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Power distribution trailer for an electric driven hydraulic fracking system

Abstract

An electric driven hydraulic fracking system is disclosed. A pump configuration that includes the single VFD, the single shaft electric motor, and the single hydraulic pump that is mounted on the single pump trailer. A power distribution trailer distributes the electric power generated by the power generation system at the power generation voltage level to the single VFD and converts the electric power at a power generation voltage level to a VFD voltage level and controls the operation of the single shaft electric motor and the single hydraulic pump. The power distribution trailer converts the electric power generated by the power generation system at the power generation level to an auxiliary voltage level that is less than the power generation voltage level. The power distribution trailer distributes the electric power at the auxiliary voltage level to the single VFD that controls an operation of the of the auxiliary systems.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) The present application is a continuation of and claims priority to U.S. patent application Ser. No. 18/371,262 filed Sep. 21, 2023 and published as U.S. Patent Application Publication No. 2024/0011380 A1, which is a continuation of and claims priority to U.S. patent application Ser. No. 17/963,728 filed Oct. 11, 2022, now U.S. Pat. No. 11,795,800, which is a continuation of and claims priority to U.S. patent application Ser. No. 17/522,478 filed Nov. 9, 2021, now U.S. Pat. No. 11,466,550, which is a continuation of and claims priority to U.S. patent application Ser. No. 17/240,422 filed Apr. 26, 2021, now U.S. Pat. No. 11,168,556, which is a continuation of and claims priority to U.S. patent application Ser. No. 17/064,149, filed Oct. 6, 2020, now U.S. Pat. No. 10,989,031, which is a continuation of and claims priority to U.S. patent application Ser. No. 16/790,538, filed Feb. 13, 2020, now U.S. Pat. No. 10,794,165, which claims priority to U.S. Provisional Patent Application No. 62/805,521 filed Feb. 14, 2019, each of which is hereby incorporated by reference in its entirety.

BACKGROUND
Field of Disclosure
(1) The present disclosure generally relates to electric driven hydraulic fracking systems and specifically to a single Variable Frequency Drive (VFD), a single shaft electric motor, and a single hydraulic pump positioned on a single pump trailer.
Related Art
(2) Conventional hydraulic fracking systems are diesel powered in that several different diesel engines apply the power to the hydraulic pumps as well as several types of auxiliary systems that assist the hydraulic pumps to execute the fracking, such as hydraulic coolers and lube pumps. Conventional diesel powered hydraulic fracking systems require a diesel engine and a transmission to be connected to a hydraulic pump to drive the hydraulic pump. However, typically several hydraulic pumps are required at a single fracking site to prepare the well for the later extraction of the fluid, such as hydrocarbons, from the existing well. Thus, each of the several hydraulic pumps positioned at a single fracking site require a single diesel engine and single transmission to adequately drive the corresponding hydraulic pump requiring several diesel engines and transmissions to also be positioned at the single fracking site in addition to the several hydraulic pumps.
(3) Typically, the diesel engines limit the horsepower (HP) that the hydraulic pumps may operate thereby requiring an increased quantity of hydraulic pumps to attain the required HP necessary prepare the well for the later extraction of fluid, such as hydrocarbons, from the existing well. Any

increase in the power rating of hydraulic pumps also results in an increase in the power rating of diesel engines and transmissions required at the fracking site as each hydraulic pump requires a sufficiently rated diesel engine and transmission. As the diesel engines, transmissions, and hydraulic pumps for a single fracking site increase, so does quantity of trailers required to transport and position configurations at the fracking site.

(4) The numerous diesel engines, transmissions, and hydraulic pumps required at a fracking site significantly drives up the cost of the fracking operation. Each of the numerous trailers required to transport and position configurations require CDL drivers to operate as well as increased manpower to rig the increased assets positioned at the fracking site and may be classified as loads in need of permits, thus adding expense and possible delays. The amount of diesel fuel required to power the numerous diesel engines to drive the numerous hydraulic pumps required to prepare the well for the later extraction of the fluid, such as hydrocarbons, from the existing well also significantly drives up the cost of the fracking operation. Further, the parasitic losses typically occur as the diesel engines drive the hydraulic pumps as well as drive the auxiliary systems. Such parasitic losses actually decrease the amount of HP that is available for the hydraulic pumps operate thereby significantly decreasing the productivity of hydraulic pumps. In doing so, the duration of the fracking operation is extended resulting in significant increases in the cost of the fracking operation. The diesel engines also significantly increase the noise levels of the fracking operation and may have difficulty operating within required air quality limits.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) Embodiments of the present disclosure are described with reference to the accompanying drawings. In the drawings, like reference numerals indicate identical or functionally similar elements. Additionally, the left most digit(s) of a reference number typically identifies the drawing in which the reference number first appears.

(2) FIG. **1** illustrates a top-elevational view of a hydraulic fracking operation such that the hydraulic pumps may pump a fracking media into a fracking well to execute a fracking operation to extract a fluid from the fracking well;

(3) FIG. **2** illustrates a top-elevational view of a single pump configuration that includes a single VFD, a single shaft electric motor, and a single hydraulic pump that are each mounted on a single pump trailer;

(4) FIG. **3** illustrates a block diagram of an electric driven hydraulic fracking system that provides an electric driven system to execute a fracking operation in that the electric power is consolidated in a power generation system and then distributed such that each component in the electric driven hydraulic fracking system is electrically powered;

(5) FIG. **4** illustrates a block diagram of an electric driven hydraulic fracking system that further describes the incorporation of the power distribution trailer into the electric driven hydraulic fracking system;

(6) FIG. **5** illustrates a block diagram of an of an electric driven hydraulic fracking system that further describes the incorporation of the power distribution trailer into the electric driven hydraulic fracking system;

(7) FIG. **6** illustrates a top-elevational view of a connector configuration for each of the VFDs that may couple to a medium voltage cable, a low voltage cable, and a communication cable.

