UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LIBERTY ENERGY INC. AND LIBERTY ENERGY SERVICES LLC
Petitioners

v.

U.S. WELL SERVICES, LLC
Patent Owner

Case No. IPR2025-01424
Patent 11,211,801

PETITION FOR *INTER PARTES* REVIEW OF CLAIMS 1-20 OF U.S. PATENT NO. 11,211,801

TABLE OF CONTENTS

Page

I. MANDATORY NOTICES 1
II. STANDING AND FEES 2
III. OVERVIEW OF THE '801 Patent 2
A. Subject Matter 2
B. Priority Date 5
C. Prosecution History 5
IV. SUMMARY OF PRIOR ART AND GROUNDS 10
A. Reckels (EX1004) 10
B. IEEE Red Book (EX1005) 11
C. Oehring178 (EX1007) 12
D. Solar Turbines (EX1008) 13
E. Coli (EX1009) 13
F. Kumar (EX1010) 14
G. Grounds 15
V. LEVEL OF ORDINARY SKILL 15
VI. CLAIM CONSTRUCTION 16
VII. THE CHALLENGED CLAIMS ARE UNPATENTABLE 16
A. Ground 1: Claims 1-4, 6, 8-10, 12-14, 16, 18, and 19 are obvious over Reckels in view of IEEE Red Book 16
1. Motivation to Combine 16
2. Claim 1 26
3. Claim 2 40
4. Claim 3 42
5. Claim 4 43
6. Claim 6 46
7. Claim 8 47
8. Claim 9 50
9. Claim 10 53

10. Claim 12 57
11. Claim 13 58
12. Claim 14 58
13. Claim 16 58
14. Claim 18 58
15. Claim 19 59

B. Ground 2: The Combination of Reckels, IEEE Red Book, Coli, and Solar Turbines Renders Claims 5 and 15 Obvious. 59
1. Motivation to Combine 59
2. Claim 5 61
3. Claim 15 64

C. Ground 3: The Combination of Reckels, IEEE Red Book, and Oehring178 Renders Claims 7 and 17 Obvious. 64
1. Motivation to Combine 64
2. Claim 7 68
3. Claim 17 69

D. Ground 4: The Combination of Reckels, IEEE Red Book, Oehring178, and Kumar Renders Claims 11 and 20 Obvious. 69
1. Motivation to Combine 69
2. Claim 11 72
3. Claim 20 74

VIII. CONCLUSION 74

LIST OF EXHIBITS

Ex. No.[1]	Description
1001	U.S. Patent No. 11,211,801 to Jared Oehring *et al.*(the "'801 Patent")
1002	File History for U.S. Patent No. 11,211,801 ("File History")
1003	Declaration of Dr. Robert Durham
1004	PCT International Patent Application Publication WO2018/071738 A1 by Reckels *et al.* ("*Reckels*")
1005	"IEEE Recommended Practice for Electric Power Distribution for Industrial Plants," ANSI/IEEE Red Book-1993 ("*IEEE Red Book*")
1006	Claim Listing
1007	U.S. Patent Publication No. 2017/0030178 to Oehring and Hinderliter ("*Oehring178*")
1008	Solar Turbines Power Generation and Product Selection Guide, available as of May 12, 2016 at https://web.archive.org/web/20160512094159/http://s7d2.scene7.com/is/content/Caterpillar/C10550166
1009	U.S. Patent Publication No. 2012/0255734 to Coli ("*Coli*")
1010	Kumar, B., et al, "Harmonics in Offshore Electrical Power System," 2005 Offshore Technology Conference
1011	TM2500 Mobile Power Plant webpage at GEPower.com, available as of October 1, 2017 at https://web.archive.org/web/20171001044253/https://www.gepower.com/gas/gas-turbines/tm2500
1012	Declaration of Mina Ching, Internet Archive
1013	Declaration of Sylvia Hall-Ellis, Ph.D.

[1] Citations to patents are made by column and line number. Citations to patent publications are made by paragraph number. Citations to EX1002 are made with reference to the Bates-stamped pagination. Citations to other exhibits are to the original page numbers found in the underlying document. All emphases are added unless otherwise indicated.

1014	Lionel B. Roe, PRACTICES AND PROCEDURES OF INDUSTRIAL ELECTRICAL DESIGN (McGraw-Hill: 1972), ISBN: 0-07-053390-3
1015	Camara, John A., "Electrical Engineering Reference Manual for the Electrical and Computer PE Exam," 6th ed. (Professional Publications, Inc. 2002), ISBN: 1-888577-56-8
1016	IEEE100: THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS, 7th ed. (IEEE Press: 2000), ISBN: 0-7381-2601-2
1017	U.S. Patent No. 1,743,771 to Hall *et al*.
1018	Fink, Donald G., STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS, 13th ed. (McGraw-Hill, New York: 1993), ISBN: 0-07-020984-7.
1019	U.S. Patent Publication No. 2011/0241590 to Horikoshi et al., entitled "Motor Driving Apparatus Having Fault Diagnostic Function" (filed Feb. 11, 2011 and published Oct. 6, 2011).
1020	National Electrical Code, 2017 Edition, National Fire Protection Association
1021	Solar Turbines Turbomachiney Systems For Oil and Gas Applications, available as of May 12, 2016 at https://web.archive.org/web/20160512100652/http://s7d2.scene7.com/is/content/Caterpillar/C10550151
1022	Solar Turbines Product and Solutions – Oil and Gas, available as of May 8, 2016 at https://web.archive.org/web/20160508213125/https://mysolar.cat.com/en_US/products/oil-and-gas.html
1023	Solar Turbines Products and Solutions – Power Generation, available as of May 8, 2016 at https://web.archive.org/web/20160508192056/https://mysolar.cat.com/en_US/products/power-generation.html

I. MANDATORY NOTICES

Real Party in Interest: Liberty Energy Services LLC, Liberty Energy Inc. (collectively, "Liberty" or "Petitioners"), and Liberty Advanced Equipment Technologies LLC are the real parties in interest.

Related Matters: The '801 Patent is involved in a pending lawsuit between Petitioners and U.S. Well Services, LLC ("Patent Owner," or "PO") entitled *ProFrac Services, LLC, et al v. Liberty Energy Services LLC, et al*, 2:25-cv-00522-JRG-RSP (E.D. Tex.) ("Liberty Litigation").

Lead Counsel and Back-Up Counsel: Petitioners designate lead and back-up counsel as noted below. A Power of Attorney is filed concurrently herewith under 37 C.F.R. § 42.10(b).

Lead Counsel	Backup Counsel
Chad C. Walters, Reg. No. 48,022 Baker Botts L.L.P. 2001 Ross Ave., Suite 900 Dallas, TX 75201-2980 Phone: (214) 953-6511 chad.walters@bakerbotts.com	Joseph Andrew Grado, Reg. No. 80,316 Baker Botts L.L.P. 2001 Ross Ave., Suite 900 Dallas, TX 75201-2980 Phone: (214) 953-6522 andrew.grado@bakerbotts.com Jacob McDonald, Reg. No. 74,336 Baker Botts L.L.P. 2001 Ross Ave., Suite 900 Dallas, TX 75201-2980 Phone: (214) 953-6652 Fax: (214) 661-4661 jacob.mcdonald@bakerbotts.com Melissa L. Muenks, Reg. No. 78,860 Baker Botts L.L.P.

	401 S. 1st Street, Suite 1300 Austin, Texas 78704 Phone: (214) 322-2671 melissa.muenks@bakerbotts.com

Service Information: Correspondence to lead and back-up counsel can be provided at the postal and electronic addresses above. Petitioners also consent to service by electronic mail at chad.walters@bakerbotts.com, andrew.grado@bakerbotts.com, jacob.mcdonald@bakerbotts.com, melissa.muenks@bakerbotts.com, and dllibertyvuswellservicesiprs@bakerbotts.com.

II. STANDING AND FEES

Standing: Petitioners certify under 37 C.F.R. § 42.104(a) that the '801 Patent is eligible for *inter partes* review and that Petitioners are not barred or estopped from requesting *inter partes* review on the grounds set forth herein.

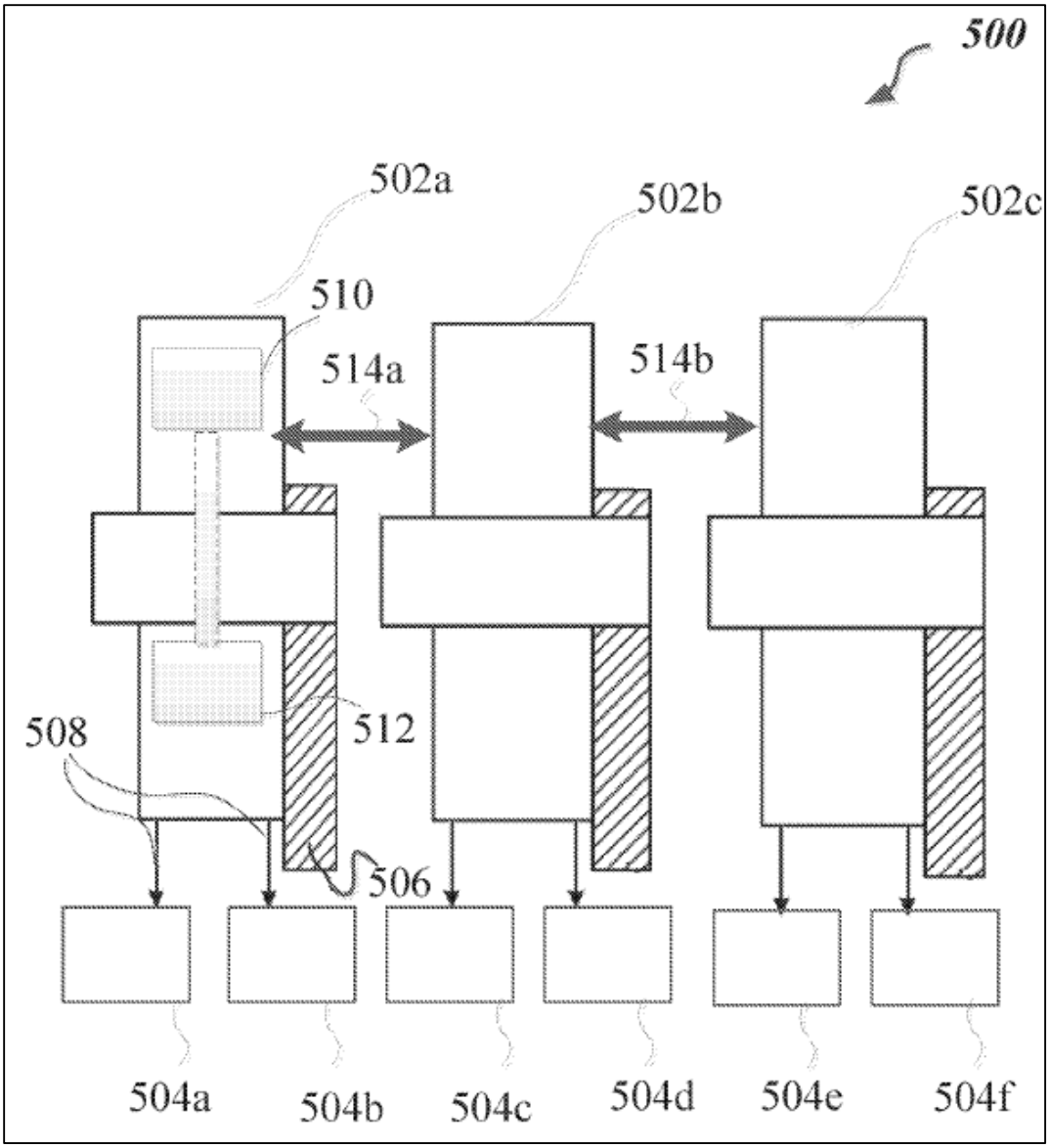
Fees: The Office is authorized to charge the fee set forth in 37 C.F.R. § 42.15(a) to Deposit Account No. 02-0384 as well as any additional fees that might be due in connection with this Petition.

III. OVERVIEW OF THE '801 Patent

A. Subject Matter

The '801 Patent relates to a "hydraulic fracturing system" that includes a "mobile grid assembly for powering an electric hydraulic fracturing pump in limited space environments." EX1001, 1:16-19. The '801 Patent describes "a singular

mobile platform of at least one mobile power unit (MPU) and at least one first switchgear that is configured to handle electric power from the MPU." *Id*., 1:54-57. Power generated by the MPU is provided to "directly power[] fracturing pump trailers or units (FPs)," which include one or more fracturing pumps for performing fracturing operations at a wellsite. *Id*., 5:32-67, 11:44-47. The '801 Patent also describes implementing "a common bus where much of the equipment is on the same circuit. As such, the common bus of the present disclosure supports the voltage and combined current requirements of the various equipment loads." *Id*., 4:18-23. Figure 5 of the '801 Patent, copied below, depicts an example hydraulic fracturing system, including MPUs 502, fracturing pump trailers 504, switch gear 512, and power cable interconnects 514. *Id*., 10:21-35. "In this configuration, power cable interconnects 514a,b are provided between the MPUs 502a-c to act as a common bus for load sharing." *Id.*, 10:29-31. To account for this load sharing configuration, where the power of MPUs 502 can be combined to power the fracturing pump trailers 504, the '801 Patent explains that "the switch gear, interconnect cables, and electrical bus bars are sized to handle all of the available electrical current that can be generated by the combined MPUs." *Id*., 5:42-45.



Id., Fig. 5.

The ’801 Patent explains that by incorporating an interconnecting cable to act as a common bus between multiple MPUs, excess power from a turbine generator can be redistributed within the system, thereby improving overall efficiency of the system. *Id*., 4:18-33.

As discussed below, fracturing systems as described, using modular power distribution components in a load sharing arrangement, were well known before the time of alleged invention of the '801 Patent. EX1003, ¶111-267.

B. Priority Date

The '801 Patent was filed as U.S. Patent App. No. 16/443,273 (the "'273 Application") on June 17, 2019, and claims priority to U.S. provisional application No. 62/685,797, which was filed on June 15, 2018. For purposes of this Petition, Petitioner assumes that the earliest possible priority date for the Challenged Claims of the '801 Patent would be no earlier than June 15, 2018.

C. Prosecution History

The '273 Application that ultimately issued as the '801 Patent was filed on June 17, 2019. On September 19, 2020, the Examiner issued a first Non-final Office Action, rejecting Claims 1-4, 6-10, 12-14, and 16-19 under 35 U.S.C. § 102 as being anticipated by U.S. Patent Pub. No. 2016/0105022 ("*Oehring*") and rejecting claims 5, 11, 15, and 20 under 35 U.S.C §103 under *Oehring*. EX1002, 430-436. In its December 20, 2019, response, the Applicant amended Claim 9 to correct for typographical errors, and argued against the § 102 rejection without further amendment. EX1002, 404, 405, 410.

On April 2, 2020, the Examiner issued a Final Rejection, maintaining the §§102 and 103 rejections of Claims 1-20 under *Oehring*. *Id*., 321-322.

On September 24, 2020, the Applicant submitted amendments to the claims accompanied by a Request for Continued Examination. *Id*., 264-274. Applicant amended the independent claims to clarify that the claimed "at least one generator" and "at least one switch gear" are both located on "the mobile unit". *Id*., 265 (amending independent Claim 1 to recite "at least one switch gear, the at least one generator coupled to the at least one switch gear **and located** on the mobile unit **with the at least one switch gear**,…"); *see also id*., 267 (amending independent Claim 12 to recite "providing a mobile unit with at least one generator and at least one switchgear **located together in the mobile unit**,…"). In the accompanying remarks, the Applicant argued that *Oehring* failed to disclose the subject matter of the claims because "*Oehring* reports providing generators (e.g., generators 222) in a respective trailers, skids, or vehicles, and separately, switchgears (e.g., switchgear 235) on respective trailers, skids, or vehicles." EX1002, 271.

On October 5, 2020, the Examiner issued a second Non-final Office Action, rejecting Claims 1-20 under §103 over *Oehring* in view of U.S. Patent No. 6,765, 304 ("*Baten*"). *Id*., 207-216. In the Office Action, the Examiner explained that "Baten clearly shows a single mobile unit containing a generator coupled to a switchgear," and that "one of ordinary skill in the art would have deemed it obvious to try to combine the power generation apparatus of Oehring with the colocation feature of Baten, thereby obtaining the claimed invention." *Id*., 209-210.

On March 26, 2021, the Applicant amended the independent claims to require load sharing functionality between the power generation system of a first mobile unit and that of a second mobile unit:

> 1. (Currently Amended) A system comprising:
>
> a first mobile unit;
>
> at least one first generator; and
>
> at least one switch gear, the at least one first generator coupled to the at least one switch gear and located on the first mobile unit with the at least one switch gear, the first mobile unit configured to provide power generated by the at least one first generator in electrical buses for ~~at least one~~ loads on one or more external mobile units, the electrical buses common to the loads and adapted to support voltage and combined current requirements of the loads of the at least one first generator and of a second generator of a second mobile unit that is adapted to support load sharing with the at least one first generator of the first mobile unit.

EX1002, 154 (showing amendments to Claim 1).

> 12. (Currently Amended) A method comprising:
>
> providing a first mobile unit with at least one first generator and at least one switchgear located together in the first mobile unit, the at least one first generator coupled to the at least one switch gear on the first mobile unit;
>
> generating power from the at least one generator;
>
> providing the power [[in]] using electrical buses for ~~at least one~~ loads in one or more external mobile units, the electrical buses common to the loads and adapted to support voltage and combined current requirements of the loads of the at least one first generator and of a second generator of a second mobile unit that is adapted to support load sharing with the at least one first generator of the first mobile unit.

Id., 156 (showing amendments to Claim 12).

On April 2, 2021, the Examiner issued a second Final Office Action, again rejecting Claims 1-20 under §103 over *Oehring* and *Baten*. *Id*., 121-129. The

Examiner cited portions of *Oehring* as teaching the newly-amended subject matter. *Id*., 122.

