figs. 12, 13; Ex. 1003 ¶¶ 203–205).

Patent Owner does not challenge Petitioner's contentions apart from its arguments regarding the combination of Coli and Birch discussed in § II.F above. PO Resp. 32.

Hunt discloses a power generation system that uses natural gas to fuel an engine coupled with a generator, such as a turbine. Ex. 1008 ¶ 25. The generated power can be used to power a local load, such as a pump for extracting oil from a wellhead, or supplied to a utility grid. *Id.* ¶¶ 27, 31, 37. The system includes a multifunction control module that monitors gas flow and generates control signals to produce the desired generator output. *Id.* ¶ 33. The MCM controls a switchgear, which is coupled to the generator power bus and the grid power bus. *Id.* ¶ 46. A switchgear control relay is connected to engage or disengage the switchgear, thus coupling or decoupling the power buses. *Id.* Thus, Hunt supports Petitioner's contentions. We further determine that Petitioner has set forth reasoning

with rational underpinning explaining why it would have been obvious to include the functionality of Hunt's control system and switchgear in Coli's control system. *See, e.g.*, Pet. 59–60 (arguing that the modification would be "the application of a known technique (i.e., using a control system (MCM) plus a switchgear with a gas turbine generator at a well site system) to a known system (i.e., the electric hydraulic fracturing system and control system described in *Coli* that provides power using gas turbine generators) ready for improvement (*i.e.*, as described in *Hunt*, to increase protection at the well site, as well as for power supply flexibility)").

For the foregoing reasons, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claim 7, 17, and 20 are disclosed by the combination of Coli, Birch, and Hunt, 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.

2. Claims 8, 18, and 21

Claim 8 depends from claim 1 through claim 7 and further recites,

> the emergency power off unit comprising an auxiliary power and a switchgear, each coupled to the plurality of generators and the centralized control unit, wherein the switchgear is responsive to a signal from the centralized control unit to open a breaker to substantially immediately cut power to the plurality of generators.

Ex. 1001, 22:10–16. Claim 18 depends from claim 9 through claim 17, and claim 21 depends from claim 19 through claim 20. *Id.* at 22:57–63, 23:21–26. Each of claims 18 and 21 contains substantially the same recitation as claim 8. *Id.* Petitioner relies on Hunt as described in § II.J.1

above, mapping Hunt's connection to the power grid to the recited auxiliary power and arguing that switchgear include breakers. Pet. 62–68 (citing Ex. 1008 ¶¶ 25–29, 31, 45–46, 53, 59, 61, 69–70, 73, 85, Figs. 2, 13; Ex. 1003 ¶¶ 206–212).

Patent Owner does not challenge Petitioner's contentions apart from its arguments regarding the combination of Coli and Birch discussed in § II.F above. PO Resp. 32.

For the reasons set forth in in § II.J.1 above, Hunt supports Petitioner's contentions, and we find that Petitioner has set forth reasoning with rational underpinning explaining why it would have been obvious to include the functionality of Hunt's control system and switchgear in Coli's control system. *See, e.g.*, Pet. 59–60.

For the foregoing reasons, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claim 8, 18, and 21 are disclosed by the combination of Coli, Birch, and Hunt, 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.

K. Asserted Obviousness Based on Coli, Birch, Dykstra, and Hunt

Petitioner argues that claims 7, 8, 17, 18, 20, and 21 would have been obvious over Coli, Birch, Dykstra, and Hunt. Pet. 70–71. In support of its showing, Petitioner relies upon the Ehsani 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 claims 7, 8, 17,

18, 20, and 21 are disclosed by the combination of Coli, Birch, Dykstra, and Hunt, 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.

Petitioner relies on Coli, Birch, and Hunt as set forth in § II.J above and relies on Dykstra as set forth in § II.G above. Pet. 70–71.

Patent Owner does not challenge Petitioner's contentions apart from its arguments regarding the combination of Coli and Birch discussed in § II.F above. PO Resp. 32.

For the reasons set forth in §§ II.G and § II.J above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the limitations of claims 7, 8, 17, 18, 20, and 21 are disclosed by the combination of Coli, Birch, Dykstra, and Hunt, 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.

L. 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 it presented objective evidence of nonobviousness during prosecution of the related '410 patent. PO Resp. 33. Patent Owner argues that Petitioner was aware of this evidence, but "failed to consider or discuss any of the evidence presented during the prosecution of the '410 Patent." *Id.* (emphasis omitted). According to Patent Owner, "Petitioner's failure to address known secondary considerations evidence makes the Petition deficient." *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* Paper 8 (Order granting additional preliminary briefing); Paper 7, 6–10 (Petitioner presenting arguments regarding a lack of nexus); Paper 9, 6–9 (Patent Owner presenting additional arguments regarding 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).