DETAILED DESCRIPTION

(8) The following Detailed Description refers to accompanying drawings to illustrate exemplary embodiments consistent with the present disclosure. References in the Detailed Description to “one exemplary embodiment,” an “exemplary embodiment,” an “example exemplary embodiment,” etc.,

indicate the exemplary embodiment described may include a particular feature, structure, or characteristic, but every exemplary embodiment may not necessarily include the particular feature, structure, or characteristic. Moreover, such phrases are not necessarily referring to the same exemplary embodiment. Further, when a particular feature, structure, or characteristic may be described in connection with an exemplary embodiment, it is within the knowledge of those skilled in the art(s) to effect such feature, structure, or characteristic in connection with other exemplary embodiments whether or not explicitly described.

(9) The exemplary embodiments described herein are provided for illustrative purposes, and are not limiting. Other exemplary embodiments are possible, and modifications may be made to the exemplary embodiments within the spirit and scope of the present disclosure. Therefore, the Detailed Description is not meant to limit the present disclosure. Rather, the scope of the present disclosure is defined only in accordance with the following claims and their equivalents.

(10) Embodiments of the present disclosure may be implemented in hardware, firmware, software, or any combination thereof. Embodiments of the present disclosure may also be implemented as instructions applied by a machine-readable medium, which may be read and executed by one or more processors. A machine-readable medium may include any mechanism for storing or transmitting information in a form readable by a machine (e.g., a computing device). For example, a machine-readable medium may include read only memory ("ROM"), random access memory ("RAM"), magnetic disk storage media, optical storage media, flash memory devices, electrical optical, acoustical or other forms of propagated signals (e.g., carrier waves, infrared signals, digital signals, etc.), and others. Further firmware, software routines, and instructions may be described herein as performing certain actions. However, it should be appreciated that such descriptions are merely for convenience and that such actions in fact result from computing devices, processors, controllers, or other devices executing the firmware, software, routines, instructions, etc.

(11) For purposes of this discussion, each of the various components discussed may be considered a module, and the term "module" shall be understood to include at least one software, firmware, and hardware (such as one or more circuit, microchip, or device, or any combination thereof), and any combination thereof. In addition, it will be understood that each module may include one, or more than one, component within an actual device, and each component that forms a part of the described module may function either cooperatively or independently from any other component forming a part of the module. Conversely, multiple modules described herein may represent a single component within an actual device. Further, components within a module may be in a single device or distributed among multiple devices in a wired or wireless manner.

(12) The following Detailed Description of the exemplary embodiments will so fully reveal the general nature of the present disclosure that others can, by applying knowledge of those skilled in the relevant art(s), readily modify and/or adapt for various applications such exemplary embodiments, without undue experimentation, without departing from the spirit and scope of the present disclosure. Therefore, such adaptations and modifications are intended to be within the meaning and plurality of equivalents of the exemplary embodiments based upon the teaching and guidance presented herein. It is to be understood that the phraseology or terminology herein for the purpose of description and not of limitation, such that the terminology or phraseology of the present specification is to be interpreted by those skilled in the relevant art(s) in light of the teachings herein.

(13) System Overview

(14) FIG. **1** illustrates a top-elevational view of a hydraulic fracking operation such that the hydraulic pumps may pump a fracking media into a well to execute a fracking operation to extract a fluid from the well. A hydraulic fracking operation **100** includes a fracking trailer **170** that a fracking configuration may be deployed. The fracking configuration may be the fracking equipment that executes the actual fracking to prepare the well for the later extraction of the fluid from the well. For example, the fracking trailer **170** may include the fracking equipment that

implements the missile as well as the well heads that are affixed onto the well and distribute the fracking media into the well to prepare the well for later extraction of the fluid from the well. The fluid extracted from the well may include a liquid, such as crude oil, and so on, or a gas, such as such as hydrocarbons, natural gas and so on, that is extracted from the well that is then stored and distributed.

(15) The power that is generated to provide power to each of the numerous components included in the hydraulic fracking operation **100** is positioned on a power generation system **110**. Often times, the fracking site is a remote site where it has been determined that sufficient fluid has been located underground to justify temporarily establishing the hydraulic fracking operation **100** for a period of time to drill the well and extract the fluid from the well. Such fracking sites are often times positioned in remote locations such as uninhabited areas in mountainous regions with limited road access to the fracking sites such that the hydraulic fracking operation **100** is often times a mobile operation where each of the components are positioned on trailers that are then hauled to the fracking site via semi-trucks and/or tractors. For example, the fracking trailer **170** includes the fracking equipment which is hauled in via a semi-truck and is positioned closest to the well as compared to the other components in order to execute the fracking operation.