On July 8, 2021, the Examiner met with the Applicant's representative to discuss the latest §103 rejections, including the Applicant's position that "the Oehring reference provides redundancy and reports that 'the at least one first generator being independent of the at least one second generator so that if the at least one first generator loses the ability to generate electricity, the at least one second generator can continue to generate electricity,'" and the Applicant's position that "such discussion [in *Oehring*] is at least teaching away from load sharing and from electrical buses common to the loads and adapted to support voltage and combined current requirement, as in claim 1." *Id*., 102-106. In response to this teach-away argument, the Examiner noted that they "disagree[] and asserts that redundancy is a type of 'load sharing' and vice versa, i.e., with redundancy, and with load sharing, shared components are used to drive common loads." *Id*., 103.

Following this examiner interview, the Applicant submitted amendments to the claims accompanied by a Request for Continued Examination on July 30, 2021. *Id*., 82-90. The Applicant amended the independent claims to now recite that the switchgear, the transformer, the bus bar, and the electrical buses of the switchgear are sized to support a load sharing arrangement with a second generator, rather than

just the electrical buses of the switchgear being so sized as recited in the prior version of the claims:

> 1. (Currently Amended) A system comprising:
>
> a first mobile unit;
>
> ~~at least one first generator; and~~
>
> at least one switch gear to be associated with at least one transformer, an interconnect, and a bus bar; and
>
> [[, the]] at least one first generator coupled to the at least one switch gear and located on the first mobile unit with the at least one switch gear, the first mobile unit configured to provide power generated by the at least one first generator [[in]] using electrical buses of the at least one switchgear and using the at least one transformer, the interconnect, and the bus bar, the power for loads on one or more external mobile units, the at least one switchgear, the electrical buses, the interconnect, and the bus bar ~~common to the loads and adapted~~ sized to support voltage and ~~combined~~ current requirements of the loads and to support voltage and current outputs of the at least one transformer with the at least one first generator ~~and of~~ in a load sharing arrangement with a second generator of a second mobile unit ~~that is adapted to support load sharing with the at least one first generator of the first mobile unit~~.

Id., 86.

> 12. (Currently Amended) A method comprising:
>
> providing a first mobile unit with at least one first generator and at least one switchgear located together in the first mobile unit, the at least one first generator coupled to the at least one switch gear on the first mobile unit, the at least one switch gear to be associated with at least one transformer and with an interconnect and a bus bar;
>
> generating power from the at least one generator;
>
> providing the power using electrical buses of the at least one switchgear and using the at least one transformer, the interconnect, and the bus bar, the power for loads in one or more external mobile units, the at least one switchgear, the interconnect, the bus bar, and the electrical buses ~~common to the loads and adapted~~ sized to support voltage and ~~combined~~ current requirements of the loads and to support voltage and current outputs of the at least one transformer with the at least one first generator in a load sharing arrangement with ~~and of~~ a second generator

of a second mobile unit ~~that is adapted to support load sharing with the at least one first generator of the first mobile unit~~.

Id., 88-89.

In its accompanying remarks, the Applicant noted that as a result of the July 8, 2021, examiner interview and "further feedback" provided by the Examiner on July 14, 2021, "distinguishing aspects between the present subject matter and the references were made apparent," "[p]articularly aspects of load sharing and sizing of features to be used with a switch gear and at least one first generator of a first mobile unit that is in a load sharing arrangement with a second generator of a second mobile unit [which] were discussed as allowable matter." *Id*., 91.

Following these amendments, a Notice of Allowance was issued on August 19, 2021. *Id*., 47.

IV. SUMMARY OF PRIOR ART AND GROUNDS

A. Reckels (EX1004)

International Publication Number WO 2018/071738 to Reckels ("*Reckels*") was filed as International Application Number PCT/US2017/056449 on October 13, 2017 and was published on April 18, 2018. *Reckels* qualifies as prior art to the '801 Patent under at least 35 U.S.C. §§102(a)(1)-(2).

Reckels generally discloses an "electric fracturing pump wellsite configuration," wherein an electric power generation system is used to generate power for use by one or more fracturing pumps. EX1004, [0015]. *Reckels* discloses

"a power generation trailer 10 [that] includes a gas turbine assembly 18" that is "connected to a generator 20," which "is then connected to an electric room 22, which may include transformers, switchgear, variable frequency drives, and other electrical components needed to drive high power electric motors." *Id*., [0018]. A second trailer 14, which includes hydraulic pump 28 and high pressure fracturing fluid pump 30, "receives electrical power from the power generation trailer 10" to drive the pumps. *Id*. *Reckels* further provides that "[g]enerally, the gas turbines and the pumps can also be connected to a common bus bar, so that the gas turbines can run at different loads, e.g. one at 100% and the other at 50%." *Id*., [0015].

Reckels is in the same field of endeavor—electrical power supply and distribution in industrial systems—as the '801 Patent. EX1003, ¶97.

B. IEEE Red Book (EX1005)

IEEE Red Book is ANSI/IEEE Std 141-1986—IEEE Recommended Practice for Electric Power Distribution for Industrial Plants. *IEEE Red Book* was publicly accessible and indexed at the library, and accordingly would have been searchable and obtainable by the public by at least July 30, 1987. EX1003, ¶98; EX1013, ¶¶34-41, 49. Further, Dr. Durham has owned a copy of *IEEE Red Book* since at least 1992, when it was used in a Power Systems class in his graduate studies. EX1003, ¶98. *IEEE Red Book* qualifies as prior art to the '801 Patent under at least 35 U.S.C. §102(a)(1).

IEEE Red Book discloses the process of planning and designing an electric distribution system, including the determination of current and voltage requirements of a system's load to plan the characteristics of the system's sources and distribution components. *See, e.g.*, EX1005, 43-44, 53-55.

IEEE Red Book is in the same field of endeavor—electrical power supply and distribution in industrial systems—as the '801 Patent. EX1003, ¶100.

C. Oehring178 (EX1007)

U.S. Patent Publication No. 2017/0030178 to Oehring and Hinderliter ("*Oehring178*") was filed on October 12, 2016, and was published on February 2, 2017. *Oehring178* qualifies as prior art to the '801 Patent under at least 35 U.S.C. §102(a)(1).

Oehring178 discloses an electric hydraulic fracturing system with turbine generators, switchgear, transformers, electric motor-driven pumps, and variable frequency drives (VFDs), where VFDs and motor control centers (MCCs) are located on a mobile trailer on which fracturing pumps are located. EX1007, [0029], [0038], Fig. 4.

Oehring178 is in the same field of endeavor—electrical power supply and distribution in industrial systems—as the '801 Patent. EX1003, ¶103.

D. Solar Turbines (EX1008)

Solar Turbines is a selection guide for industrial gas turbine products manufactured by Solar® Turbines (a Caterpillar company). According to the Internet Archive, *Solar Turbines* was publicly available on the internet as of at least May 12, 2016. EX1008; EX1012, 1, 19-23. *Solar Turbines* thus qualifies as a prior art printed publication under at least 35 U.S.C. §102(a)(1).

Solar Turbines lists specifications of particular products within the Solar® Turbines industrial gas turbine product line, including those of the Taurus™ 70. Solar Turbines was a well-known turbine generator manufacturer used in the oil and gas industry, such that *Solar Turbines* is in the same field of endeavor—electrical power supply and distribution in industrial systems—as the '801 Patent. EX1003, ¶106.

E. Coli (EX1009)

U.S. Patent Application Publication No. 2012/0255734 to Coli ("*Coli*") was filed on April 6, 2012, and published on October 11, 2012. *Coli* qualifies as prior art to the '801 Patent under at least 35 U.S.C. §§102(a)(1)-(2).

Coli discloses the use of turbine generators to power electric motors that drive hydraulic fracturing pumps, and provides examples of such generators and pumps, such as the "SWGS-2500 Well Service Pump sold by Gardner Denver, Inc." and the "TM2500+ turbine generator sold by General Electric." EX1009, [0044], [0046].

Coli is in the same field of endeavor—electrical power supply and distribution in a hydraulic fracturing system—as the '801 Patent. EX1003, ¶109.

F. Kumar (EX1010)

"Harmonics in Offshore Electrical Power System" by B. Kumar *et al*. ("*Kumar*") is a paper prepared for presentation at the 2005 Offshore Technology Conference held in Houston, Texas on May 2-5, 2005. *Kumar* bears a copyright date of 2005. *Kumar* was publicly accessible and indexed at the library, and accordingly would have been searchable and obtainable by the public by at least May 11, 2005. EX1003, ¶110; EX1013, ¶¶42-49. *Kumar* qualifies as a prior art printed publication under 35 U.S.C. § 102(a)(1).

Kumar teaches the causes and effects of "harmonics" in oil and gas power generation and distribution systems, and how one may mitigate the negative effects of harmonics. In particular, *Kumar* teaches that harmonics are created by "power electronic devices such as electrical submersible pumps (ESPs), variable speed drives," and other components, and that harmonics can cause damage to a power system including "damage to equipment and disruption to production process, can cause overheating, produce electromagnetic interference to other control / communication equipment." EX1010, 2,4. *Kumar* discloses several methods to mitigate harmonics, including the use of isolation transformers. *Id*., 5, 6. *Kumar* is

in the same field of endeavor—electrical power supply and distribution in industrial systems—as the '801 Patent. EX1003, ¶112.

Kumar is also reasonably pertinent to a problem faced by the inventors the '801 Patent, which describes using an isolation transformer "for filtering out harmonics between the power source (generators) and the load (fracturing equipment in FP 704a,b) with or without changing the voltage." EX1001, 11:50-54; EX1003, ¶112.

G. Grounds

Ground	Claims	Basis (35 U.S.C. §)	Prior Art
1	1-4, 6, 8-10, 12-14, 16, 18, 19	103	*Reckels*, *IEEE Red Book*
2	5, 15	103	*Reckels*, *IEEE Red Book, Solar Turbines*, *Coli*
3	7, 17	103	*Reckels*, *IEEE Red Book*, *Oehring178*
4	11, 20	103	*Reckels*, *IEEE Red Book*, *Oehring178*, *Kumar*

EX1003, ¶18; EX1006 (listing challenged claim elements).

V. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art ("POSITA") would have either (1) a Bachelor of Science in Mechanical Engineering, Electrical Engineering, Petroleum Engineering or an equivalent field as well as at least 2 years of academic or industry experience in the oil and gas industry, including design and/or analysis of power systems for well operations or (2) at least four years of industry experience in the oil

and gas industry, including design and/or analysis of power systems for well operations. EX1003, ¶43.

VI. CLAIM CONSTRUCTION

Claim terms in IPR are construed according to their "ordinary and customary meaning" to a POSITA. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*); 37 C.F.R. §42.100(b). Constructions are proposed "only to the extent necessary." *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). For purposes of this proceeding and grounds presented herein, Petitioners do not present any constructions. EX1003, ¶44.

VII. THE CHALLENGED CLAIMS ARE UNPATENTABLE

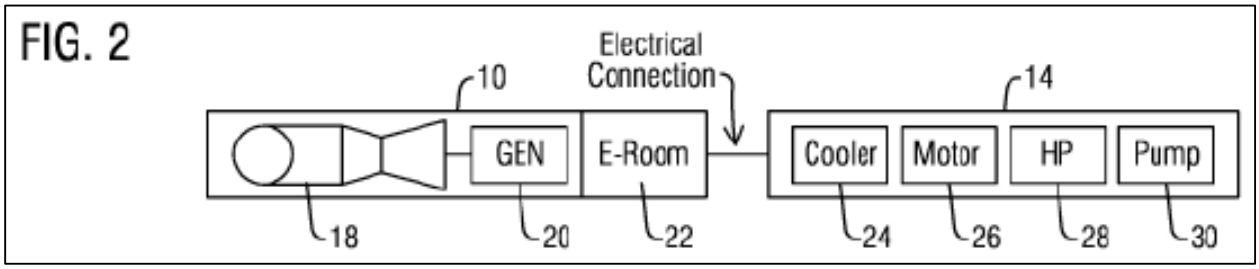
A. Ground 1: Claims 1-4, 6, 8-10, 12-14, 16, 18, and 19 are obvious over Reckels *in view of* IEEE Red Book

1. Motivation to Combine

A POSITA would have been motivated to combine *Reckels* and the teachings of *IEEE Red Book* to arrive at the claimed invention, and would have a reasonable expectation of success. EX1003, ¶¶114-128.

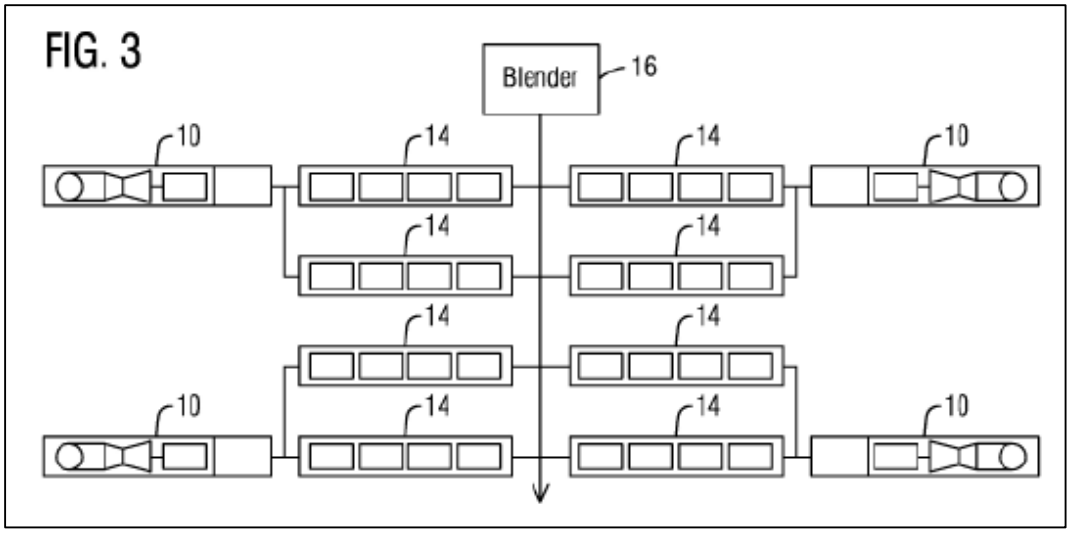
Reckels generally discloses an "electric fracturing pump wellsite configuration," wherein an electric power generation system is used to generate power for use by one or more electric fracturing pumps. EX1004, [0015]. *Reckels* describes different configurations for supplying power from the power generation system to the electric fracturing pumps.

In one configuration, depicted by Figure 2 of *Reckels*, a power generation trailer 10 includes a "gas turbine assembly 18" that is "connected to a generator 20," which "is then connected to an electric room 22, which may include transformers, switchgear, variable frequency drives, and other electrical components needed to drive high power electric motors." *Id*., [0018]. A second trailer 14, which includes hydraulic pump 28 and high pressure fracturing fluid pump 30, "receives electrical power from the power generation trailer 10." *Id*. "The hydraulic pump 28[ ] generates hydraulic fluid pressure that is used to rotate and control the flowrate of the high pressure fracturing fluid pump 30. The high pressure fracturing fluid pump 30 receives the fracturing liquids and pressurizes them for subsequent injection into the wellbore and formation." *Id*. Figure 2 of *Reckels* is copied below:



Id., Fig. 2.

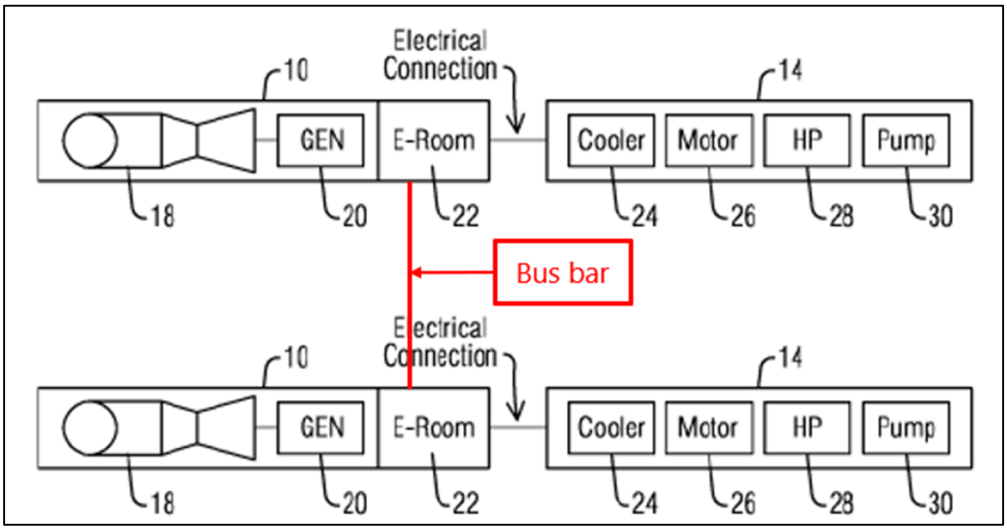
In a similar configuration, Figure 3 of *Reckels* depicts several power generation trailers 10, each of which is "electrically connected to two of the hydraulic fracturing pump trailers 14." *Id*., [0019]. Figure 3 of *Reckels* is copied below:



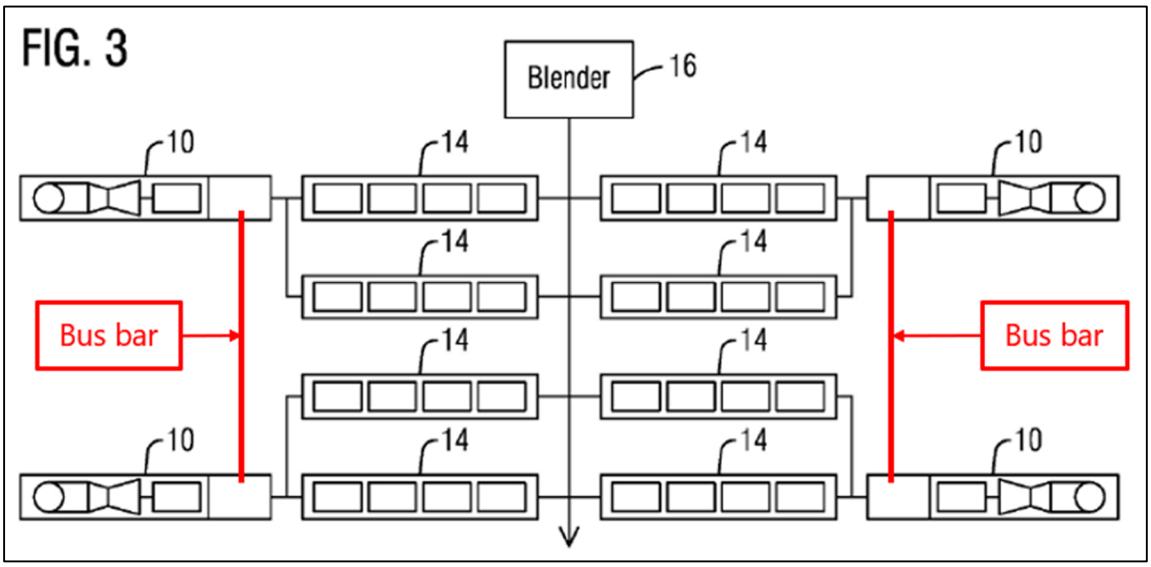
Id., Fig. 3.