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. 32–34), we decline to

adopt such a rule. Patent Owner has cited no authority supporting such an interpretation. *See id.* at 33 (citing *ClassCo, Inc. v. Apple, Inc.*, 838 F.3d 1214, 1220 (Fed. Cir. 2016); *In re Kao*, 639 F.3d 1057, 1067–68 (Fed. Cir. 2011)). In *ClassCo*, the Federal Circuit determined that "the Board erred in giving [the patentee's] evidence of nonobviousness no weight," but it "nonetheless agree[d] that the value this evidence possesses in establishing nonobviousness is not strong in comparison to the findings and evidence regarding the prior art under the first three *Graham* factors." *ClassCo*, 838 F.3d at 1223. Thus, rather than applying the per se rule advocated by Patent Owner, the court held the error to be harmless and affirmed the Board's decision that the subject claims were unpatentable. *Id.* at 1222–23. Similarly, in *In re Kao*, the court determined that "the Board erred by failing to consider [the applicant's] evidence of secondary considerations," but explained that this error was harmless because "[the applicant's] evidence of secondary considerations was insufficient to overcome [the] strong showing of primary considerations that rendered the claims at issue invalid." *In re Kao*, 639 F.3d at 1071–72; *see also id.* at 1073 ("this error was harmless because there was no nexus between the secondary considerations presented and the claimed invention"). Thus, the cases cited by Patent Owner contradict its per se argument. To the extent Petitioner erred by failing to address objective evidence of nonobviousness in the Petition, such error is harmless because, as discussed below, Patent Owner's asserted evidence of nonobviousness is not persuasive to overcome Petitioner's showings of obviousness.

Additionally, 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 its Clean Fleet products embody the system recited in independent claim 1. PO Resp. 38–42. Patent Owner asserts that the Clean Fleet products have "electric powered frac pumps" that are "rated for 14,500psi," turbine generators that provide power for the system, and a data van including a centralized control unit. *Id.* at 39–42 (citing Ex. 2041, 1, 2, 9, 11–12; Ex. 2047, 1; Ex. 2051, 1; Ex. 2052, 9, 27; Ex. 2050, 61–128). Patent Owner argues that its Clean Fleet products embody independent claims 9 and 19 for the same reasons advanced for claim 1 and, with respect to claim 9, also because the Clean Fleet products "pump[] fracturing fluid into a well . . . at a high pressure" and, with respect to claim 19, also because the Clean Fleet products have Ethernet connections. *Id.* at 46–50 (citing Ex. 2041, 1, 2, 9, 11–12; Ex. 2043, 23; Ex. 2047, 1; Ex. 2051, 1; Ex. 2052, 1, 9, 27; Ex. 2050, 61–128), 56–61 (citing Ex. 2041, 1–12; Ex. 2043, 23; Ex. 2051, 1; Ex. 2052, 9, 27; Ex. 2050, 61–128).

Petitioner argues that Patent Owner fails to address coextensiveness and, therefore, Patent Owner has not established that it is entitled to a presumption of nexus. Pet. Reply 19. Petitioner also notes that "[Patent Owner] points to the same Clean Fleet product for non-obviousness across sixteen patents" and argues that Patent Owner's reliance on the same evidence for all of these patents is improper because the patents recite "dozens of features" not recited in the '278 patent, including a variable frequency drive performing electric motor diagnostics, a triplex or quinteplex pump, a heater, a pump down pump, a boost pump, a combustible fuel vaporization system, switchgear units, a tiebreaker, a proppant storage

system with integrated control devices, a weight monitoring system, and a discharge branch including a section of axially rotatable piping. *Id.* at 19–22 (emphasis omitted). Petitioner also argues that Petitioner has not established a nexus between its Clean Fleet products and the claims of the '278 patent because Patent Owner relies on its use of electrically-powered pumps, which are disclosed in the prior art. *Id.* at 23–24 (citing PO Resp. 67; Ex. 2050 ¶¶ 164, 168, 174; Ex. 1004 ¶¶ 40, 41–52, 65–66).