(16) In another example, the power generation system **110** may also be a mobile operation such that the power generation equipment may be mounted on a power generation trailer and transported to the fracking site via a semi-truck and/or tractor. The power generation system **110** may be positioned on the fracking site such that any component of the hydraulic fracking operation **100** may be powered by the power generation system **110**. In doing so, the power required for the hydraulic fracking operation **100** may be consolidated to the power generation system **110** such that the power generation system **110** provides the necessary power required for the hydraulic fracking operation **100**. Thus, the power generation system **110** may be positioned at the fracking site in a manner such that each component of the hydraulic fracking operation **100** may have power distributed from the power generation system **110** to each respective component of the hydraulic fracking operation **100**.

(17) The power generation system **110** may include power generation systems that generate electric power such that the hydraulic fracking operation **100** is powered via electric power generated by the power generation system **110** and does not require subsidiary power generation systems such as subsidiary power generation systems that include diesel engines. In doing so, the power generation system **110** may provide electric power to each component of the hydraulic fracking operation **100** such that the hydraulic fracking operation **100** is solely powered by electric power generated by the power generation system **110**. The power generation system **110** may consolidate the electric power that is generated for the electric driven hydraulic fracking system **100** such that the quantity and size of power sources included in the power generation system **110** is decreased.

(18) The power sources are included in the power generation system **110** and output electric power such that the electric power outputted from each power source included in the power generation system **110** is collectively accumulated to be electric power at a power generation voltage level as will be discussed in detail below. For example, the power output for each of the power sources included in the power generation system **110** may be paralleled to generate the electric power at the power generation voltage level. The power generation system **110** may include numerous power sources as well as different power sources and any combination thereof. For example, the power generation system may include power sources that include a quantity of gas turbine engines. In another example, the power generation system **110** may include a power source that includes an electric power plant that independently generates electric power for an electric utility grid. In another example, the power generation system **110** may include a combination of gas turbine engines and an electric power plant. The power generation system **110** may generate the electric power at a power level and a voltage level.

(19) The power generation system **110** may generate electric power at a power generation voltage

level in which the power generation voltage level is the voltage level that the power generation system is capable of generating the electric power. For example, the power generation system **110** when the power sources of the power generation system **110** include a quantity of gas turbine engines may generate the electric power at the power generation voltage level of 13.8 kV which is a typical voltage level for electric power generated by gas turbine engines. In another example, the power generation system **110** when the power sources of the power generation system include an electric power plan may generate the electric power at the power generation voltage level of 12.47 kV which is a typical voltage level for electric power generated by an electric power plant.

(20) In another example, the power generation system **110** may generate electric power that is already at a VFD voltage level to power the single shaft electric motor **150**(*a-n*) as discussed in detail below. In such an example, the power generation system **110** may generate the electric power that is already at the VFD voltage level of 4160V. In another example, the power generation system **110** may generate the electric power at the power generation voltage level at a range of 4160V to 15 kV. In another example, the power generation system **110** may generate electric power at the power generation voltage level of up to 38 kV. The power generation system **110** may generate the electric power at any power generation voltage level that is provided by the power sources included in the power generation system **110** that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure. The power generation system **110** may then provide the electric power at the power generation voltage level to the power distribution trailer **120** via a medium voltage cable.

(21) In an embodiment, the power generation system **110** may generate electric power at a power level of at least 24 Mega Watts (MW) that is generated at a power generation voltage level of at least 13.8 kV. In another embodiment, the power generation system **110** may generate electric power at a power level of at least 24 MW that is generated at a power generation voltage level of at least 12.47 kW. The power generation system **110** may generate electric power at a power level such that there is sufficient electric power to adequately power each of the components of the hydraulic fracking operation **100** while having gas turbine engines in quantity and in size that enable the gas turbine engines to be transported to the fracking site and set up remotely via a trailer. In doing so, the power distribution trailer **110** may include gas turbine engines that generate sufficient electric power to adequately power each of the components of the hydraulic fracking operation **100** while not requiring a large quantity of gas turbine engines and gas turbine engines of significant size that may significantly increase the difficulty and the cost to transport the gas turbine engines to the fracking site.

(22) In order to provide sufficient electric power to adequately power each of the components of the hydraulic fracking operation **100** while not requiring large quantities of gas turbine engines and/or gas turbine engines of significant size, the power distribution trailer **110** may include single or multiple gas turbine engines that generate electric power at power levels of 5 MW, 12 MW, 16 MW, 20-25 MW, 30 MW and/or any other wattage level that may not require large quantities of gas turbine engines and/or gas turbine engines of significant size that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure. In another example, the power generation system **110** may be the electric utility power plant that is local to the location of the fracking operation such that the power distribution trailer **120** may receive the electric power at the power level of 24 MW and the power generation voltage level of 12.47 kV directly from the electric utility power plant.

(23) In an embodiment, the power generation system **110** may include a first gas turbine engine that generates electric power at a first power level in range of 12 MW to 16 MW and a second gas turbine engine that generates electric power at a second power level in a range of 12 MW to 16 MW. The first gas turbine engine and the second gas turbine engine generate the same voltage level of at least 13.8 kV that is provided to a power distribution trailer **120** when the first power level is in the range of 12 MW to 16 MW generated by the first gas turbine engine is combined with the

second power level in the range of 12 MW to 16 MW. In order to provide sufficient electric power to adequately power each component of the hydraulic fracking operation **100** as well as limit the quantity of gas turbine engines as well as the size of the gas turbine engines such that the gas turbine engines may be positioned on a single trailer and transported to the fracking site, the power generation system **110** may include two electric gas turbine engines that generate electric power at power levels in the range of 12 MW to 16 MW such that the electric powers at the power levels in the range of 12 MW to 16 MW may be paralleled together to generate the total electric power that is available to power each of the components of the hydraulic fracking operation **100** is in the range of 24 MW to 32 MW.