Apart from these particular configurations, *Reckels* provides that "[g]enerally, the gas turbines and the pumps can also be connected to a common bus bar, so that the gas turbines can run at different loads, e.g. one at 100% and the other at 50%." *Id*., [0015]. A POSITA would have understood that in such a configuration, the Figure 2 and Figure 3 embodiments of *Reckels*, wherein power generation trailers 10 that comprise a gas turbine assembly 18, generator 20, and electric room 22 (which includes transformers and switchgear), would have been modified to employ a main-tie-main system with a "common bus bar" between the switchgears of the respective generator trailers 10 that acts as the tie, or interconnect, in order to electrically incorporate *Reckels*' teachings of a "common bus bar." EX1004, [0018]; EX1003, ¶116. Annotated copies of Figures 2 and 3 are provided below and depict what a POSITA would have understood to be an exemplary system that implements

the "common bus bar" described by *Reckels* to couple multiple power generation systems with multiple loads from *Reckels*' Figures 2 and 3 embodiments.



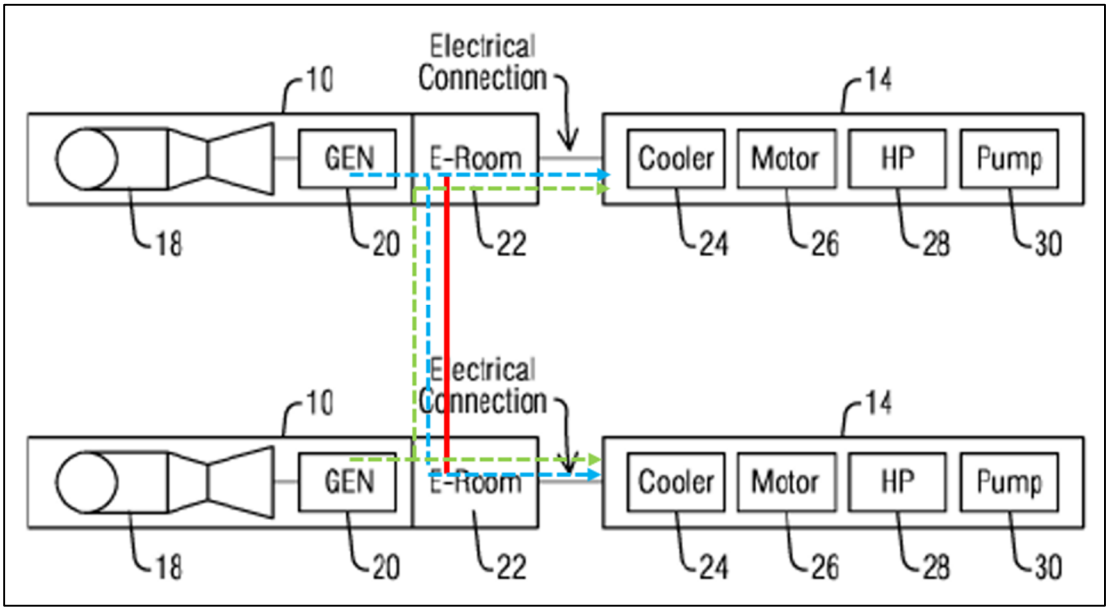
EX1004, Fig. 2 (annotated).



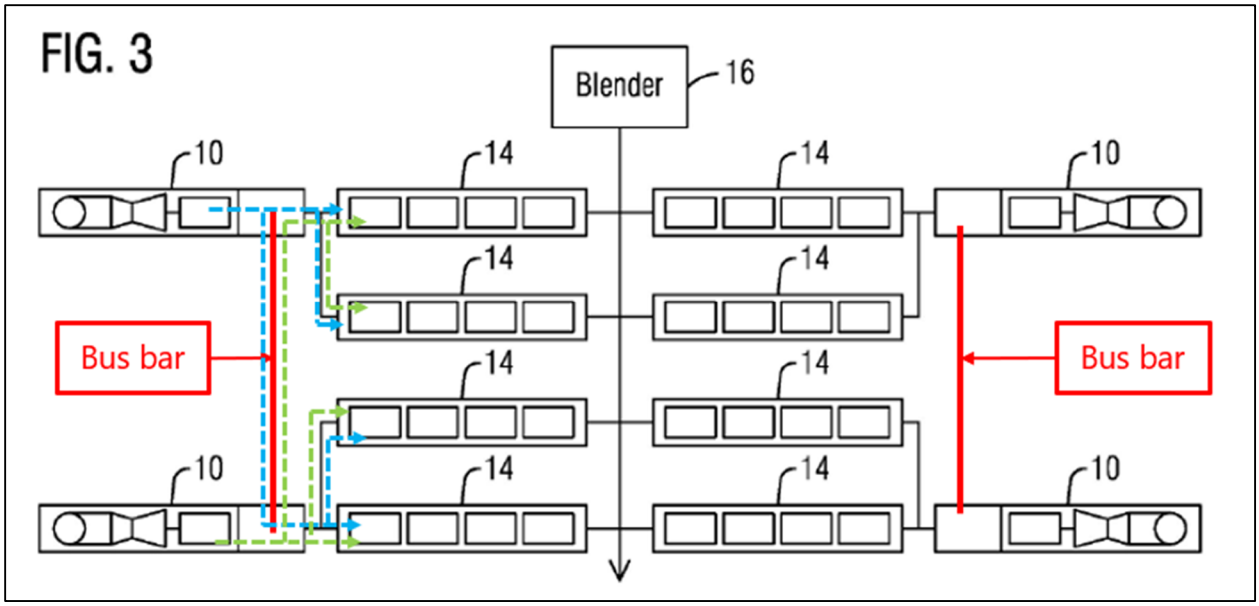
Id., Fig. 3 (annotated)

In these configurations, a POSITA would have understood that internal buses of the respective switchgears (*i.e.*, the switchgears located in e-rooms 22) would be coupled to a "common bus bar" such that the respective generators each provide

power to the common bus bar. EX1003, ¶117 (citing, EX1005, 55-56, 529, teaching that switchgears comprise a "main bus bar"). Further, a POSITA would have understood that the respective electrical connections that couple one or more second trailers 14 to a power generation trailer 10 (*e.g.*, as depicted in Figures 2 and 3) would also be coupled to the common bus bar, such that each generator coupled to the common bus bar can power the components included in the second trailers 14. EX1003, ¶118. Annotated copies of Figures 2 and 3, which have been modified to incorporate the common bus bar as described above, show how power from the respective generators would flow to the second trailers 14 coupled to the common bus bar:



EX1004, Fig. 2 (annotated, depicting power from a first generation trailer 10 provided to both second trailers 14 in blue annotation and depicting power from a second generation trailer 10 provided to both second trailers 14 in green annotation).



Id., Fig. 3 (annotated, depicting power from first generation trailer 10 provided to all second trailers 14 in left-half of figure in blue annotation and depicting power from second generation trailer 10 provided to all second trailers 14 in left-half of figure in green annotation).

It would also have been obvious to a POSITA to modify *Reckels* to include a bus bar that connects the generation systems of *Reckels*' trailers 10 with the load elements of second trailers 14, as discussed above, in view of *IEEE Red Book*, which similarly discloses an interconnect for coupling multiple power sources and load elements. EX1003, ¶122. *IEEE Red Book* discloses a detailed example of an industrial main-tie-main system with a cable acting as the tie bus. Figure 99 of *IEEE Red Book*, annotated below, discloses a one-line diagram of an industrial system that contains two main switchgear busses (blue arrows), each with a generator (annotated in green) and a cable interconnecting or tying the main busses together (red arrow).

EX1003, ¶122. Further, transformers are provided to step up or step down the voltage as needed (annotated in magenta). In this example, the cable is serving the same function as *Reckels*' "common bus bar," *i.e.*, connecting two power sources (*e.g.*, generators G1 and G2 as shown in Figure 99 of *IEEE Red Book*) with multiple loads (*e.g.*, motors M throughout Figure 99) to provide load sharing functionality.

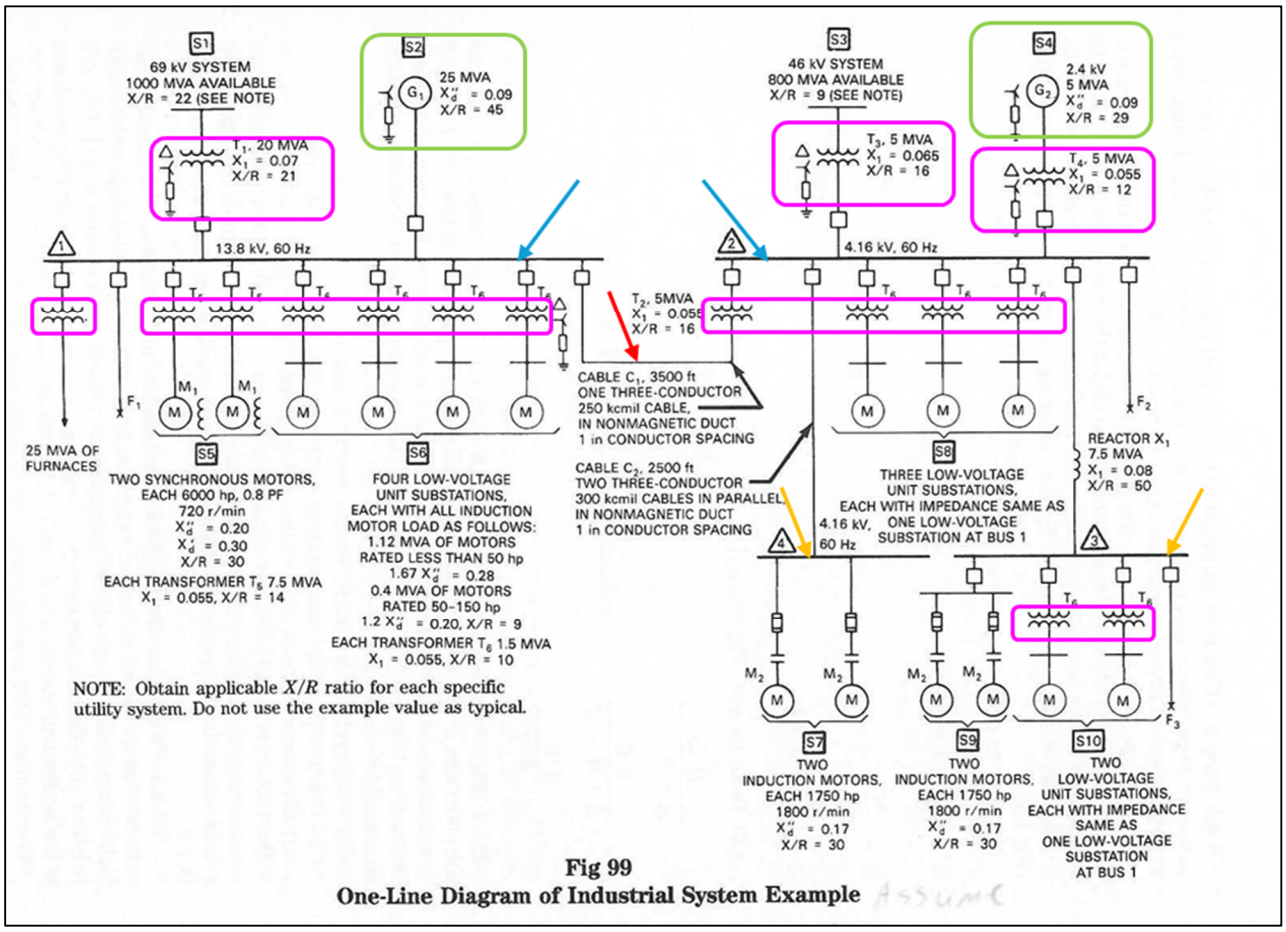


Fig 99
One-Line Diagram of Industrial System Example

EX1005, Fig. 99 (annotated)

A POSITA would have been motivated to combine *Reckels* with the teachings of *IEEE Red Book*. When implementing *Reckels*' teaching of using a "common bus bar" to connect gas turbines with the pumps, a POSITA would have been motivated

to look to other references that provide additional details describing how to build a power distribution system that implements a mechanism for coupling multiple power generation sources to multiple loads. EX1003, ¶124. The *IEEE Red Book* is one such reference. The *IEEE Red Book* is a well-known professional publication that "provides a recommended practice for the electrical design of industrial facilities," and a POSITA would have been aware of this reference as a resource for helping plan and build the electrical system taught by *Reckels*. *See* EX1005, 1; EX1003, ¶124. And although *Reckels* discloses the use of a "common bus bar" to connect its generators while *IEEE Red Book* discloses a cable tie connecting its generators, a POSITA would have understood that the fundamental operation of the bus bar and cable tie is the same—distributing current within an electrical system—such that *IEEE Red Book*'s teachings would be informative to the implementation of *Reckels*' system. EX1003, ¶124.

Further, a POSITA would have been motivated to modify the Figure 2 and Figure 3 embodiments of *Reckels* to incorporate a common bus bar to connect multiple power generation trailers 10 and the loads (*e.g.*, cooling units, motors, and pumps) of multiple trailers 14, as taught by *Reckels* and rendered obvious by *IEEE Red Book*, because this configuration allows for load sharing functionality—*i.e.*, where multiple power sources are used to power the same load(s)—which offers several benefits to *Reckels*' power generation system. *Id*., ¶125. For example, as

Reckels explains, implementing a "common bus bar" to connect multiple generator systems and multiple fracturing pumps means "that the gas turbines can run at different loads, e.g. one at 100% and the other at 50%." EX1004, [0015]. This means that the power generation systems can flexibly adapt their power output of each power generation trailer 10 to meet the demands of the load, which can improve overall system efficiency. EX1003, ¶125. Further, the common bus bar introduces redundancy into the system, such that if one of the power generation systems (*i.e.*, the generator of one power generation trailer 10) fails or is powered off for maintenance, for example, other power generation systems coupled to the common bus bar can continue powering the loads and limit total loss of service. *Id*., ¶¶55-56, 125. These benefits were well-known advantages offered by load sharing configurations and would have motivated a POSITA to incorporate *Reckels*' common bus bar as taught by *Reckels* and *IEEE Red Book*. *Id*.

Incorporating *IEEE Red Book*'s teachings of a cable tie in a main-tie-main load sharing arrangement is applying a known technique (a main-tie-main configuration for coupling multiple power source, as taught by *IEEE Red Book*) to improve similar devices (*Reckel*'s power distribution system) in the same way. EX1003, ¶126; *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). The results of the combination would be predictable: a power distribution system as taught by *Reckels* that can combine and share power generated by different power generation

trailers to drive one or more pumps on second trailers 14. EX1003, ¶126. And as discussed above, both *Reckels* and *IEEE Red Book* are in the same field of endeavor—electrical power supply and distribution in industrial systems—such that a POSITA would have been motivated to combine these references and would have reasonably expected success in doing so. EX1003, ¶126; *supra*, IV.A-B.

IEEE Red Book also discloses fundamental teachings regarding the process of planning and designing an electric distribution system, including the determining of load voltage and current requirements and planning the distribution system and sources (*e.g.*, generators and transformer(s)) to support those requirements. *See, e.g.*, EX1005, 43-44, 53-55. When implementing *Reckels*' power distribution system, a POSITA would have been motivated to search for other references that guide the planning and development of such a system, including the selection of source and distribution system components necessary to support the desired loads, and would have turned to IEEE Red Book as one such source. EX1003, ¶127.

Further, combining *Reckels* with *IEEE Red Book* is merely combining prior art elements (*i.e.*, designing power source and distribution system components to support voltage and current requirements of the loads) to known methods (*i.e.*, *Reckels*' power distribution system) to yield predictable results (*i.e.*, a robust power distribution system that can support load requirements). EX1003, ¶128. Accordingly, a POSITA would have been motivated to combine *IEEE Red Book*'s

fundamental teachings regarding electric power distribution system design with *Buckley*'s power distribution system and would have reasonably expected success in doing so. *Id*.