Patent Owner replies that "multiple patents can share a presumption of nexus with the same product [when] the claims of each of the patents covered essentially the same invention." PO Sur-reply 20 (alteration in original) (quoting *Fox Factory*, 944 F.3d at 1377).[8]

Patent Owner has not established persuasively that it is entitled to a presumption of nexus. As we noted in the Institution Decision,

> During prosecution of the '410 patent, the Applicant touted the "electric motors . . . powered by natural gas" or "a power grid" as being the reason for the asserted commercial success of the "Clean Fleet" product. Ex. 2031, 151–53. Some of [the] claims of the '278 patent, for example independent claim 1, do not include this limitation. Ex. 1001, 21:37–54; *see also id.* at 21:55–58 (dependent claim 2 reciting "at least some of the plurality of generators are powered by natural gas"). Thus, on this record, Patent Owner has not sufficiently shown that the claims of the '278 patent are coextensive with the Clean Fleet product and, thus, has not sufficiently shown that it is entitled to a presumption of nexus.

[8] In our quotation here, we have modified Patent Owner's quotation to *Fox Factory* to correct an inaccuracy. Rather than referring to "essentially the same *inventions*" as stated by Patent Owner (PO Sur-reply 20 (emphasis added)), *Fox Factory* refers to the singular "essentially the same *invention*." *Fox Factory*, 944 F.3d at 1377 (emphasis added).

Inst. Dec. 43 (alteration in original). Patent Owner did not, in its post-institution briefing, address that preliminary conclusion, and we maintain it here. Patent Owner also fails to establish that the Clean Fleet products had a centralized control unit configured to monitor pressure or temperature of the pumps and generators or configured to monitor one or more operating characteristics, as discussed further below. Moreover, to the extent Patent Owner asserts that it is simply the use of a centralized control unit in hydraulic fracturing that corresponds to objective indicia of nonobviousness, the evidence of record establishes that the prior art disclosed such a centralized control unit. *See* Ex. 1004 ¶¶ 64–72; *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").

Patent Owner also has not satisfied its burden to establish a nexus, absent a presumption, between the claims of the '278 patent and the asserted evidence of nonobviousness. Patent Owner and Mr. Schaaf rely heavily on Exhibits 2041 and 2052. *See* PO Resp. 38–42; Ex. 2050, 72–80. However, Patent Owner identifies Exhibit 2041 only as "USWS0037334-USWS0037345" (PO Resp. vi) or as "USWS0037334 (AEO)" (in the Board's P-TACTS filing system), and Patent Owner identifies Exhibit 2052 only as "USWS0068517-USWS0068545" (PO Resp. vii) or as "USWS0068517 (AEO)" (in the Board's P-TACTS filing system). These exhibits appear to be brochures created by Patent Owner. Thus, we question the appropriateness of Patent Owner's reliance on Exhibits 2041 and 2052 as *objective* evidence to establish nonobviousness. Nonetheless, even considering these exhibits, we are not apprised of a nexus between Patent Owner's Clean Fleet products and the claims of the '278 patent. For

example, independent claims 1 and 9 require the centralized control unit to be configured to monitor pressure or temperature of the pumps and generators (Ex. 1001, 21:52–54, 22:28–30), and independent claim 19 requires the centralized control unit be configured to monitor one or more operating characteristics (*id.* at 23:9–12). Patent Owner relies on the assertion in Exhibit 2041 that the Clean Fleet products include a "data monitoring" feature. PO Resp. 41 (quoting Ex. 2041, 1), 48–49 (quoting Ex. 2041, 1), 61 (quoting Ex. 2041, 1). However, Exhibit 2041 does not provide any specific information about the asserted "data monitoring," and, thus, Patent Owner has not established persuasively that its Clean Fleet products perform the type of monitoring recited in the '278 patent. Patent Owner's broad citations to the entirety of its declarant's discussion regarding Petitioner's Clean Fleet products (*e.g.*, *id.* at 41 (citing Ex. 2050, 61–128)) is not helpful in considering Patent Owner's arguments. Our review of Mr. Schaaf's Declaration reveals that he relies on the same pages of Exhibit 2041 as Patent Owner. *See* Ex. 2050, 79–80.

Furthermore, the Clean Fleet products appear to contain several components that are not recited in the claims of the '278 patent. For example, the Clean Fleet products appear to include a proppant delivery system, an auxiliary unit, and fuel gas heaters. *See* Ex. 2041, 5–6, 10. However, none of these components are required by the claims of the '278 patent.

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."). Although Patent Owner acknowledges the requirement that, in such a case, all of the patents must cover essentially the same invention (*see* PO Sur-reply 20), 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 '278 patent. *See* Pet. Reply 20–22. We additionally note that, in other proceedings, Patent Owner ascribed commercial success to features unrecited in the '278 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"); IPR2021-01316, Paper 19 at 25 (touting "the electric blenders of the '724 Patent").