(24) Further, the power generation system **110** including more than one gas turbine engine to generate the electric power provides redundancy in the power generation for the hydraulic fracking operation **100**. In doing so, the power generation system **110** provides a redundancy to the electric driven hydraulic fracking system in that the first gas turbine engine continues to provide the first power level to the power distribution trailer **120** when the second gas turbine engine suffers a short circuit and/or other shutdown condition and the second gas turbine engine continues to provide the second power level to the power distribution trailer **120** when the first gas turbine engine suffers the short circuit and/or other shutdown condition. The power generation system **110** may then maintain a reduced quantity of hydraulic pump(s) **160**(*a-n*) to continuously operate in the continuous duty cycle without interruption in continuously pumping the fracking media due to the redundancy provided by the first gas turbine engine and the second gas turbine engine.

(25) By incorporating two gas turbine engines that generate electric power at power levels in the range of 12 MW to 16 MW redundancy may be provided in that the electric power that is provided to the components of the hydraulic fracking operation **100** such that the fracking media is continuously pumped into the well to execute the fracking operation to prepare the well for the later extraction of the fluid from the well despite one of the gas turbine engines suffering a short circuit condition. In doing so, the incident energy at the point where the short circuit occurs may be reduced due to the reduced short circuit availability of the power generation system **110**. However, if one of the gas turbine engines were to fail due to a short circuit condition, the remaining gas turbine engine may continue to provide sufficient power to ensure the fracking media is continuously pumped into the well. A failure to continuously pump the fracking media into the well may result in the sand, which is a major component of the fracking media coming out of the suspension and creating a plug at the bottom of the well which typically results in a significant expense to remove the sand in the well so that the fracking can continue. The power generation system **110** may include any combination of gas turbine engines and/or single gas turbine engine at any power level to sufficiently generate electric power to adequately power each of the components of the hydraulic fracking operation **100** that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(26) The power generation system **110** may generate the electric power at a power generation voltage level that is in the medium voltage range of 1.0 kilo Volts (kV) to 72.0 kV. However, in an embodiment, the power generation system **110** may generate the electric power at the power generation voltage level of 13.8 kV. In another embodiment, the power generation system **110** may generate the electric power at the power generation voltage level of 13.8 kV. The generation of the electric power at the voltage level in the medium voltage range enables medium voltage cables to be used to connect the power generation system **110** to the power distribution trailer **120** to propagate the electric power from the power generation system **110** to the power distribution trailer **120** as well as enabling the use of medium voltage cables to propagate the electric voltage level to any of the components powered by the electric power in the medium voltage range. The use of medium voltage cables rather than the use of low voltage cables decreases the size of the cable required in that medium voltage cables require less copper than low voltage cables thereby reducing the size and/or quantity of the cables required for the distribution of power throughout the

hydraulic fracking operation **100**.

(27) Further, the consolidation of gas turbine engines to decrease the quantity of gas turbine engines required to power the components of the hydraulic fracking operation **100** and/or the incorporation of the electric utility power plant also consolidates the quantity of medium voltage cables that are required to connect each of the gas turbine engines to the power distribution trailer **120** thereby further reducing the cost of the cables required for the hydraulic fracking operation **100**. Further, the power generation system **110** generated the electric power at the power generation voltage level of 13.8 kV and/or 12.47 kV enables the hydraulic fracking operation **100** to be more easily integrated with any electric utility grid anywhere in the world such that the electric utility grid may be more easily substituted into the power generation system **110** in replacement of the gas turbine engines since it is more common that the electric utility grid has transformers available to deliver the electric power at the power generation voltage level of 13.8 kV and/or 12.47 kV.

(28) The power distribution trailer **120** may distribute the electric power at the power level generated by the power generation system **110** to each variable frequency drive (VFD) **140**(*a-n*) positioned on each pump trailer **130**(*a-n*). As noted above, the power generation system **110** may include at least one gas turbine engine, the electric utility grid, and/or a combination thereof, to generate the electric power. In doing so, a medium voltage power cable may be connected from each component of the power generation system **110** to the power distribution trailer **120**. For example, the power generation system **110** may include two gas turbine engines with each of the gas turbine engines generating electric power at the power level of 12 MW to 16 MW at the voltage level of 13.8 kV. In such an example, two medium voltage cables may then connect each of the two gas turbine engines to the power distribution trailer **120** such that the electric power at the power level of 12 MW to 16 MW at the voltage level of 13.8 kV may propagate from the gas turbine engines to the power distribution trailer **120**.