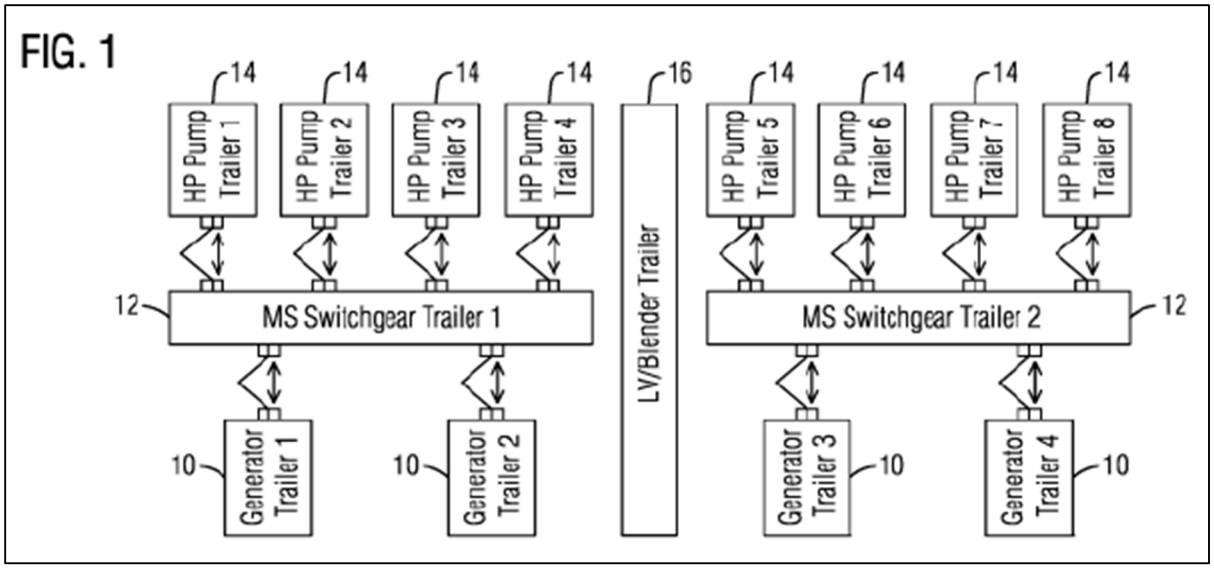
2. Claim 1

a) 1[p]: A system comprising:

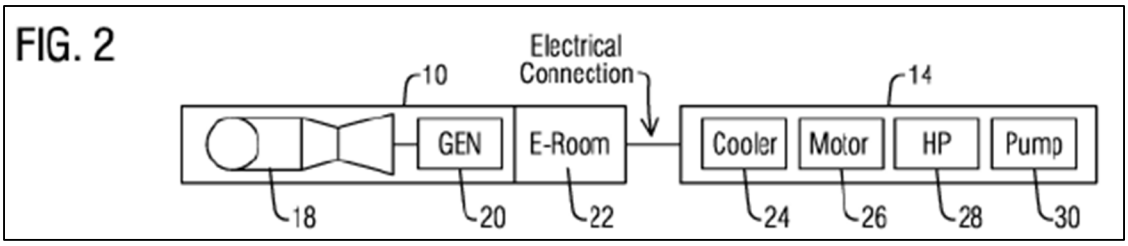
To the extent the preamble is limiting, the *Reckels-IEEE Red Book* combination discloses the preamble. EX1003, ¶¶130-131. *Reckels* discloses a "hydraulic fracturing pump system" that "includes two individual trailers, wherein a first trailer 10 includes a power generation system and a second trailer includes a hydraulic pumping system 14." EX1004, [0018].

b) 1[a]: a first mobile unit;

Reckels discloses a "first trailer 10 [that] includes a power generation system." EX1004, [0018]; *see also id.*, [0015] (referring to trailers 10 as "generator trailers 10"); *see also id.*, [0018] (referring to trailer 10 as "power generation trailer 10"). *Reckels* explains that the trailer may be a "semi-trailer." *Id*., Abstract. Examples of trailer 10 are provided in Figures 1 and 2 of *Reckels*, copied below:



EX1004, Fig. 1.

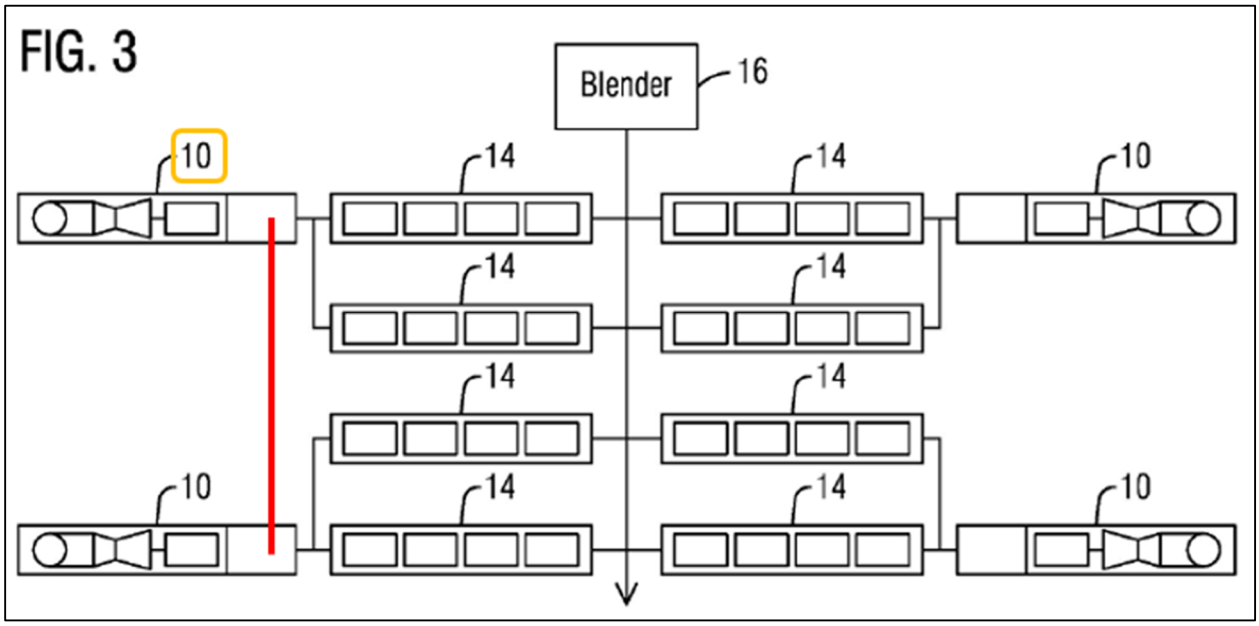


Id., Fig. 2.

A POSITA would have understood that the trailer 10 (*e.g.*, semi-trailer) is configured to be transported to different locations via a semi-truck, for example, such that the trailer 10 is "*mobile*." EX1003, ¶133. This understanding is consistent with the '801 Patent, which lists a trailer as an example of a mobile unit. *See, e.g.*, EX1001, 6:6-16. Accordingly, *Reckels* discloses a first trailer 10, which may be a semi-trailer, as the "*first mobile unit*."

For the sake of clarity, Petitioners provide an annotated copy of the modified version of *Reckels*' Figure 3 embodiment, wherein a common bus bar couples two

power generation trailers 10 and associated second trailers 14, to highlight the "*first mobile unit*" (annotated with an orange box):



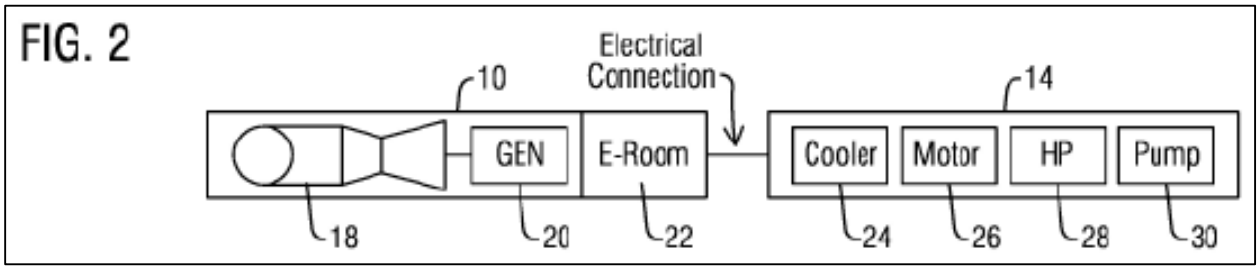
EX1004, Fig. 3 (annotated).

The *Reckels-IEEE Red Book* combination therefore discloses Limitation 1[a].

c) 1[b]: at least one switch gear to be associated with at least one transformer, an interconnect, and a bus bar; and

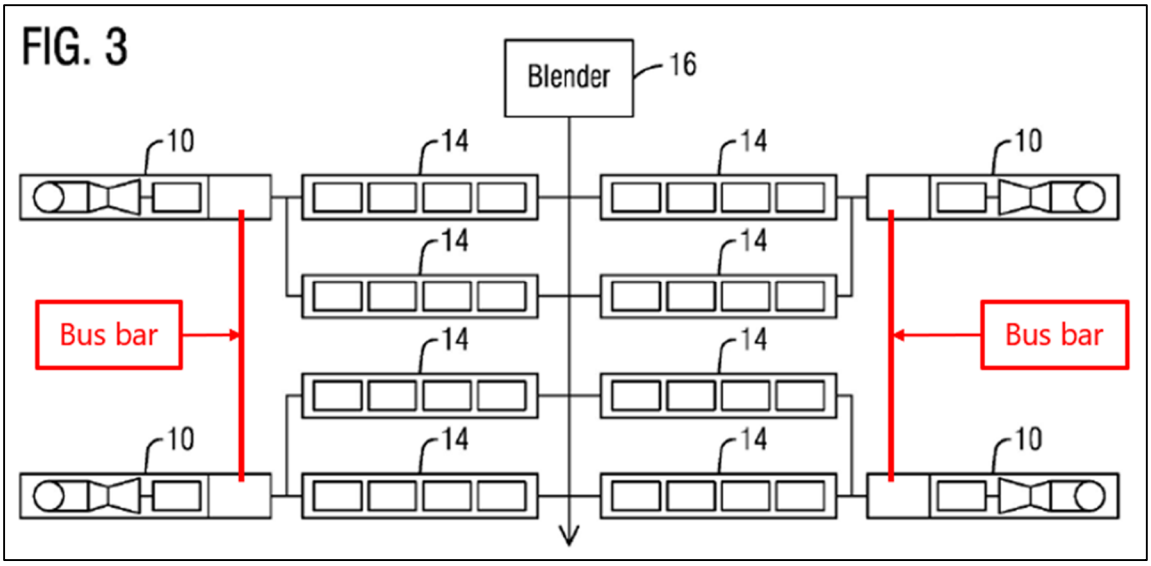
Reckels teaches that power generation trailer 10 includes a "gas turbine assembly 18" that is "connected to a generator 20," which "is then connected to an electric room 22, which may include ***transformers***, ***switchgear***, variable frequency drives, and other electrical components needed to drive high power electric motors." EX1004, [0018]. A second trailer 14, which includes hydraulic pump 28 and high pressure fracturing fluid pump 30, "receives electrical power from the power generation trailer 10" via an "electrical connection." *Id.*; *see also id.*, Fig. 2. A copy

of Figure 2, depicting the generator 20 and electric room 22 as components of the trailer 14, is depicted below:



Id., Fig. 2.

Reckels further discloses that "the gas turbines and the pumps can also be connected to a common bus bar, so that the gas turbines can run at different loads, e.g. one at 100% and the other at 50%." *Id*., [0015]. As discussed above in Section VII.A.1, *Reckels* discloses, and renders obvious in view of *IEEE Red Book*, a modified implementation of the Figure 2 and Figure 3 configurations wherein at least two of *Reckels*' power generation trailers 10 and their associated second trailers 14 are connected via a "common bus bar." *See supra*, VII.A.1. An example of this configuration is depicted below:

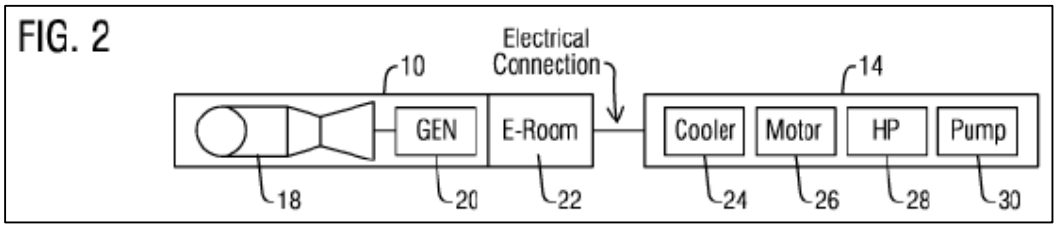


EX1004, Fig. 3 (annotated).

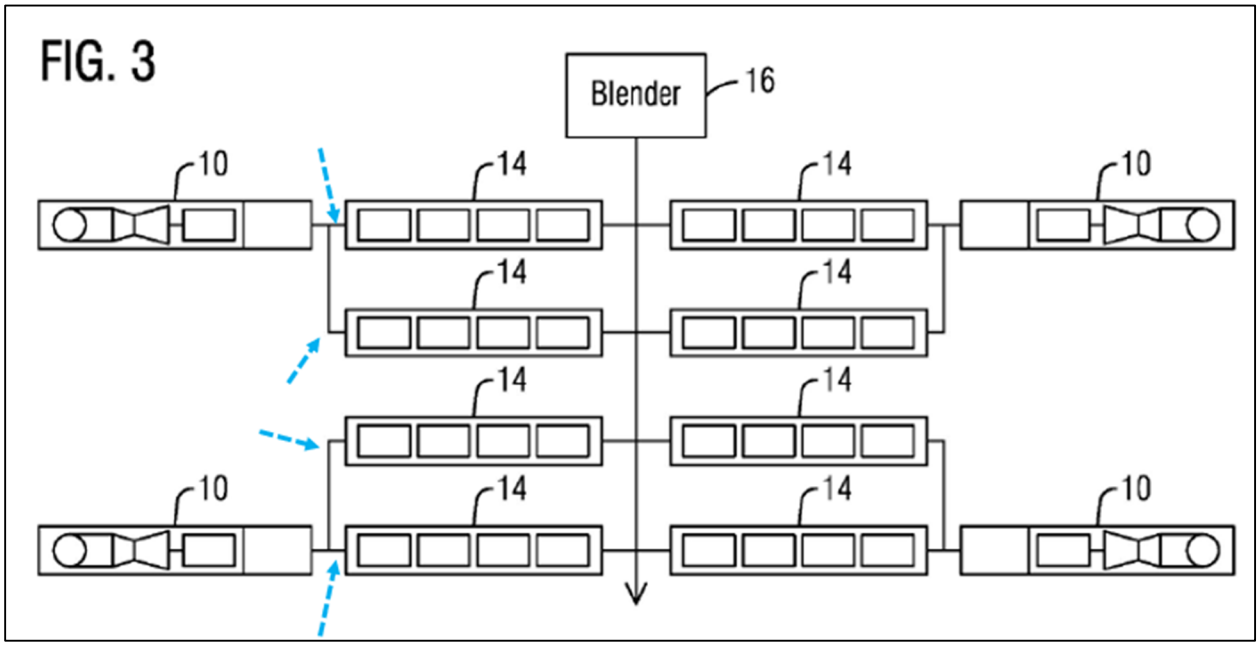
In this configuration, a POSITA would have understood that internal buses of the respective switchgears would be coupled to the "common bus bar" such that the respective generators each provide power to the common bus bar. EX1003, ¶¶136-137; *see also supra*, VII.A.1. Further, a POSITA would have understood that the respective electrical connections of each power generation trailer 10-second trailer 14 combination would also be coupled to the common bus bar, such that each generator can power the components of both second trailers 14. EX1003, ¶136. And as shown, and discussed above, a switchgear of an electrical room 22 is "*associated with*" a transformer of the same electrical room 22. EX1004, [0018] (explaining that electrical room 22 includes a transformer and a switchgear).

The "electrical connection" shown in Figure 2 of *Reckels* is an interconnect associated with the switchgear of power generation trailer 10 and second trailer 14.

This is consistent with the '801 Patent's use of the term "*interconnect*" as simply referring to components connecting two equipment trailers. *See, e.g.,* EX1001, 4:7-11; 6:54-59; 10:23-31.



EX1004, Fig. 2. Similar electrical connections (*i.e.*, "*interconnects*") are depicted in Figure 3, annotated below:



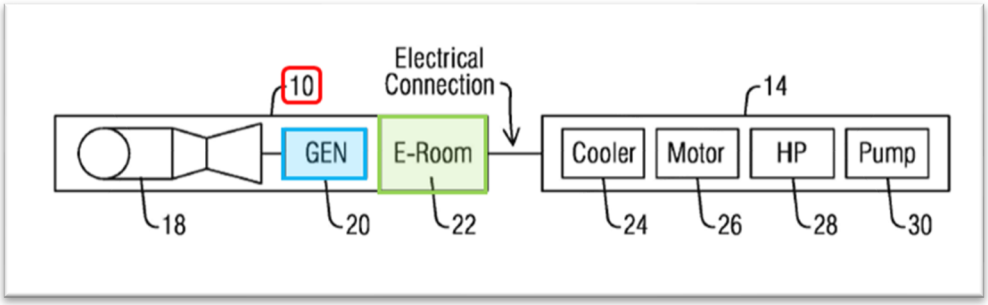
Id., Fig. 3 (annotated, showing electrical connections with blue arrows). And in the modified Figure 3 embodiment wherein a common bus bar is incorporated, the common bus bar serves to interconnect power generation trailers 10, such that the

common bus bar would also be understood to be an example of an "*interconnect*" as claimed. EX1003, ¶140.

Accordingly, *Reckels* discloses, and renders obvious in view of *IEEE Red Book*, a switchgear (*e.g.*, a switchgear of a first e-room 22) associated with a transformer (*e.g.*, a transformer of the first e-room 22), interconnect (*e.g.*, an electrical connection connecting the components of the e-room 22 to a first second trailer 14, and the common bus bar), and bus bar (*e.g.*, the common bus bar coupling the components of the first e-room 22 with the components of a second e-room 22, and the internal bus bar of the switchgear of the first e-room 22) as claimed.

d) 1[c]: at least one first generator coupled to the at least one switch gear and located on the first mobile unit with the at least one switch gear,

Reckels teaches that a power generation trailer 10 comprises a "gas turbine assembly 18" that is "connected to a generator 20," which "is then connected to an electric room 22," that includes transformers and switchgear. EX1004, [0018]. As shown in Figure 2 of *Reckels,* power generator trailer 10 (*i.e.*, the "*first mobile unit*") (annotated in red) contains ***both*** generator 20 (highlighted in blue) and e-room 22 (highlighted in green).