Thus, for at least the foregoing reasons, Patent Owner fails to establish a nexus between its Clean Fleet products and the claims of the '278 patent.

3. Patent Owner's Asserted Evidence

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

a. 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 Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392–93 (Fed. Cir. 1988)). 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 products have achieved commercial success. PO Resp. 64–67. Patent Owner relies predominantly on the declaration of Joel N. Broussard (Ex. 2016) in support of its contention that the Clean Fleet products drove a 22% growth in its business and on a Yahoo News article (Ex. 2011) in support of its contention that it entered a license agreement for its Clean Fleet products. *Id.* at 65–66 (citing Ex. 2016, 4; Ex. 2011).

Petitioner argues that "[Patent Owner] takes a narrow view of the 'market' limited only to electric fracturing fleets, and provides no evidence of its market share compared to the total fracturing market of diesel and electric." Pet. Reply 24. Petitioner notes that Patent Owner relies on the Declaration of Mr. Schaaf in support of its assertions of commercial success and argues that Mr. Schaaf merely relied upon Mr. Broussard's declaration and the prosecution history of the '410 patent but "did not do any independent analysis to verify any of the facts." *Id.* at 24–25.

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. *See In re Huang*, 100 F.3d at 140 ("[The inventor's affidavit] merely represents the inventor's opinion as to the purchaser's reason for buying the product, and,

alone, is insufficient. Instead, the applicant must submit some factual evidence that demonstrates the nexus between the sales and the claimed invention—for example, an affidavit from the purchaser explaining that the product was purchased due to the claimed features."). For the contentions relied upon by Patent Owner, Mr. Broussard cites to the prosecution history of the '410 patent for support. Ex. 2016, 4–5 (citing Ex. 2031, 143–99). The arguments regarding objective indicia of nonobviousness presented during prosecution of the '410 patent consist mainly of conclusory assertions. For example, regarding the contention regarding 22% growth, the applicant cites to "Exhibit A at ¶ 9." Ex. 2031, 150–51. Exhibit A is the declaration of Jared Oehring, Patent Owner's Vice President of Technology. *Id.* at 166. Thus, the declarant is not unbiased and, therefore, his declaration is not objective. Moreover, Mr. Oehring does not discuss "22% growth" in paragraph nine or elsewhere in his declaration. *See id.* at 166–68. We do not find such evidence to be objective or persuasive of nonobviousness of the challenged claims.

Exhibit 2011 is a Yahoo News press release that purports that Patent Owner sold PIK Notes that ProFrac converted into licenses. Ex. 2011, 1–2. However, Patent Owner has not entered the asserted license(s) into the record in this proceeding. Therefore, we are unable to evaluate the veracity of Exhibit 2011 or determine if the '278 patent is included in the asserted license. Moreover, Patent Owner's attempt to establish that the purported license includes the '278 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 2011 persuasive of commercial success.

We additionally note that Patent Owner does not define the relevant market or present sales figures in support of its assertions of commercial success. *See J.T. Eaton & Co.*, 106 F.3d at 1571 (noting that commercial success is "usually shown by significant sales in a relevant market, and that the successful product is the invention disclosed and claimed in the patent").

Finally, we note that the use of electric motors in place of diesel engines in hydraulic fracturing systems was known prior to the '278 patent. *See, e.g.*, Ex. 1004 ¶¶ 9–11, 38–39, 66–71. For this additional reason, Patent Owner's assertions of commercial success are unpersuasive. *See Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1312 (Fed. Cir. 2006) ("if the feature that creates the commercial success was known in the prior art, the success is not pertinent"); *In re Kao*, 639 F.3d at 1070 (requiring a determination of "whether the commercial success of the embodying product resulted from the merits of the claimed invention as opposed to the prior art or other extrinsic factors").

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

b. Industry Praise

"Evidence that the industry praised a claimed invention or a product that embodies the patent claims weighs against an assertion that the same claimed invention would have been obvious. Industry participants,

especially competitors, are not likely to praise an obvious advance over the known art." *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1053 (Fed. Cir. 2016) (en banc).

Patent Owner argues that its Clean Fleet products have been praised by the industry. PO Resp. 67–70. Patent Owner argues that its Clean Fleet products have received praise from professionals in the industry, recognition from industry publications, and industry awards. *Id.* at 67.