(29) The power distribution trailer **120** may then distribute the electric power to each of the VFDs **140**(*a-n*) positioned on each of the pump trailers **130**(*a-n*). As will be discussed in detail below, several different hydraulic pumps **160**(*a-n*) may be required to continuously pump the fracking media into the well to execute the fracking operation to prepare the well for the later extraction of the fluid from the well. In doing so, each of the different hydraulic pumps **160**(*a-n*) may be driven by a corresponding VFD **140**(*a-n*) also positioned on the corresponding pump trailer **130**(*a-n*) with the hydraulic pump **160**(*a-n*). Each of the VFDs **140**(*a-n*) may then provide the appropriate power to drive each of the single shaft electric motors **150**(*a-n*) that then drive each of the hydraulic pumps **160**(*a-n*) to continuously pump the fracking media into the well to execute the fracking operation to prepare the well for the later extraction of the fluid from the well. Thus, the power distribution trailer **120** may distribute the electric power generated by the power distribution trailer **110** which is consolidated to reduce the quantity of the gas turbine engines to the several different VFDs **140**(*a-n*) positioned on each of the pump trailers **130**(*a-n*). The components of the power distribution trailer **120** may be transported to the fracking site.

(30) For example, the power distribution trailer **120** is configured to distribute the electric power at the power level of at least 24 MW generated by the at least one gas turbine engine from the voltage level of at least 13.8 kV to the single VFD **140** *a* positioned on the single pump trailer **130** *a*. In such an example, the power generation system **110** includes two different gas turbine engines that generate the electric power at the power level of 12 MW to 16 MW and at the voltage level of 13.8 kV. Two different medium voltage cables may then propagate the electric power generated by each of the two gas turbine engines at the power level of 12 MW to 16 MW and at the voltage level of 13.8 kV to the power distribution trailer **120**. The power distribution trailer **120** may then combine the power levels of 12 MW to 16 MW generated by each of the two gas turbine engines to generate a power level of 24 MW to 32 MW at the voltage level of 13.8 kV. The power distribution trailer **120** may then distribute the electric power at the voltage level of 13.8 kV to each of eight different VFDs **140**(*a-n*) via eight different medium voltage cables that propagate the electric power at the

voltage level of 13.8 kV from the power distribution trailer **120** to each of the eight different VFDs **140**(*a-n*). The power distribution trailer **120** may distribute the power generated by any quantity of gas turbine engines to any quantity of VFDs that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(31) In an embodiment, the power distribution trailer **120** may include a plurality of switch gear modules in that each switch gear module switches the electric power generated by each of the components of the power generation system **110** and received by the corresponding medium voltage cable to the medium voltage cable on and off to each of the corresponding VFDs **140**(*a-n*). For example, the power distribution trailer **120** may include eight different switch gear modules to independently switch the electric power generated by the two gas turbine engines at the medium voltage level of 13.8 kV as received by the two different medium voltage cables on and off to the eight different medium voltage cables for each of the eight corresponding VFDs **140**(*a-n*) to distribute the electric power at the medium voltage level of 13.8 kV to each of the eight corresponding VFDs **140**(*a-n*).

(32) In such an embodiment, the switch gear modules may include a solid state insulated switch gear (2SIS) that is manufactured by ABB and/or Schneider Electric. Such medium voltage switch gears may be sealed and/or shielded such that there is no exposure to live medium voltage components. Often times the fracking site generates an immense amount of dust and debris so removing any environmental exposure to live medium voltage components as provided by the 2SIS gear may decrease the maintenance required for the 2SIS. Further, the 2SIS may be permanently set to distribute the electric power from each of the gas turbine engines to each of the different VFDs **140**(*a-n*) with little maintenance. The power distribution trailer **120** may incorporate any type of switch gear and/or switch gear configuration to adequately distribute the electric power from the power generation system **110** to each of the different VFDs **140**(*a-n*) that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(33) As noted above, the power distribution trailer **120** may distribute the electric power at the power generation voltage level generated by the power generation system **110** to each of the different VFDs **140**(*a-n*) positioned on the corresponding pump trailer **130**(*a-n*). FIG. **2** illustrates a top-elevational view of a single pump configuration **200** that includes a single VFD **240**, a single shaft electric motor **250** and a single hydraulic pump **260** that are each mounted on a single pump trailer **230**. The single pump configuration **200** shares many similar features with each pump trailer **130**(*a-n*) that includes each corresponding VFD **140**(*a-n*), single shaft electric motor **150**(*a-n*), and single hydraulic pump **160**(*a-n*) depicted in the hydraulic fracking operation **100**; therefore, only the differences between the single pump configuration **200** and the hydraulic fracking operation **100** are to be discussed in further details.

(34) The power distribution trailer **120** may distribute the electric power at the voltage level generated by the power generation system **110** to the single VFD **240** that is positioned on the single pump trailer **130**(*a-n*). The single VFD **240** may then drive the single shaft electric motor **250** and the single hydraulic pump **260** as well as control the operation of the single shaft electric motor **250** and the single hydraulic pump **260** as the single shaft electric motor **250** continuously drives the single hydraulic pump **260** as the single hydraulic pump **260** continuously pumps the fracking media into the well to execute the fracking operation to prepare the well for the later extraction of the fluid from the well. In doing so, the VFD **240** may convert the electric power distributed by the power distribution trailer **120** at the power generation voltage level generated by the power generation system **110** to a VFD voltage level that is a voltage level that is adequate to drive the single shaft electric motor **250**. Often times, the power generation voltage level of the electric power distributed by the power distribution trailer **120** as generated by the power generation system **110** may be at a voltage level that is significantly higher than a voltage level that is adequate to drive the single shaft electric motor **250**. Thus, the single VFD **240** may convert the power generation voltage level of the electric power as distributed by the power distribution trailer

120 to significantly lower (or higher) the voltage level to the VFD voltage level that is needed to drive the single shaft electric motor **250**. In an embodiment, the single VFD **240** may convert the power generation voltage level of the electric power as distributed by the power distribution trailer **120** to the VFD voltage level of at least 4160V. In another embodiment, the single VFD **240** may convert the power generation voltage level of the electric power as distributed by the power distribution trailer **120** to the VFD voltage level that ranges from 4160V to 6600V. In another embodiment, the single VFD **240** may convert the power generation level of the electric power as distributed by the power distribution trailer **120** to the VFD voltage level that ranges from 0V to 4160V.