Id., Fig. 2 (annotated).

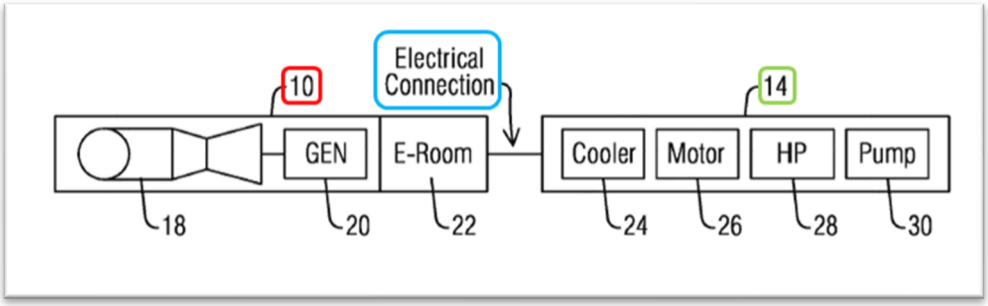
In the modified version of *Reckels*' Figure 3 embodiment, where a common bus bar couples two power generation trailers 10 and associated second trailers 14, a POSITA would have understood that each power generation trailer 10 (*i.e.*, "*mobile unit*") includes a generator coupled to a switchgear (which is located in the respective power generation trailer 10's e-room 22), including the "*first mobile unit*" as identified above with respect to Limitation 1[a]. EX1003, ¶145; *see supra*, VII.A.2.(b).

Accordingly, the *Reckels-IEEE Red Book* combination discloses Limitation 1[c].

> e) 1[d]: the first mobile unit configured to provide power generated by the at least one first generator using electrical buses of the at least one switchgear and using the at least one transformer, the interconnect, and the bus bar, the power for loads on one or more external mobile units,

Reckels further explains that a "second trailer 14," which "includes a cooling unit 24, a fixed speed electric motor 26, a hydraulic pump 28 connected to the electric motor, and a high pressure pump connected to the hydraulic pump 30,"

"receives electrical power from the power generation trailer 10." EX1004, [0014]. "The electrical power is provided to the fixed speed electric motor 26, which rotates the hydraulic pump 28. The hydraulic pump 28 generates hydraulic fluid pressure that is used to rotate and control the flowrate of the high pressure fracturing fluid pump 30." *Id.*, [0018]. Figure 2 of *Reckels*, copied and annotated below, depicts this relationship between a power generation trailer 10 and a second trailer 14.

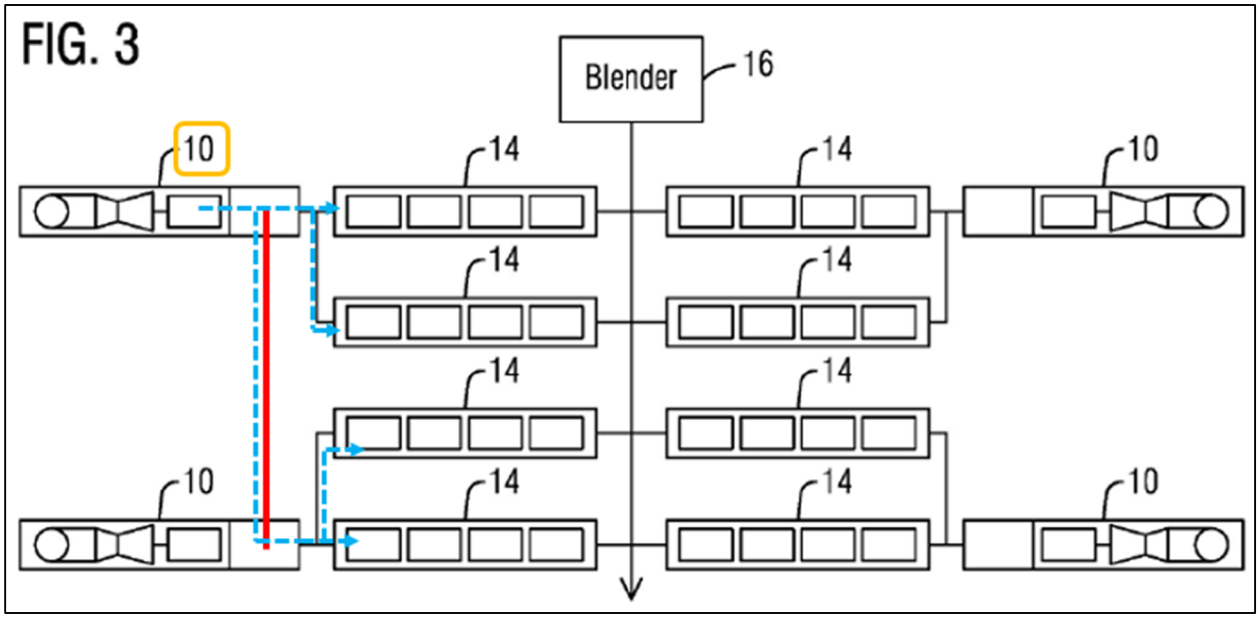


Id., Fig. 2 (annotated).

A POSITA would have understood that the cooling unit, motor, and pumps included in a "second trailer 14" comprise "*loads on one or more external mobile units*." EX1003, ¶149. As shown, second trailers 14 are separate from power generation trailers 10, such that second trailers 14 are "*external*" units. And as discussed above for Limitation 1[a], a POSITA would have understood that these second trailers 14 are "*mobile*" because they are designed to be transported via semi-trucks and because the '801 Patent lists trailers as examples of mobile units. *See supra*, VII.A.2.(b).

Accordingly, *Reckels* discloses that a power generation trailer 10 (*i.e.*, "*the first mobile unit*") is configured to provide power from generator 20 ("*is configured to provide power generated by the at least one first generator*") to power the cooling unit, motor, and pumps on a second trailer 14 ("*..., the power for loads on one or more external mobile units*").

The annotated copy of Figure 3 below, which incorporates the common bus bar as disclosed by *Reckles* and rendered obvious by *IEEE Red Book*, shows how power is delivered from the generator of the "*first mobile unit*" to the second trailers 14 to power the associated pumps:



EX1004, Fig. 3 (annotated); EX1003, ¶151.

As shown, power generated by the generator 20 of the first power generation trailer 14 (*i.e.*, the power generation trailer 10 with orange annotation) is passed to

the E-room 22 of the first power generation trailer, where it is conditioned by a transformer and distributed to a switchgear bus within the e-room 22, before it is passed, via electrical buses of the switchgear, to the common bus bar and distributed to the secondary trailers 14 via the respective electrical connections. EX1003, ¶152. As such, *Reckels* discloses, and renders obvious in view of *IEEE Red Book*, "*the first mobile unit configured to provide power generated by the at least one first generator*" (*e.g.*, that the first power generation trailer 14 is configured to provide power via its component generator 20) "*using electrical buses of the at least one switchgear and using the at least one transformer*" (*e.g.*, using electrical busses of the switchgear and using the transformer included in the associated e-room 22), "*the interconnect*" (*e.g.*, the common bus bar and the electrical connections to the second trailers 14), and "*the bus bar*" (*e.g.*, the common bus bar and the internal bus bar of the switchgear). Thus, *Reckels* discloses, and renders obvious in view of *IEEE Red Book*, Limitation 1[d].

> f) 1[e]: the at least one switchgear, the electrical buses, the interconnect, and the bus bar sized to support voltage and current requirements of the loads and to support voltage and current outputs of the at least one transformer with the at least one first generator in a load sharing arrangement with a second generator of a second mobile unit.

As discussed above regarding Limitations 1[b] and 1[d], *Reckels* discloses, and renders obvious in view of *IEEE Red Book*, a load sharing arrangement where the generators of different power generation trailers 10 share, via a common bus bar,

load from multiple second trailers 14 that include fracturing pumps. *See supra*, VII.A.2.(c), VII.A.2.(e); *see also* EX1004, [0015] ("the gas turbines and the pumps can also be connected to a common bus bar, so that the gas turbines can run at different loads, e.g. one at 100% and the other at 50%.").

A POSITA would have recognized that the distribution system components (*e.g.*, switchgear and associated internal busses, electrical connections, and common bus bar) of the system must be sized to support the voltage and current requirements of the loads (*e.g.*, the cooling units, motors, and pumps of second trailers 14) and transformers (*e.g.*, the transformers of e-rooms 22). EX1003, ¶156 (citing EX1005). The sizing of equipment to support the voltage and current requirements of the loads, transformers, and sources (*e.g.*, generators) included in a system is common practice and required on all properly designed electrical power systems. EX1003, ¶89-93, 156 (citing EX1005, EX1015, and EX1020).

For example, *IEEE Red Book* explains the process of planning and designing an electric distribution system, which begins with determining the loads and then planning the distribution system and sources (*e.g.*, generators and transformer(s)) to support the load requirement. Chapter 2 of *IEEE Red Book* is titled "System Planning" and outlines the procedures for designing and planning power systems. Chapter 2 includes a "Planning Guide for Distribution Design" which "will guide the engineer in the design of an electric distribution system for any industrial plant."

EX1005, 43. This planning guide teaches engineers to "determine the approximate total plant load in kilowatts or kilovolt-amperes" (kVA). *Id*.[2] This total plant load could include: (1) system demand (*i.e.*, the sum of the electrical ratings of each piece of equipment), (2) peak load (*i.e.*, the maximum load consumed or produced by a unit or group of units), (3) maximum demand (*i.e.*, the greatest of all demands that have or could occur), and (4) load factor (*i.e.*, the ratio of the average load to the peak load). EX1005, 43-44. Based on this load information, maximum demand that the various components of the system must support is determined. EX1005, 44; EX1003, ¶157.

Further, in planning the system, *IEEE Red Book* teaches to consider information such as "plant load in kilowatts and maximum demand in kilovolt-amperes," "preferred service voltage," "anticipated power factor," and "nature of connected load." EX1005, 52. When including generation, *IEEE Red Book* teaches

[2] Kilowatts (kW) are units of power, which is the product of the voltage and current and the power factor. Kilovolt amperes (kVA) is a unit of apparent power, which is the product of the voltage and current, without taking into account the power factor. kVA is generally larger than kW for any given system. At most, kW is equal to kVA. By considering voltage and kVA, the *IEEE Red Book* discloses the consideration of current, which must be known to calculate kW or kVA.

that at least generator ratings must be considered including "[g]enerator load in kilovolt-amperes" and "generator voltage." *Id*.

IEEE Red Book further teaches "a complete one-line or single-line diagram [] should present sufficient data to plan and evaluate the electric power system." *Id*., 53. The one line should include at least the following: (1) power sources (*e.g.*, generators) including voltages and available short circuit currents, (2) size, type, ampacities (*i.e.*, current carrying capacity), and number of all conductors (*e.g.*, buses and ties) in kilovolt-ampere rating (*i.e.*, both voltage and current), (3) capacities, voltages, impedance, connections and grounding methods of transformers, (4) identification and quantity of protective devices (relays, fuses, and circuit breakers), and (5) identification of all loads. EX1005, 53. Based on the information contained in the one line, including the voltage and current requirements of the loads, switchgear, conductors (including buses), generators and all other electric equipment, a POSITA would know how the equipment of the electrical system should be sized and how the system should be planned and designed. EX1003, ¶160.

Accordingly, *IEEE Red Book* teaches that POSITA would design the distribution components of *Reckels*' power system, including "*the at least one switchgear*" (*e.g.*, the switchgear identified with respect to Limitation 1[b]), "*the electrical buses*" (*e.g.*, the internal buses of the switchgear, as discussed above with respect to Limitation 1[d]), "*the interconnect*" (*e.g.*, the electrical connection

between the power generation trailer 10 and the second trailers 14 and the common bus bar as identified with respect to Limitation 1[b]), and "*the bus bar*" (*e.g.*, the common bus bar coupling the trailers 10 and the second trailers 14 and the internal bus bar of the switchgear as identified with respect to Limitation 1[b]) to be sized to support the voltage and current requirements of the loads (*e.g.*, the cooling units, motors, and pumps of second trailers 14) and the current and voltage outputs of the transformers and generators (*e.g.*, the generator 20 and the transformer of e-room 22 as identified with respect to Limitations 1[b]-[c]) as configured in the load sharing arrangement brought about by the integration of the common bus bar in *Reckels*' Figure 3 embodiment as discussed above.

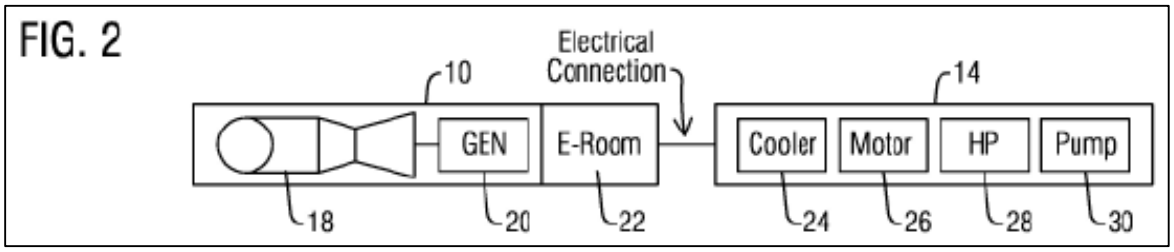
Accordingly, the combination of *Reckels* and *IEEE Red Book* renders Limitation 1[e] obvious.

3. Claim 2

a) The system of claim 1, wherein the system is part of a hydraulic fracturing system that consumes the power and that comprises a wellbore and at least one pressuring system to create fractures in a subterranean formation that surrounds the wellbore.

Reckels discloses that its system is a "hydraulic fracturing pump system" that "includes two individual trailers, wherein a first trailer 10 includes a power generation system and a second trailer includes a hydraulic pumping system 14." EX1004, [0018]. And as discussed above for Limitation 1[d], the hydraulic fracturing pump system (*i.e.*, the cooling unit, motor, and pumps of second trailer

14) "*consumes the power*" generated by the power generation system of the first trailer 10. *See supra*, VII.A.2.(e). Figure 2 of *Reckels* depicts this "hydraulic fracturing pumping system":



Id., Fig. 2.

Accordingly, *Reckels* discloses a system that is "*part of a hydraulic fracturing system that consumes the power*" generated by the power generation system. EX1003, ¶165.

Further, *Reckels* discloses that "[h]ydraulic fracturing generally involves pumping a high pressure fluid mixture that includes particles/proppants and optional chemicals at high pressure through the wellbore into a formation. As the high-pressure fluid mixture enters the formation, it fractures the formation and creates fissures." EX1004, [0001].

Reckels discloses that its second trailer 14 comprises a "high pressure fracturing fluid pump 30 [that] receives the fracturing liquids and pressurizes them for subsequent injection into the wellbore and formation." *Id*., [0018].

Accordingly, *Reckels-IEEE Red Book* combination discloses a hydraulic fracturing system that "*comprises a wellbore and at least one pressuring system*"

(*i.e.*, *Reckels*' hydraulic pumping system comprising hydraulic pump 28 and high pressure fracturing fluid pump 30 on second trailer 14) "*to create fractures in a subterranean formation that surrounds the wellbore*." EX1003, ¶¶164-165.

4. Claim 3

a) The system of claim 1, further comprising: at least one fracturing pump (FP) mobile unit of the one or more external mobile units, the at least one FP mobile unit physically external relative to the first mobile unit, wherein the at least one transformer is provided to condition the power supplied to the at least one FP mobile unit.

As discussed above in Limitation 1[d], *Reckels*' power generation trailer 10 supplies power to the components (*e.g.*, cooling units, motors, and pumps) of one or more second trailers 14 (*i.e.*, an "*external mobile unit*"). *See supra*, VII.A.2.(e); EX1004, [0018]. And as discussed above with reference to Claim 2, the *Reckels*' high pressure fracturing fluid pump 30 on a second trailer 14 "receives the fracturing liquids and pressurizes them for subsequent injection into the wellbore and formation." *See supra*, VII.A.3; EX1004, [0018]. Accordingly, a POSITA would have understood that second trailer 14, which includes the high pressure fracturing fluid pump 30, to be a "*fracturing pump (FP) mobile unit of the one or more external mobile units, the at least one FP mobile unit physically external relative to the first mobile unit.*" EX1004, [0018]; EX1003, ¶¶169-170.