Petitioner argues that, in large part, Patent Owner's arguments regarding awards "relies solely on a declaration from its CEO Broussard." Pet. Reply 26 (citing PO Resp. 67–70). Petitioner argues that "Mr. Schaaf did not review the awards, know who else received them, or know the criteria for the awards." *Id.*

Patent Owner again relies predominantly on Mr. Broussard's declaration and arguments made during prosecution of the '410 patent. *See* PO Resp. 68–69 (citing Ex. 2016, 8–9); Ex. 2016 ¶¶ 18–19 (citing Ex. 2031, 143–99). As explained above, however, Patent Owner has failed to establish that these documents are objective evidence. Additionally, several of the exhibits cited by Petitioner in support of its contention of industry praise consist mainly of quotations by Patent Owner employees. *See* PO Resp. 69–70 (citing, *inter alia*, Exs. 2009, 2017, 2018, 2020). Finally, although Patent Owner touts several awards (*see, e.g.*, *id.* at 67–68), Patent Owner presents no evidence regarding the basis on which such awards are granted. We do not find such evidence persuasive to establish that the industry praised the system claimed in the '278 patent.

Accordingly, for at least the foregoing reasons, we find Patent Owner's evidence of industry praise 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 '278 patent.

M. Ultimate Conclusion of Obviousness

Petitioner has shown that the individual limitations of claims 1–23 of the '278 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 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 challenges.

III. PATENT OWNER'S MOTION TO SEAL

On April 13, 2022, Patent Owner filed a motion to file certain documents under seal. Paper 17. Petitioner did not oppose this motion. Because Patent Owner did not explain adequately why the subject documents contained confidential information, we denied Patent Owner's motion without prejudice, expressly authorizing Patent Owner to file a renewed motion to seal. Paper 33.

On October 17, 2022, Patent Owner filed a renewed motion to file certain documents under seal. Paper 35 ("Motion" or "Mot."). Petitioner did not oppose the Motion. For the reasons discussed below, Patent Owner's Motion is *granted*.

A. Motion to Seal

There is a strong public policy in favor of making information filed in an *inter partes* review open to the public, especially because the proceeding determines the patentability of claims in an issued patent and, therefore, affects the rights of the public. Under 35 U.S.C. § 316(a)(1) and 37 C.F.R. § 42.14, the default rule is that all papers filed in an *inter partes* review are open and available for access by the public; a party, however, may file a concurrent motion to seal and the information at issue is sealed pending the outcome of the motion. It is only "confidential information" that is protected from disclosure. 35 U.S.C. § 316(a)(7) (2018). In that regard, the Consolidated Trial Practice Guide provides:

> The rules aim to strike a balance between the public's interest in maintaining a complete and understandable file history and the parties' interest in protecting truly sensitive information.
> . . . .
> 2. Confidential information: The rules identify confidential information in a manner consistent with Federal Rule of Civil Procedure 26(c)(1)(G), which provides for protective orders for trade secret or other confidential research, development, or commercial information. 37 C.F.R. § 42.54.

CTPG 19. The Consolidated Trial Practice Guide, in the default protective order, further provides that, "[w]here confidentiality is alleged as to some but not all of the information submitted to the Board, the submitting party

shall file confidential and non-confidential versions of its submission." *Id.* at 111.

The standard for granting a motion to seal is "for good cause." 37 C.F.R. § 42.54(a). The filing party bears the burden of proof in showing entitlement to the relief requested in a motion to seal. *Id.* § 42.20(c).

1. Exhibit 2043

Patent Owner seeks to seal Exhibit 2043 in its entirety. Mot. 1. Patent Owner asserts that this exhibit "is a proposal that contains confidential, non-public, technical specification, commercial, and trade secret information that show and describe information that [Patent Owner] maintains as confidential commercial information." *Id.* at 2. Patent Owner asserts that this exhibit includes "[Patent Owner's] own design, cost, engineering, and manufacturing data and criteria." *Id.* Patent Owner argues that "[s]uch information could be improperly used by competitors to gain unfair business and competitive advantage with customers in the marketplace, including using details of [Patent Owner's] precise costs, dimensions and measurements for developing and manufacturing competitive commercial products." *Id.* at 2–3. Patent Owner indicates that it produced Exhibit 2043 in the Texas litigation with the designation "CONFIDENTIAL – OUTSIDE ATTORNEY'S EYES ONLY." *Id.* at 3.

We are persuaded that Exhibit 2043 contains information that is confidential and, therefore, that good cause exists to maintain this exhibit under seal. Accordingly, Patent Owner's motion to seal Exhibit 2043 is *granted*.