(35) For example, the power generation system **110** generates the electric power at a power generation voltage level of 13.8 kV. The power distribution trailer **120** then distributes the electric power at the power generation voltage level of 13.8 kV to the single VFD **240**. However, the single shaft electric motor **250** operates at a rated voltage level of at least 4160V in order to drive the single hydraulic pump **260** in which the rated voltage level of at least 4160V for the single shaft electric motor **250** to operate is significantly less than the power generation voltage level of 13.8 kV of the electric power that is distributed by the power distribution trailer **120** to the single VFD **240**. The single VFD **240** may then convert the electric power at the power generation voltage level of at least 13.8 kV distributed from the power distribution trailer **120** to a VFD rated voltage level of at least 4160V and drive the single shaft electric motor **250** that is positioned on the single pump trailer **230** at the VFD rated voltage level of at least 4160V to control the operation of the single shaft electric motor **250** and the single hydraulic pump **260**. The single VFD **240** may convert any voltage level of the electric power distributed by the power distribution trailer **120** to any VFD voltage level that is adequate to drive the single shaft electric motor that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(36) The single VFD **240** may also control the operation of the single shaft electric motor **250** and the single hydraulic pump **260**. The single VFD **240** may include a sophisticated control system that may control in real-time the operation of the single shaft electric motor **250** and the single hydraulic pump **260** in order for the single shaft electric motor **250** and the single hydraulic pump **260** to adequately operate to continuously pump the fracking media into the well to execute the fracking operation to prepare the well for the later extraction of the fluid from the well. Although, the single shaft electric motor **250** and the single hydraulic pump **260** may operate continuously to continuously pump the fracking media into the well, such continuous operation may not be continuously executed with the same parameters throughout the continuous operation. The parameters in which the single shaft electric motor **250** and the single hydraulic pump **260** may continuously operate may actually vary based on the current state of the fracking operation. The single VFD **240** may automatically adjust the parameters in which the single shaft electric motor **250** and the single hydraulic pump continuously operate to adequately respond to the current state of the fracking operation.

(37) As noted above, the single VFD **240** may convert the electric power at the power generation voltage level distributed by the power distribution trailer **120** to the VFD voltage level that is adequate to drive the single shaft electric motor **250**. The single shaft electric motor **250** may be a single shaft electric motor in that the single shaft of the electric motor is coupled to the single hydraulic pump **260** such that the single shaft electric motor **250** drives a single hydraulic pump in the single hydraulic pump **260**. The single shaft electric motor **250** may continuously drive the single hydraulic pump **260** at an operating frequency to enable the single hydraulic pump **260** to continuously pump the fracking media into the well to execute the fracking operation to prepare the well for the later extraction of the fluid from the well. The single shaft electric motor **250** may operate at the VFD voltage levels and at the operating frequencies below or above the rated levels in order to rotate at a RPM level that is appropriate to continuously drive the single hydraulic pump **260** at the maximum horsepower (HP) level that the single hydraulic pump **260** is rated to pump. In

an embodiment, the single shaft electric motor **250** may operate at a VFD voltage level of at least 4160V. In an embodiment, the single shaft electric motor **250** may operate at a VFD voltage level in a range of 4160V to 6600V. In an embodiment, the single shaft electric motor **250** may operate at a VFD voltage level in arrange of 0V to 4160V. The single shaft electric motor **250** may operate any VFD voltage level that is adequate to continuously drive the single hydraulic pump **260** that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(38) For example, the power distribution trailer **120** may distribute the electric power to the single VFD **240** at the power generation voltage level of 13.8 kV. The single VFD **240** may then convert the electric power at the power generation voltage level of 13.8 kV to the VFD voltage level of 4160V to adequately drive the single shaft electric motor **250**. The single shaft electric motor **250** may operate at an operating frequency of 60 Hz and when the VFD voltage level of 4160V to adequately drive the single shaft electric motor at the operating frequency of 60 Hz, the single shaft electric motor **250** may then rotate at a RPM level of at least 750 RPM. The single shaft electric motor **250** may rotate at a RPM level of at least 750 RPM based on the VFD voltage level of at least 4160V as provided by the single VFD **240** and to drive the single hydraulic pump **260** that is positioned on the single pump trailer **230** with the single VFD **240** and the single shaft electric motor **250** with the rotation at the RPM level of at least 750 RPM.