And as discussed above with reference to Limitation 1[d], *Reckels*' power generation system on first trailer 10 comprises a generator 20 and a transformer

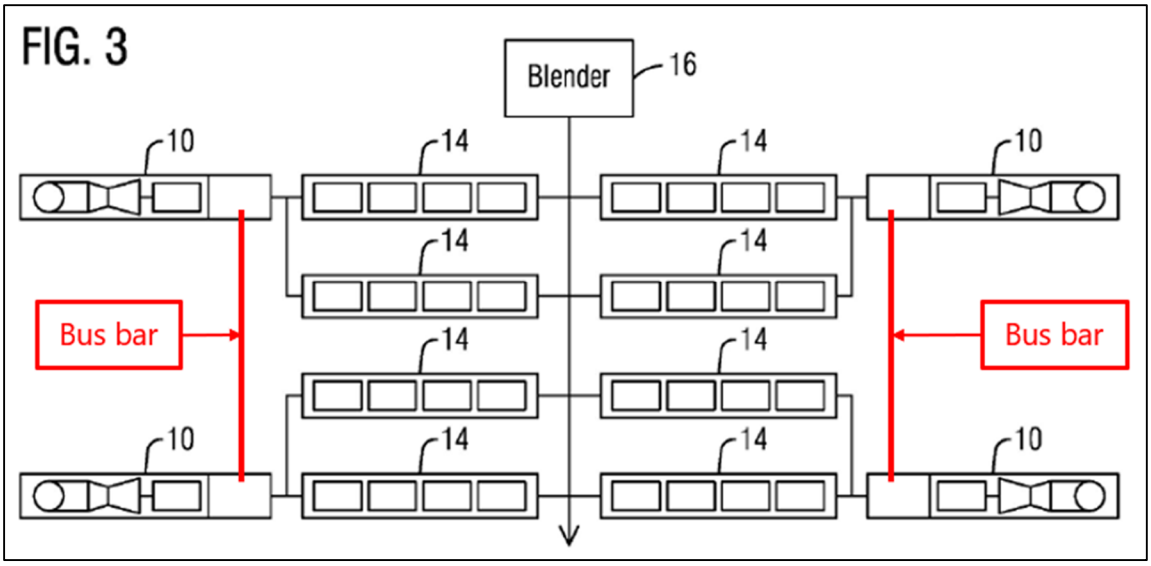
(within e-room 22) to supply power to the second trailer 14. *See supra*, VII.A.2.(e); EX1004, [0018]. The transformer, as well as the other components in e-room 22, are "needed to drive high power electric motors" (*e.g.*, the motor on a second trailer 14). *Id*. A POSITA would have understood that the transformer's role in powering the electric motor(s) on the second trailer 14 (*i.e.*, "*the at least one FP mobile unit*") is to "*condition the power*" supplied by generator 20 (*e.g.*, by stepping up or stepping down the voltage supplied to the load), consistent with the well-known functionality of transformers. EX1003, ¶¶62-68, 171 (citing EX1005, EX1014-1015).

Thus, the *Reckels-IEEE Red Book* combination discloses Claim 3.

5. Claim 4

> a) The system of claim 1, further comprising: a predetermined number of FP mobile units comprised in the one or more external mobile units, the predetermined number of FP mobile units determined by a maximum of the power available from the at least one first generator and handled by the at least one switch gear.

As discussed above with reference to Claim 3, *Reckels* discloses that its second trailers 14 (*i.e.*, "*external mobile units*") are fracturing pump (FP) mobile units because they are mobile and include hydraulic fracturing pumps 30. *See supra*, VII.A.4; *see also* VII.A.2.(e). And as discussed above with reference to Claim 1, *Reckels*' "*system*" (*i.e.*, the modified Figure 3 embodiment incorporating a common bus bar) includes two sets of four second trailers 14 coupled to two power generation trailers 10 via respective common bus bars, as depicted below:



EX1004, Fig. 3 (annotated); *see supra*, VII.A.2.

A POSITA would have understood that the number of second trailers 14 (*i.e.*, "*number of FP mobile units comprised in the one or more external units*") included in this system is "*predetermined*" based on the maximum power available from the generators 20 (including "*the at least one first generator*" of the "*first mobile unit*" as identified above, *see supra*, VII.A.1.(d)) and handled by the associated switchgears. EX1003, ¶¶177-178. As discussed above with reference to Limitation 1[e], it is common practice and a requirement of all properly designed electrical power systems that the power requirements of a system's load must be supported by the system's power sources (*e.g.*, generators) and distribution system components (*e.g.*, switchgears). *See supra*, VII.A.2.(f). In *Reckels*' system, where the load elements (*e.g.*, cooling units, motors, and pumps) are located on the second trailers 14 (*i.e.*, the "*FP mobile units*"), a POSITA would have known that the number of

second trailers 14 coupled to one or more power generation trailers 10 cannot result in a load power requirement that exceeds the maximum amount of power that can be generated by associated generators and handled by associated switchgears, or else the system would become overloaded and fail. EX1003, ¶178. Accordingly, the number of second trailers 14 available to *Reckels*' power distribution system is "*predetermined*" to be equal to or less than the number of second trailers that can be supported by the maximum amount of power that can be generated by available generators and handled by associated switchgear.

Reckels' description of the Figure 1 embodiment provides an example of a "*predetermined*" number of second trailers 14 that can be included in *Reckels*' power distribution system, explaining that "each generator is configured to supply electrical power to two of the high pressure electric pump trailers 14" (*i.e.*, second trailers 14). EX1004, [0015]. A POSITA would have understood that this two-pump-to-one-generator formula is carried over to the Figure 3 embodiment, which again shows two second trailers 14 for every power generation trailer 10. Accordingly, a POSITA would have understood that each power generation trailer 10 can support the maximum loads of up to two second trailers 14 at any given time, such that there is a "*predetermined*" number of second trailers 14 (*i.e.*, "*FP mobile units*") that can be incorporated into *Reckels*' system at a given time. EX1003, ¶180. This number applies to the modified Figure 3 embodiment as well—when a common bus bar

connects the generators of two power generation trailers 10, up to four second trailers 14 can be supported by the summed power of the two generators of the connected power generation trailers 10. *Id*.

Accordingly, the *Reckels-IEEE Red Book* combination renders obvious Claim 4.

6. Claim 6

a) The system of claim 1, further comprising: the at least one switchgear being physically arranged to replace an electronic equipment room (EER) of at least one of the one or more external mobile units that is designed to comprise the EER.

As discussed above with reference to Claim 1, *Reckels'* power generation trailer 10 includes an "electric room 22, which may include transformers, switchgear, variable frequency drives, and other electrical components needed to drive high power electric motors." *Supra*, VII.A.2.(c); EX1004, [0018]. A POSITA would have understood *Reckels*' electric room 22 disclose an "*electric equipment room (EER)*" as claimed, because the "*equipment*" in the electric room 22 are "electrical components." EX1003, ¶185. This is consistent with the '801 Patent, which discloses an EER that includes the same electrical equipment. *See, e.g.*, EX1001, 8:23-29 (identifying "switch gear" and "transformers" as components included in an EER).

And discussed above with reference to Claim 1, *Reckels* discloses different embodiments for pairing a power generation with one or more second trailers 14 (on

which the system's load—cooling units, motors, and pumps—are located), including the Figure 2 embodiment where one power generation trailer 10 is paired with one second trailer 14 and the Figure 3 embodiment where one power generation trailer 10 is paired with two second trailers 14. *See, e.g., supra*, VII.A.2.(b). A POSITA would have understood that to power the load of two second trailers 14 using the Figure 2 embodiment, two power generation trailers 10 would be required, because the Figure 2 embodiment teaches a one-to-one relationship for power generation trailers 10 and second trailers 14. EX1003, ¶188; EX1004, [0018]. Accordingly, a POSITA would have recognized that powering the loads of two second trailers 14 using the Figure 3 embodiment, where one power generation trailer 10 is used to power the loads of two second trailers 14, eliminates the need for one power generation trailer 10 (and its associated electric room 22) when compared to using the Figure 2 embodiment. EX1003, ¶188.

Accordingly, the Figure 3 embodiment of *Reckels* teaches a switchgear that is arranged to replace an electric room 22 (*i.e.*, "*electronic equipment room (EER)*") of an external mobile unit (*i.e.*, a different power generation trailer 10) when compared to the Figure 2 embodiment of *Reckels*.

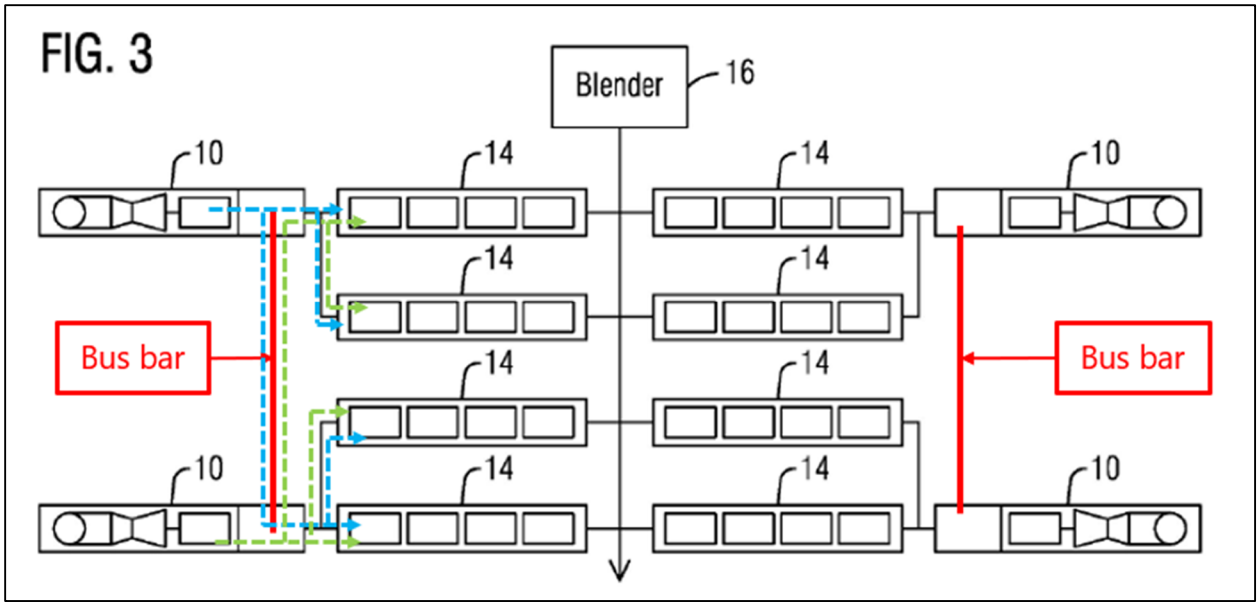
7. Claim 8

a) <u>The system of claim 1, further comprising: the interconnect configured to couple the first mobile unit with the second mobile unit, the second mobile unit having at least one second switch gear in addition to the second generator, the</u>

> interconnect to transmit power in support of redundancy in addition to the load sharing arrangement between the first mobile unit and the second mobile unit.

As discussed above with reference to Claim 1, the modified Figure 3 embodiment of the *Reckels-IEEE Red Book* combination teaches a system that includes a common bus bar (*i.e.*, an example of an "*interconnect*") that couples two power generation trailers 10 and four second trailers 14 in a load sharing arrangement. *See supra*, VII.A.2(e)-(f). And as discussed above with reference to Claim 1, each generator trailer 10 comprises a generator 20 and a switchgear (in e-room 22). *See supra*, VII.A.2.

A POSITA would have understood that the common bus bar would also support redundancy between the coupled power generation trailers 10. EX1003, ¶192. A POSITA would have known that in the combined *Reckels-IEEE Red Book* system, power generated from either of the interconnected generators could be distributed to any of the pumps coupled to the common bus bar, including those directly connected to the other power generation trailer 10. An annotated copy of Figure 3, provided below, shows how power can flow from the generators 20 of coupled power generation trailers 10 to the second trailers 14:



EX1004, Fig. 3 (annotated).

For example, should one of the pumps connected to the top generator be offline, the excess power can be redistributed across the common bus bar (*i.e.*, "*interconnect*") to pump(s) connected to the bottom generator, particularly in the case of the bottom generator being offline (and vice versa). Thus, redundant power supplies to the pumps are enabled ("*support[ed]*") by the common bus bar (*i.e.*, "*interconnect*"). Indeed, such redundant functionality was well known in the art and described by in detail by *IEEE Red Book*, for example. EX1003, ¶192-195 (citing EX1005).

Accordingly, the combination of *Reckels* and *IEEE Red Book* renders Claim 8 obvious. This understanding is consistent with the '801 Patent, which describes redundancy as providing excess power from a turbine generator being redistributed

to other equipment to account for failure of power supply equipment. *See* EX1001, 4:21-33.

8. Claim 9

The combination of *Reckels* and *IEEE Red Book* disclose the additional limitations of Claim 9. The two limitations of Claim 9 are joined by an "or" which means that if either limitation is disclosed by the prior art, then the entire claim is obvious. *Brown v. 3M*, 265 F.3d 1349, 1351 (Fed. Cir. 2001) ("When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art.").

> a) 9[a]: The system of claim 1, further comprising: the at least one switch gear configured in the load sharing arrangement by being in part on an incoming side of the at least one transformer such that the sizing is based at least in part on current available for the voltage output of a secondary side of the at least one transformer that is coupled to the at least one first generator and the second generator; or

As discussed above with reference to Claim 1, *Reckels*' e-room 22 includes switchgear and transformers for providing power from generators 20 to second trailers 14, but *Reckels* does not provide a particular configuration for how to arrange the switchgear and transformer. It would have been obvious to a POSITA that the switchgear would be located either on the incoming side of the transformer or on the outgoing side of the transformer, as both arrangements were well known in the art.

EX1003, ¶199. For example, the Figure 99 embodiment of *IEEE Red Book* discussed above (which depicts a main-tie-main configuration for coupling two generators with multiple loads (*e.g.*, motors)), shows that switchgears (denoted by the blue arrows) can be located on the incoming side of transformers (*e.g.*, transformers T6 annotated in magenta) and/or on the outgoing side of transformers (*e.g.*, transformers T1 (annotated in green) T3 (annotated in blue) and T4 (annotated in red)).

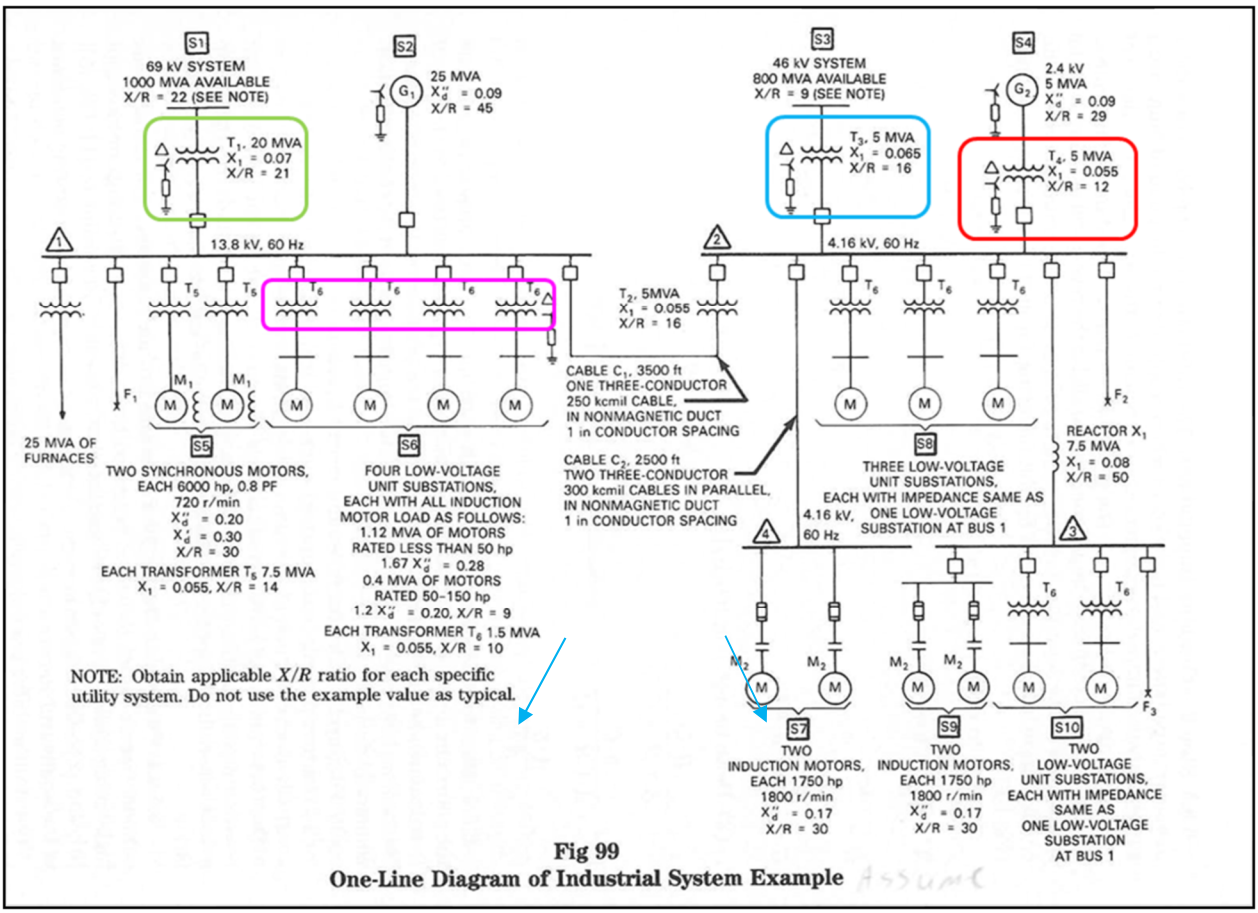


Fig 99
One-Line Diagram of Industrial System Example

EX1005, Fig. 99 (annotated).

When the switchgear of the combined *Reckels-IEEE Red Book* system is arranged on the incoming (primary) side of the transformer, a POSITA would have understood that the sizing of the switchgear (and its associated buses), common bus bar, and electrical connections (*i.e.*, "*the sizing*") is based on the current available at the secondary side of the transformer. As discussed above regarding Limitation 1[e], sizing equipment for the available current and voltage is disclosed by *IEEE Red Book*. *Supra*, VII.A.2.(f). Although sizing components on the on the ***incoming/primary*** side of the transformer (*e.g.*, the switchgear) based on current available at the ***secondary*** side of the transformer is considered "indirect" sizing, a POSITA would have understood that the current available at the primary of the transformer is related to the current available at the secondary side of the transformer based on the turns ratio of the transformer, such that the current on the primary side of the transformer (for which a switchgear, and any other components, on the primary side of the transformer would need to be sized) is based on current on the secondary side of the transformer. EX1003, ¶200.

Further, a POSITA would have understood that the transformer (*i.e.*, the transformer of e-room 22) is "*coupled to the at least one first generator*" because the transformer is located on the power generation trailer 10 as the trailer 10's generator, and that the transformer is "*coupled to…the second generator*" via the

common bus bar and switchgear buses connecting the first power generation trailer 10 with the second power generation trailer 10. EX1003, ¶201.