As a reminder, confidential information that is subject to a protective order ordinarily becomes public forty-five days after final judgment in a trial. CTPG 21–22. After final judgment in a trial, a party may file a motion to expunge confidential information from the record prior to the information becoming public in accordance with 37 C.F.R. § 42.56.

2. Paper 16 and Exhibits 2039, 2041, 2050, 2051, and 2052

In its original motion, Patent Owner sought to seal Exhibits 2039, 2041, 2051, and 2052 and the portions of the Patent Owner Response (Paper 16) and the second declaration of Mr. Schaaf (Ex. 2050) that discuss these exhibits. Paper 17, 1. In accordance with our rules, we provisionally sealed these documents. It its renewed Motion, Patent Owner does not seek to seal these documents. Therefore, Paper 16 and Exhibits 2039, 2041, 2050, 2051, and 2052 will be made publicly available.

B. Protective Order

As noted in the Scheduling Order, "[n]o protective order shall apply to this proceeding until the Board enters one." Paper 13, 2. Although Patent Owner does not request that we enter a protective order in this case, the Motion contains a "proposed protective order" as an attachment thereto. Mot. 5–9. However, Patent Owner does not state whether its proposed order is the Board's default protective order. In our order regarding the original motion to seal, we provided Patent Owner with instructions regarding proposed protective orders:

> Should Patent Owner file a renewed motion to seal, Patent Owner should also request that a protective order be entered and identify whether it wishes the Board's default protective order or a protective order deviating therefrom be entered.

> Patent Owner is reminded that, should it choose to propose a protective order deviating from the default protective order, the parties "must submit the proposed protective order jointly along with a marked-up comparison of the proposed and default protective orders showing the differences between the two and explain why good cause exists to deviate from the default protective order." Paper 13, 3.

Paper 33, 6. Although Patent Owner did not comply with our instruction, we nonetheless enter the Board's default protective order in this case. We note that the "proposed protective order" attached to the Motion appears to be the Board's default protective order.

We also provided Patent Owner with instructions regarding the confidentiality designation on Exhibit 2043:

> [W]e note that certain ones of the Subject Exhibits contain confidentiality designations that are not provided for by the default protective order. *See, e.g.*, Exs. 2032, 2033, 2041, and 2043; *see also* Mot. 2. Patent Owner should file replacement copies of the exhibits containing the confidentiality designation set forth in the default protective order, along with an assertion that no changes other than to the confidentiality designation have been made. Alternatively, Patent Owner should propose a protective order defining the current confidentiality designations. Patent Owner is cautioned that the Board encourages use of the default protective order and any order deviating therefrom will only be entered upon a showing of good cause. *See* Paper 13, 3.

Paper 33, 6–7 (footnote omitted). Patent Owner did not comply with our instruction to file another version of Exhibit 2043 without the "CONFIDENTIAL – OUTSIDE ATTORNEY'S EYES ONLY" designation, nor did Patent Owner request that we enter a modified protective order defining such designation. In this proceeding, we assign no heightened level of confidentiality to Exhibit 2043 and, instead,

Exhibit 2043 is to be treated in accordance with the Board's default protective order.

IV. CONCLUSION[9]

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 1–23 of the '278 patent are unpatentable. In summary,

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–5, 9–14, 16, 19, 22, 23	103	Coli, Birch	1–5, 9–14, 16, 19, 22, 23	
1–5, 9–14, 16, 19, 22, 23	103	Coli, Birch, Dykstra	1–5, 9–14, 16, 19, 22, 23	
6, 15	103	Coli, Birch, Rusnak	6, 15	
6, 15	103	Coli, Birch, Dykstra, Rusnak	6, 15	

[9] 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
7, 8, 17, 18, 20, 21	103	Coli, Birch, Hunt	7, 8, 17, 18, 20, 21	
7, 8, 17, 18, 20, 21	103	Coli, Birch, Dykstra, Hunt	7, 8, 17, 18, 20, 21	
Overall Outcome			1–23	

V. ORDER

Accordingly, it is

ORDERED that claims 1–23 of the '278 patent have been shown to be unpatentable;

FURTHER ORDERED that Owner's Motion to seal Exhibit 2043 is *granted*;

FURTHER ORDERED that the Board's default protective order is entered and shall govern the treatment of confidential information in this proceeding;

FURTHER ORDERED that Paper 16 and Exhibits 2039, 2041, 2050, 2051, and 2052 will be unsealed; 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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