(39) In an embodiment, the single shaft electric motor **250** may rotate at a RPM level of at least 750 RPM. In an embodiment, the single shaft electric motor **250** may rotate at a RPM level of 750 RPM to 1400 RPM. The single shaft electric motor **250** may operate at any RPM level to continuously drive the single hydraulic pump **260** that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure. The single shaft electric motor may operate at any operating frequency to continuously drive the single hydraulic pump **260** that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(40) The single shaft electric motor **250** may be an induction motor that rotates at the RPM level needed to obtain required pump speed based on the input gear box ratio of the single hydraulic pump **260**. Based on the operating frequency of the single shaft motor **250** and the VFD voltage level applied to the single shaft electric motor **250**, the single shaft electric motor **250** may then rotate at the required RPM level and produce sufficient torque to cause the pump to produce the required flow rate of fracking media at the required output pressure level. However, the VFD voltage level applied to the single shaft electric motor **250** may be determined based on the input gear box ratio of the single hydraulic pump **260** as the single shaft electric motor **250** cannot be allowed to rotate at the RPM level that exceeds the maximum speed rating of the input gear box of the single hydraulic pump **260** or the maximum speed of the single hydraulic pump **260**. The single shaft electric motor **250** may be an induction motor, a traction motor, a permanent magnet motor and/or any other electric motor that continuously drives the single hydraulic pup **260** that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(41) As noted above, the single shaft electric motor **250** may be coupled to a single hydraulic pump in the single hydraulic pump **260** and drive the single hydraulic pump **260** such that the single hydraulic pump **260** continuously pumps the fracking media into the well to execute the fracking operation to prepare the well for the later extraction of the fluid from the existing well. The single hydraulic pump **260** may operate on a continuous duty cycle such that the single hydraulic pump **260** continuously pumps the fracking media into the well. Rather than operating on an intermittent duty cycle that causes conventional hydraulic pumps to temporarily stall in the pumping of the fracking media into the well, the single hydraulic pump **260** in operating on a continuous duty cycle may continuously pump the fracking media into the well without any intermittent stalling in the pumping. In doing so, the efficiency in the fracking operation to prepare the well for the later

extraction of the fluid from the well may significantly increase as any intermittent stalling in pumping the fracking media into the well may result in setbacks in the fracking operation and may increase the risk of sand plugging the existing well. Thus, the single hydraulic pump **260** in operating on the continuous duty cycle may prevent any setbacks in the fracking operation due to the continuous pumping of the fracking media into the well.

(42) The single hydraulic pump **260** may continuously pump the fracking media into the well at the HP level that the single hydraulic pump **260** is rated. The increase in the HP level that the single hydraulic pump **260** may continuously pump the fracking media into the well may result in the increase in the efficiency in the fracking operation to prepare the well for later extraction of the fluid from the well. For example, the single hydraulic pump **260** may continuously pump the fracking media into the well at the HP level of at least 5000 HP as driven by the single shaft motor **250** at the RPM level of at least 750 RPM. The single hydraulic pump **260** operates on a continuous duty cycle to continuously pump the fracking media at the HP level of at least 5000 HP. In an embodiment, the single hydraulic pump **260** may operate at continuous duty with a HP level of 5000 HP and may be a Weir QEM5000 Pump. However, the single hydraulic pump **260** may any type of hydraulic pump that operates on a continuous duty cycle and at any HP level that adequately continuously pumps the pumping fracking media into the well to execute the fracking operation to prepare the well for the later extraction of the fluid from the well that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(43) The single pump trailer **230** discussed in detail above may then be incorporated into the hydraulic fracking operation **100** depicted in FIG. **1**. Each of the several pumps trailers **130**(*a-n*), where n is an integer equal to or greater than one, may be in incorporated into the hydraulic fracking operation **100** to increase the overall HP level that is applied to the fracking equipment positioned on the fracking trailer **170** by each of the single hydraulic pumps **160**(*a-n*) positioned on each of the pump trailers **130**(*a-n*). In doing so, the overall HP level that is applied to the fracking equipment positioned on the fracking trailer **170** to continuously pump the fracking media into the well may be significantly increased as the HP level that is applied to the fracking equipment is scaled with each single hydraulic pump **160**(*a-n*) that is added to the hydraulic fracking operation **100**.

(44) The positioning of each single VFD **140**(*a-n*), single shaft electric motor **150**(*a-n*), and each single hydraulic pump **160**(*a-n*) positioned on each corresponding pump trailer **130**(*a-n*) enables the power distribution trailer **120** to distribute the electric power at the power generation voltage level to each single VFD **140**(*a-n*) from a single power distribution source rather than having a corresponding single power distribution source for each single VFD **140**(*a-n*), single shaft electric motor **150**(*a-n*), and each single hydraulic pump **160**(*a-n*). In doing so, the electric power at the power generation voltage level may be distributed to each single VFD **140**(*a-n*), where n is in an integer equal to or greater than one and corresponds to the number of pump trailers **130**(*a-n*), then each single VFD **140**(*a-n*) may individually convert the power generation voltage level to the appropriate VFD voltage for the single shaft electric motor **150**(*a-n*) and the single hydraulic pump **160**(*a-n*) that is positioned on the corresponding pump trailer **130**(*a-n*) with the single VFD **140**(*a-n*). The single VFD **140**(*a-n*) may then also control the corresponding single shaft electric motor **150**(*a-n*) and the single hydraulic pump **160**(*a-n*) that is positioned on the corresponding pump trailer **130**(*a-n*) with the single VFD **140**(*a-n*).