> b) 9[b]: the at least one switch gear configured in the load sharing arrangement by being in part on an outgoing side of the at least one of the at least one transformer such that the sizing is based at least in part on the current available at the secondary side of the at least one transformer that is coupled to the at least one first generator and the second generator.

As discussed above with reference to Limitation 9[a], it would have been obvious to a POSITA that a switchgear located in the e-room 22 of the *Reckels-IEEE Red Book* system would be located on the outgoing side of a transformer of the same e-room 22, as was well known in the art. *See supra*, VII.A.8.(a). And for the same reasons discussed above with reference to Limitations 1[e] and 9[a], "*the sizing*" of the switchgear and other components of the *Reckels-IEEE Red Book* combination would have been based on the current available at the secondary side of the transformer as claimed. *See supra*, VII.A.2.(f), VII.A.8.(a); EX1003, ¶204.

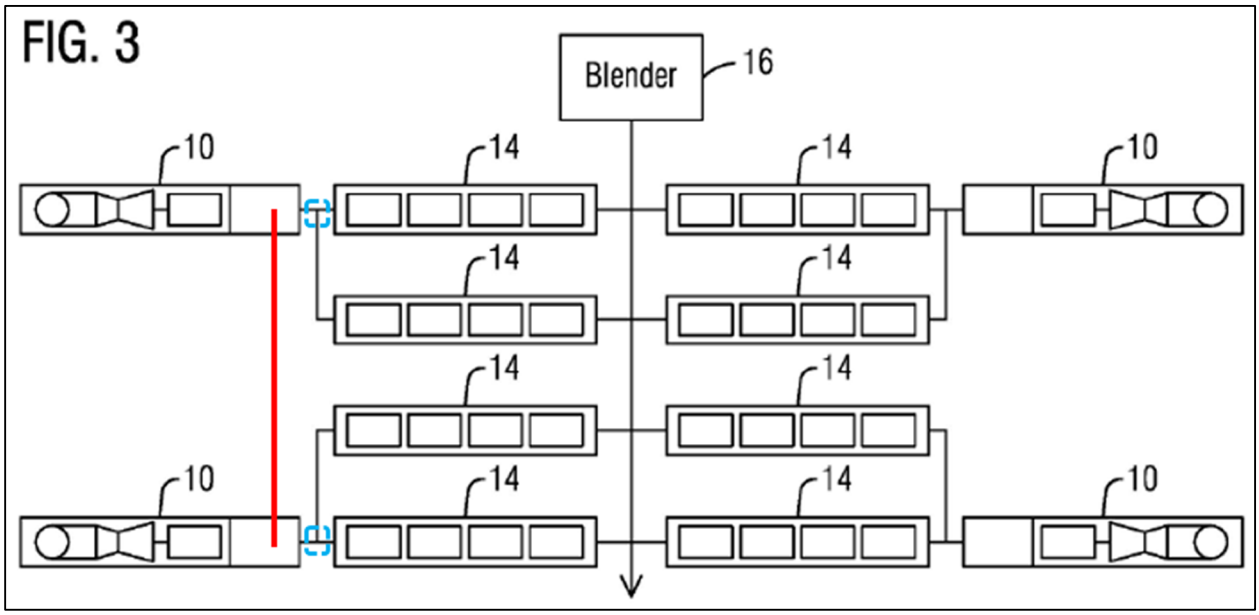
9. Claim 10

> a) 10[a]: The system of claim 1, further comprising: at least one load sharing FP mobile unit coupled, as at least one of the loads, with a second FP mobile unit of the one or more external mobile units; and

Limitation 10[a] is disclosed by the combination of *Reckles* and *IEEE Red Book*. As discussed above with reference to Claim 1, the modified Figure 3 embodiment of *Reckels*' power distribution system depicts power generation trailers 10 providing power to several second trailers 14, where power generation trailers 10

and second trailers 14 are coupled to each other via a common bus bar, such that the generators 20 of the power generation trailers 10 operate in a load sharing arrangement to provide combined power to drive the loads of the second trailers 14. *See supra*, VII.A.2.(e)-(f). Because the loads of the second trailers (*i.e.*, "*FP mobile unit*," s*ee supra*, VII.A.4) are driven by this load sharing arrangement, a POSITA would have understood the second trailers 14 to be "*load sharing FP mobile units*." EX1003, ¶*.

An annotated copy of the modified Figure 3 embodiment is provided below:



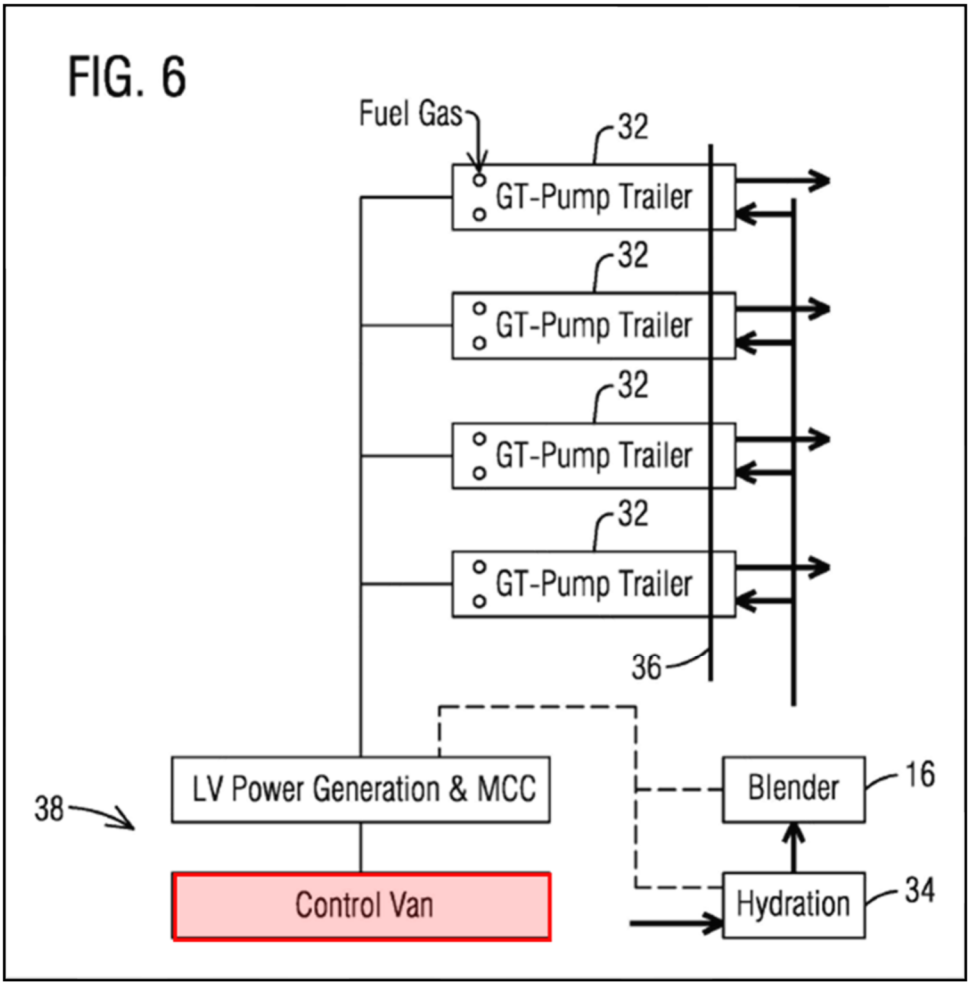
EX1004, Fig. 3 (annotated).

As shown, the second trailers 14 are paired such that two second trailers are coupled at a common electrical connection. This coupling is highlighted in blue in the above annotated copy of Figure 3. Accordingly, the combined *Reckels-IEEE Red Book* system discloses "*at least one load sharing FP mobile unit coupled, as at*

least one of the loads, with a second FP mobile unit of the one or more external mobile units."

> b) 10[b]: a datavan in the one or more external mobile units for control of the at least one load sharing FP mobile unit, the datavan offering the control of the at least one load sharing FP mobile unit instead of a second control available from within the first mobile unit.

In addition to the general configuration for connecting power generation trailers 10 with second trailers 14 as depicted in Figure 3, *Reckels* provides another configuration wherein "each of the hydraulic fracturing pump trailers 32 may be in electrical communication with a control system 38 that is configured to control the operation of each of the hydraulic fracturing pump trailers, along with the various other components of a hydraulic fracturing operation. The control system 38 is generally contained in a separate control van or trailer on the wellsite." EX1004, [0024]. An annotated copy of Figure 6 of *Reckels* is provided below, highlighting the "control van" in red:



EX1004, Fig. 6 (annotated).

In *Reckels*' Figure 3 embodiment, components of the "electric room 22," such as a variable frequency drive (VFD), are used to control the "high power electric motors" that drive pumps 30 on second trailers 14. *See supra*, VII.A.2.(c); EX1004, [0018]. A POSITA would have understood that when incorporated into the Figure 3 embodiment, the "control van" described in Figure 6 would replace the control functionality of the electric room 22, consistent with the control van's description as being "configured to control the operation of each of the hydraulic fracturing pump

trailers, along with the various other components of a hydraulic fracturing operation." EX1003, ¶¶212-213 ; EX1004, [0024]. In this configuration, the control van would therefore "*offer[] the control of the at least one load sharing FP mobile unit instead of a second control available from within the first mobile unit*" (*i.e.*, the components of the electric room 22).

10. Claim 12

a) 12[p]: A method comprising:

See supra, VIII.A.2 (disclosing and rendering obvious method for powering fracturing equipment); EX1003, ¶216.

b) 12[a]: providing a first mobile unit with at least one first generator and at least one switchgear located together in the first mobile unit, the at least one first generator coupled to the at least one switch gear on the first mobile unit, the at least one switch gear to be associated with at least one transformer and with an interconnect and a bus bar;

See supra, VIII.A.2.(b)-(c); EX1003, ¶217.

c) 12[b]: generating power from the at least one generator;

See supra, VIII.A.2.(e); EX1003, ¶¶218-219.

d) 12[c]: providing the power using electrical buses of the at least one switchgear and using the at least one transformer, the interconnect, and the bus bar, the power for loads in one or more external mobile units, the at least one switchgear, the interconnect, the bus bar, and the electrical buses sized to support voltage and current requirements of the loads and to support voltage and current outputs of the at least one transformer with the at least one first generator in a load sharing arrangement with a second generator of a second mobile unit.

See supra, VIII.A.2.(e)-(f); EX1003, ¶220.

11. Claim 13

a) 13[a]: The method of claim 12, further comprising: providing at least one fracturing pump (FP) mobile unit of the one or more external mobile units that is physically external relative to the first mobile unit; and

See supra, VIII.A.4; EX1003, ¶221.

b) 13[b]: conditioning the power supplied to the at least one FP mobile unit using the at least one transformer.

See supra, VIII.A.4; EX1003, ¶222.

12. Claim 14

a) The method of claim 12, further comprising: determining a number of FP mobile units for the one or more external mobile units based at least in part on a maximum of the power available from the at least one first generator and handled by the at least one switch gear.

See supra, VIII.A.5; EX1003, ¶223.

13. Claim 16

a) The method of claim 12, further comprising: physically arranging the at least one switch gear to replace an electronic equipment room (EER) of at least one of the one or more external mobile units that is designed to comprise the EER.

See supra, VIII.A.6; EX1003, ¶224.

14. Claim 18

a) The method of claim 12, further comprising: coupling the first mobile unit with the second mobile unit using the interconnect, the second mobile unit having at least one second switch gear in addition to the second generator, the interconnect

to transmit power in support of redundancy in addition to the load sharing between the first mobile unit and the second mobile unit.

See supra, VIII.A.7; EX1002, ¶225.

15. Claim 19

a) 19[a]: The method of claim 12, further comprising: coupling at least one load sharing FP mobile unit to share the at least one load of a second FP mobile unit of the one or more external mobile units; and

See supra, VIII.A.9.(a); EX1002, ¶226.

b) 19[b]: controlling, via a datavan in the one or more external mobile units, the at least one load sharing FP mobile unit, the datavan offering the control of the at least one load sharing FP mobile unit instead of a second control available from within the first mobile unit.

See supra, VIII.A.9.(b); EX1002, ¶227.

B. Ground 2: The Combination of Reckels, IEEE Red Book, Coli, *and* Solar Turbines *Renders Claims 5 and 15 Obvious.*

1. Motivation to Combine

A POSITA would have been motivated to combine *Reckels* and *IEEE Red Book*. *Supra*, VII.A.1. A POSITA would have been motivated to combine *Coli* and *Solar Turbines* with the *Reckels-IEEE Red Book* combination. EX1003, ¶228.

As discuss above with refence to Claim 1, the *Reckels-IEEE Red Book* combination teaches a hydraulic fracturing system that uses turbine generators located on power generation trailers 10 to power electric motors that drive hydraulic

fracturing pumps, the motors and pumps located on second trailers 14. *See supra*, VII.A.2.

Coli similarly discloses the use of turbine generators to power electric motors that drive hydraulic fracturing pumps, and provides examples of such generators and pumps. In particular, *Coli* identifies "SWGS-2500 Well Service Pump sold by Gardner Denver, Inc." as an example of a fracturing pump, and explains that such a pump can operate at "a true 2500 hp" provided directly from an electric motor. EX1009, [0046], [0049]-[0050]. And *Coli* further identifies the "TM2500+ turbine generator sold by General Electric" as an example of a turbine generator that "can generate sufficient power (for example 31 MW at 13,800 volts AC power) to supply several electric motors 21 and pumps 22." *Id*., [0044].

Solar Turbines lists specifications of particular products within the Solar® Turbines industrial gas turbine product line, which was a well-known product line for turbine generators in the oil and gas industry. EX1003, ¶231 (citing EX1021). In particular, Solar Turbines provides product specifications for the Taurus™ 60 generator set, which is rated for 5.7 MW of output power. EX1008, 3, 5.

A POSITA would have been motivated to look to *Coli* and *Solar Turbines* for the implementation details of incorporating particular generators and pumps when designing the *Reckels-IEEE Red Book* system. EX1003, ¶232. That is, *Reckels* does not specify what pumps and generators would be implemented in its system, or the

specifications of such devices, so a POSITA would have been motivated to look to other references for such details. And as discussed above, *Coli* discloses particular generators and hydraulic pumps used in electric-powered hydraulic fracturing systems, and *Solar Turbines* discloses particular turbine generator sets used in the oil and gas industry.

A POSITA would have had a reasonable expectation of success in combining the teachings of *Coli* and *Solar Turbines* with *the Reckels-IEEE Red Book* system, as it is merely the use of applying a known technique (particular generators and fracturing pumps as taught by *Coli* and *Solar Turbines*) to a known device (electric-powered hydraulic fracturing system of the *Reckels-IEEE Red Book* combination) ready for improvement (the practical design of the system) to yield predictable results (a system constructed with applicable pumps and generators). EX1003, ¶233.

Thus, a POSITA would have been motivated to combine *Coli* and *Solar Turbines* with the combined *Reckels-IEEE Red Book* system and would have reasonably expected success in doing so. EX1003, ¶234.

2. Claim 5

a) The system of claim 1, further comprising: a predetermined number of first generators comprising the at least one first generator, the predetermined number of first generators having individual power output values that is lesser than a power output of an isolated single generator occupying all available space in an independent mobile unit physically external to the first mobile unit.

As discussed above with reference to Claim 1, the *Reckels-IEEE Red Book* combination discloses a power generation system for driving electric-powered fracturing pumps. *See supra*, VII.A.2. *Coli* provides examples of what was well known in the art to be a typical size fracturing pump at the time of the '801 Patent—around 2,500 hp (electric). EX1009, [0046], [0049]-[0050] (listing a "SWGS-2500 Well Service Pump sold by Gardner Denver, Inc." as an example of a fracturing pump, and explaining that such a pump can operate at "a true 2500 hp" provided directly from an electric motor); EX1003, ¶236. And as discussed above with reference to Claim 4, a POSITA would have recognized that the generator included in each of the power generation trailers 10 of the combined *Reckels-IEEE Red Book* system could power at least two fracturing pumps. *See supra*, VII.A.5. Accordingly, a POSITA would have understood that a generator providing at least 5,000 hp, such as a single-turbine generator with the rating of a Solar® Turbines Taurus 60 turbine generator, (5.7 MW, which equals roughly 7,640 hp[3]), would have sufficient capacity to power two 2,500 hp pumps. EX1003, ¶237 (citing EX1008, 2). In the *Reckels-IEEE Red Book* combination, two Taurus 60 turbine generators would

[3] 1 Hp = 0.746 kW. A POSITA would also know to size up the generator to address losses in the system from inefficiencies and for powering auxiliary equipment. EX1003, ¶*.

therefore be included in the power generation trailers 10 coupled by the common bus bar as taught by this system. EX1003, ¶*.

Further, a POSITA would have understood that the power output values of the Taurus 60 turbine generators (*i.e.*, 5.7 MW, which equals roughly 7,640 hp) would be "*lesser than a power output of an isolated single generator occupying all available space in an independent mobile unit physically external to the first mobile unit*." *Coli* teaches one such "*isolated single generator*." *Coli* discloses the use of a "single natural gas powered turbine generator 30" that "can generate sufficient power (for example 31 MW at 13,800 volts AC power) to supply several electric motors 21 and pumps 22" in a hydraulic fracturing system, in particular the "TM2500+ turbine generator sold by General Electric." EX1009, [0044]. It was well-known in the art that he TM2500 turbine generator is a "mobile power plant," such that a POSITA would have understood it to be a "*mobile unit*." EX1003, ¶238 (citing EX1011, 1). And a POSITA would have understood that the TM2500 generator "*occupies all available space*" in its supporting unit. EX1003, ¶. For example, Figure 2 of *Coli* depicts several generators 30 in an area labeled "Area C of Figure 2, which a POSITA would have recognized to be a collection of four trailers, each housing a TM2500 turbine engine to power components of the fracturing system disclosed by Coli. It was also well-known in the art that TM2500

"is packaged on a two-trailer system" and occupies the entirety of this system. EX1003, ¶238 (citing EX1011, depicting the TM2500's "two-trailer system").

Finally, a POSITA would have understood that a trailer housing the TM2500 would have been "*physically external to the first mobile unit*," both in light of the TM2500 generator's size and the fact that "*the first mobile unit*" contains just a single generator (which as discussed above, would have been understood by a POSITA to be a smaller generator with a lower power output). EX1003,¶239. Thus, the *Reckels-IEEE Red Book-Coli-Solar Turbines* combination renders obvious Claim 5.

3. Claim 15

> a) The method of claim 12, further comprising: determining a number of generators for the at least one first generator based at least in part on the number of first generators having individual power output values that is lesser than a power output of an isolated single generator occupying all available space in an independent mobile unit physically external to the first mobile unit.

See supra, VII.B.2; EX1003, ¶240.

C. Ground 3: The Combination of Reckels, IEEE Red Book, and Oehring178 Renders Claims 7 and 17 Obvious.

1. Motivation to Combine

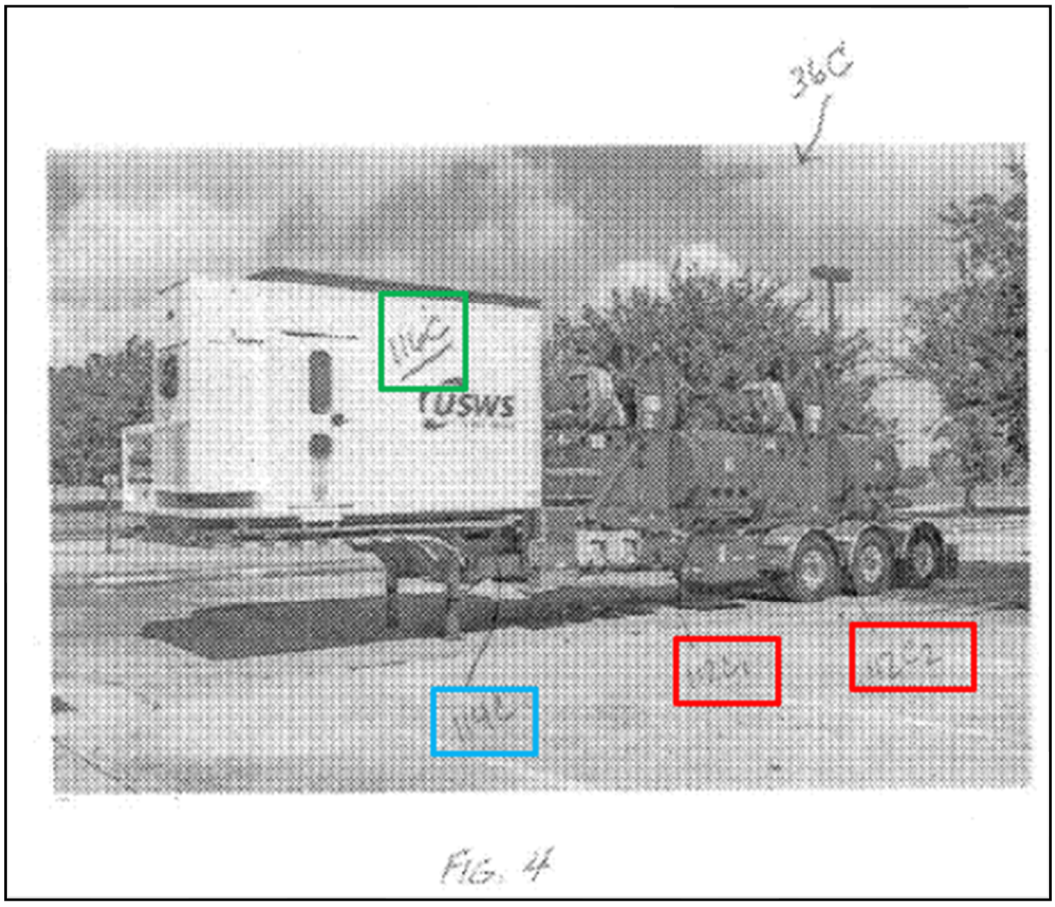
A POSITA would have been motivated to combine *Reckels* and *IEEE Red Book*. *Supra*, VII.A.1. A POSITA would have been motivated to combine *Oehring178* with the *Reckels-IEEE Red Book* combination. EX1003, ¶241.

As discussed above with reference to Claim 1, the *Reckels-IEEE Red Book* combination discloses a power generation and distribution system for powering loads on one or more second trailers 14, where the loads include a fixed speed electric motor 26 that drives a hydraulic pump 28, which in turn drives a high pressure pump 30. *See supra*, VII.A.2.(e); EX1004, [0018].

IEEE Red Book discloses the use of "motor control centers" ("MCCs") which "are tailor-made assemblies of conveniently grouped control equipment primarily used for power distribution and associated control of motors." EX1005, 451.

Oehring178 discloses an electric hydraulic fracturing system with turbine generators, switchgear, transformers, electric motor-driven pumps, and variable frequency drives (VFDs), where the turbine generator provides power which feeds through the switchgear and transformers to provide power to an electric motor. *See* EX1007, [0029]. The electric motor then drives a hydraulic fracturing pump in a fracturing operation, like the system of *Reckels*. *See id.*, [0026]-[0027]. Further, *Oehring178* discloses in Figure 4, annotated below, a "trailer 114C" (annotated in blue) on which pumps "$112C_{1,2}$" (annotated in red) and a "VFD housing 116C" (annotated in green) are mounted. The VFD housing 116C is a room "in which equipment such as VFDs for pumps, isolation breakers, and a motor control center can be situated during operation of pumps $112C_{1,2}$. The motor control cabinet can be

a breaker cabinet that contains breakers for smaller motors such as blower motors, lube motors, and fan motors." EX1007, [0038].



EX1007, Fig. 4.

A POSITA would have been motivated to incorporate VFDs and MCCs into the second trailers 14 (*i.e.*, the trailer in which the motors and pumps are included) of the combined *Reckels-IEEE Red Book* system. EX1003, ¶245. As taught by *IEEE Red Book* and *Oehring178*, MCCs were well-known components used for controlling motors, such that it would have been obvious to a POSITA to incorporate

MCCs into the *Reckels-IEEE Red Book* system to help drive the motors 26 located on *Reckels*' second trailers 14. *Id*.

It would have been further obvious, based on the teaches of *Oehring178,* to use an MCC and to place the VFD and MCC on the individual fracturing pump trailers. *Id*., ¶246. As discussed above regarding Claim 1, the "external mobile units" in the *Reckels-IEEE Red Book* combination are the fracturing pump trailers 14. *See supra*, VII.A.2.(e). *Oehring178* teaches that VFDs and MCCs would be located on fracturing pump trailers.

Further, incorporating *Oehring178*'s teachings of incorporating VFDs and MCCs on the same trailers as a fracturing pump and associated motors is applying a known technique (a trailer comprising a fracturing pump and associated motors as well as a VFD and MCC for controlling such components, as taught by *Oehring178*) to improve similar devices (*Reckel*'s second trailers 14 comprising fracturing pumps and associated motors) in the same way. EX1003, ¶247; *KSR Int'l*, 550 U.S. at 417. The results of the combination would be predictable: fracturing pump trailer as taught by *Reckels* that can includes the VFD and MCC components that are needed to drive the motors on the trailer. EX1003, ¶247. Indeed, implementing a VFD and MCC on the same trailer as a fracturing pump and associated motor, as taught by *Oehring178*, into *Reckels*' second trailers 14 would involve a simple substitution of one known element (a VFD located on a power generation trailer 10, as taught by

Reckels) for another (a VFD and MCC on the same trailer as a fracturing pump and associated motor, as taught by *Oehring178*) to obtain the predictable result of a second trailer 14 including both a VFD and MCC for controlling the motors located on the second trailer 14. *Id*. Thus, a POSITA would have been motivated to modify the fracturing pump trailers 14 of the *Reckels-IEEE Red Book* combination to include a VFD and MCC, as taught by *Oehring178* and would have reasonably expected success in doing so. *Id*.

2. Claim 7

a) 7[a]: The system of claim 1, further comprising: at least one Variable Frequency Drive (VFD); and

As discussed above with reference to Claim 1, each of the power generation trailers 10 in *Reckels*' system includes an e-room 22, which includes "variable frequency drives." EX1004, [0018]. And as discussed above, the combined *Reckels-IEEE Red Book-Oehring178* system renders obvious placing the VFDs on second trailers 14. *See supra*, VII.C.1. Accordingly, the *Reckels-IEEE Red Book-Oehring178* combination discloses and renders obvious Limitation 7[a].

b) 7[b]: at least one Motor Control Center (MCC), the VFD and the MCC being on individual ones of the one or more external mobile units that is physically external relative to the first mobile unit.

As discussed above, the combined *Reckels-IEEE Red Book-Oehring178* system renders obvious placing VFDs and MCCs on second trailers 14 to control the components (*e.g.*, motors 26) located on the second trailers 14. And as discussed

above with reference to Claim 1, *Reckels*' second trailers 14 disclose "*the one or more external mobile units that is physically external relative to the first mobile unit*." *See supra*, VII.A.2.(e). Accordingly, in the combined *Reckels-IEEE Red Book-Oehring178* system, which comprises multiple second trailers 14, a VFD located on a first second trailer 14 and an MCC located on a second second trailer 14 would be "*on individual ones of the one or more external mobile units that is physically external relative to the first mobile unit*." Accordingly, the *Reckels-IEEE Red Book-Oehring178* combination renders obvious Limitation 7[b].

3. Claim 17

a) 17[a]: The method of claim 12, further comprising: providing at least one Variable Frequency Drive (VFD); and

See supra, VII.C.2.(a); EX1003, ¶255.

b) 17[b]: providing at least one Motor Control Center (MCC), the VFD and the MCC being on individual ones of the one or more external mobile units that is physically external relative to the first mobile unit.

See supra, VII.C.2.(b); EX1003, ¶256.

D. Ground 4: The Combination of Reckels, IEEE Red Book, Oehring178, and Kumar Renders Claims 11 and 20 Obvious.

1. Motivation to Combine

A POSITA would have been motivated to combine *Reckels*, *IEEE Red Book*, and *Oehring178*. *Supra*, VII.C.1. A POSITA would have been motivated to

combine *Kumar* with the *Reckels-IEEE Red Book-Oehring178* combination. EX1003, ¶257.

As discussed above with reference to Claim 1, the *Reckles-IEEE Red Book-Oehring178* combination discloses a power distribution system for providing power to one or more fracturing pumps located on mobile trailers, where variable frequency drives (VFDs) and motor control centers (MCCs) are included on the same trailers as the fracturing pumps. *See supra*, VII.C.1. *IEEE Red Book* teaches the concept of harmonics as applied to power distribution systems. In particular, *IEEE Red Book* discloses that "[h]armonics are caused by devices that change the shape of the normal sine wave of voltage or current in synchronism with the 60 Hz supply," and may cause "objectionable interference" in "communication, signaling, and control circuits" of a system as well as "reduce the capacity of the current-carrying equipment and increase losses without providing any useful work." EX1005, 94-95. *IEEE Red Book* identifies "[p]hase-controlled rectifiers used to provide variable-speed drives for dc motors, or used and frequency changes to provide variable-speed drives for ac motors" as "major sources of harmonics." *Id*., 95.

Like *IEEE Red Book*, *Kumar* teaches the concept of "harmonics" as applied to similar power distribution systems. *See generally*, EX1009. *Kumar* explains that harmonics are created by "power electronic devices such as electrical submersible pumps (ESPs), variable speed drives," and other components, and that harmonics

can cause damage to a power system including "damage to equipment and disruption to production process, can cause overheating, produce electromagnetic interference to other control / communication equipment." *Id*., 2, 4. *Kumar* discloses several methods to mitigate harmonics, including the use of isolation transformers. *Id*., 5, 6. Further, *Kumar* explains that "harmonic control at the source (Harmonic producing Load) is the best option to control harmonics." *Id*., 5.

A POSITA implementing the power distribution system taught by the *Reckels-IEEE Red Book-Oehring178* combination would have been motivated to incorporate isolation transformers in the second trailers 14 of the system to limit the effect of harmonics created by the VFDs located on the second trailers 14. EX1003, ¶261. As *Kumar* teaches, it is best to control harmonics (*e.g.*, by using isolation transformers) "at the source (Harmonic producing Load)." EX1009, 5. A POSITA would have recognized that the VFDs located on the second trailers 14 are one such "Harmonic producing Load," as explicitly identified by both *IEEE Red Book* and *Kumar*. EX1003, ¶261 (citing EX1005, 95, EX1009, 2). Accordingly, a POSITA would have known to place an isolation transformer on the second trailers 14 to limit the effects harmonics caused by the VFDs on these trailers. EX1003, ¶261.

A POSITA would have been motivated to incorporate isolation transformers in the combined *Reckels-IEEE Red Book* system for various reasons. First, as discussed above, *IEEE Red Book* and *Kumar* explain the dangers of harmonics on

power distribution systems, including interference in other components of the system, reduced current capacity, and power loss (EX1005, 95) and "damage to equipment and disruption to production process, [which] can cause overheating, produce electromagnetic interference to other control / communication equipment" (EX1009, 4). A POSITA would have been motivated to limit such risks by incorporating isolation transformers as taught by *Kumar*. EX1003, ¶262.

Further, incorporating *Kumar*'s teachings of incorporating an isolation transformer at a harmonics-creating component such as an electric-powered pump is applying a known technique (an isolation transformer, as taught by *Kumar*) to improve similar devices (*Reckel*'s power distribution system) in the same way. EX1003, ¶263; *KSR Int'l*, 550 U.S. at 417. The results of the combination would be predictable: a power distribution system as taught by *Reckels* that is protected from harmonics caused by a VFD. EX1003, ¶263.

Thus, a POSITA would have been motivated to combine Kumar with the *Reckels-IEEE Red Book-Oehring178* system, and would have reasonably expected success in doing so. EX1003, ¶264.

2. Claim 11

a) <u>The system of claim 1, further comprising: the at least one transformer being an isolation transformer that is located in the one or more external mobile units, the isolation transformer being physically external relative to the first mobile unit and being configured for filtering harmonics between the at least one</u>

first generator and the loads in the one or more external mobile units.

As discussed above, the combined *Reckels-IEEE Red Book-Oehring178-Kumar* system teaches the use of isolation transformers in the second trailers 14 (*i.e.*, "*the one or more external mobile units*," *supra* VII.A.2.(e)) to limit the effects of harmonics caused by VFDs in the second trailers. *Supra*, VII.D.1; EX1003, ¶267. Because such isolation transformers are located on second trailers 14 (which are external to power generation trailers 10 (*i.e.*, "*the first mobile unit*")), the isolation transformers are "*physically external relative to the first mobile unit*." Further, *Kumar* explains that isolation transformers "are used to provide electrical isolation between distribution system and harmonic producing load" and "have the ability to change the voltage levels between load and supply, thereby mitigate the harmonic current." EX1009, 6. Accordingly, a POSITA would have understood that the isolation transformers of the *Reckels-IEEE Red Book-Oehring178-Kumar* system would have filtered harmonics between the load (*i.e.*, VFDs as taught by *Oehring178*) and power distribution system (including the generators 20) of the system, thereby "*being configured for filtering harmonics between the at least one first generator and the loads in the one or more external mobile units*." EX1003, ¶267.

Claim 11 is therefore rendered obvious by the *Reckels-IEEE Red Book-Oehring178-Kumar* combination. EX1003, ¶268.

3. Claim 20

a) The method of claim 12, further comprising: filtering harmonics between the at least one first generator and the loads in the one or more external mobile units using an isolation transformer as the at least one transformer that is in the one or more external mobile units, the isolation transformer being physically external relative to the first mobile unit.

See supra, VII.D.2; EX1003, ¶269.

VIII. CONCLUSION

Petitioners respectfully request *inter partes* review of the '801 Patent be instituted and that the challenged claims be cancelled as unpatentable under 35 U.S.C. § 318(b).

Respectfully submitted,

BAKER BOTTS L.L.P.

Chad C. Walters (Reg. No. 48,022)

Lead Counsel for Petitioners

Date: August 27, 2025

2001 Ross Ave., Suite 900
Dallas, TX 75201-2980
Phone: (214) 953-6511
Fax: (214) 661-4511
chad.walters@bakerbotts.com

CERTIFICATE OF SERVICE

The undersigned hereby certifies on this 27th day of August 2025, that true and correct copies of the foregoing PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 11,211,801, Exhibits 1001-1023, and Petitioner's power of attorney were served in their entirety to Patent Owner via FedEx Express® or Express Mail:

Hogan Lovells US LLP

609 Main Street, Suite 4200

Houston, Texas 77002

BAKER BOTTS L.L.P.

Chad C. Walters (Reg. No. 48,022)

Lead Counsel for Petitioners

Date: August 27, 2025

2001 Ross Ave., Suite 900
Dallas, TX 75201-2980
Phone: (214) 953-6511
Fax: (214) 661-4511
chad.walters@bakerbotts.com

CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITATION, TYPEFACE REQUIREMENTS, AND TYPE STYLE REQUIREMENTS

1. This Petition complies with the type-volume limitation of 14,000 words, comprising 13,977 words, excluding the parts exempted by 37 C.F.R. § 42.24(a).

2. This Petition complies with the general format requirements of 37 C.F.R. § 42.6(a) and has been prepared using Microsoft® Word in 14-point Times New Roman.

Respectfully submitted,

BAKER BOTTS L.L.P.

Chad C. Walters (Reg. No. 48,022)

Lead Attorney for Petitioner

Date: August 27, 2025

2001 Ross Ave., Suite 900
Dallas, TX 75201-2980
Phone: (214) 953-6511
Fax: (214) 661-4511
chad.walters@bakerbotts.com