(45) In isolating the single VFD **140**(*a-n*) to convert the electric power at the power generation voltage level to the appropriate VFD voltage level for the single shaft electric motor **150**(*a-n*) and the single hydraulic pump **160**(*a-n*) positioned on the corresponding single pump trailer **130**(*a-n*) as the single VFD **140**(*a-n*), the capabilities of the single pump trailer **130**(*a-n*) may then be easily scaled by replicating the single pump trailer **130**(*a-n*) into several different pump trailers **130**(*a-n*). In scaling the single pump trailer **130**(*a-n*) into several different pump trailers **130**(*a-n*), the parameters for the single VFD **140**(*a-n*), the single shaft electric motor **150**(*a-n*), and the single

hydraulic pump **160**(*a-n*) may be replicated to generate the several different pump trailers **130**(*a-n*) and in doing so scaling the hydraulic fracking operation **100**.

(46) In doing so, each single VFD **140**(*a-n*) may convert the electric power at the power generation voltage level as distributed by the power distribution trailer **120** to the VFD voltage level to drive each single shaft electric motor **150**(*a-n*), where n is an integer equal to or greater than one and corresponds to the quantity of single VFDs **140**(*a-n*) and pump trailers **130**(*a-n*), such that each single shaft electric motor **150**(*a-n*) rotates at the RPM level sufficient to continuously drive the single hydraulic pump **160**(*a-n*) at the HP level of the single hydraulic pump **160**(*a-n*). Rather than simply having a single hydraulic pump **260** as depicted in FIG. **2** and discussed in detail above to continuously pump at the HP level of the single hydraulic pump **260**, several different hydraulic pumps **160**(*a-n*), where n is an integer equal to or greater than one and corresponds to the to the quantity of single VFDs **140**(*a-n*), single shaft electric motors **150**(*a-n*) and pump trailers **130**(*a-n*), as positioned on different pump trailers **160** may be scaled together to scale the overall HP level that is provided to the fracking equipment as positioned on the fracking trailer **170**. In doing so, the overall HP level that is provided to the fracking equipment to continuously pump the fracking media into the well to execute the fracking operation to prepare the well for the later extraction of the fluid from the well may be easily scaled by incorporating each of the individual pump trailers **130**(*a-n*) each with single hydraulic pumps **160**(*a-n*) operating at the HP levels to scale the HP levels of the single hydraulic pumps **160**(*a-n*) to generate the overall HP level for the hydraulic fracking operation **100**.

(47) For example, each of the single hydraulic pumps **160**(*a-n*) positioned on each corresponding pump trailer **130**(*a-n*) may be operating on a continuous duty cycle at a HP level of at least 5000 HP. A total of eight pump trailers **130**(*a-n*) each with a single hydraulic pump **160**(*a-n*) positioned on the corresponding pump trailer **130**(*a-n*) results in a total of eight hydraulic pumps **160**(*a-n*) operating on a continuous duty cycle at a HP level of at least 5000 HP. In doing so, each of the eight hydraulic pumps **160**(*a-n*) continuously pump the fracking media into the well at a HP level of at least 40,000 HP and do so continuously with each of the eight hydraulic pumps **160**(*a-n*) operating on a continuous duty cycle. Thus, the fracking media may be continuously pumped into the well at a HP level of at least 40,000 HP to execute the fracking operation to prepare the well for the later extraction of the fluid from the well. The hydraulic pumps **160**(*a-n*) positioned on each corresponding pump trailer **130**(*a-n*) may operate on a continuous duty at any HP level and the and the quantity of pump trailers may be scaled to any quantity obtain an overall HP level for the hydraulic fracking operation **100** that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(48) Further, conventional hydraulic fracking operations that incorporate diesel engines require a diesel engine to drive each conventional hydraulic pump rather than being able to consolidate the power generation to a power generation system **110** that consolidates the quantity and size of the gas turbine engines to generate the electric power. Such an increase in diesel engines significantly increases the cost of the fracking operation in that significantly more trailers and/or significantly over size/weight trailers are required to transport the diesel engines resulting in significantly more and/or specialized semi-trucks and/or trailers required to transport the diesel engines which requires significantly more CDL drivers. As the overall asset count increases at the fracking site, the overall cost increases due to the increased amount of manpower required, the costs and delays related to permitted loads, as well as an increase in the amount of rigging that is required to rig each of the diesel engines to the conventional hydraulic pumps and so on. Rather, the electric driven hydraulic fracking operation **100** decreases the asset count by consolidating the power generation to the gas turbine engines of decreased size and quantity that are consolidated into the power generation system **110**. The power distribution trailer **120** then further decreases the cost by consolidating the medium voltage cabling that is required to power each of the assets thereby decreasing the amount of rigging required.

(49) Further, conventional hydraulic fracking operations that incorporate diesel engines suffer significant parasitic losses throughout the different components included in the fracking operation. Diesel engines that generate at a power level equal to the rated power level of the conventional fracking pumps may not result in delivering the full rated power to the pump due to parasitic losses throughout the conventional diesel fracking trailer configuration. For example, the diesel engines may suffer parasitic losses when driving the hydraulic coolers and the lube pumps that are associated with the conventional hydraulic pump in addition to the parasitic losses suffered from driving the conventional hydraulic pump itself. In such an example, the diesel engine may be driving the conventional hydraulic pump that is rated at 2500 HP at the HP level of 2500 HP but due to parasitic losses, the diesel engine is actually only driving the conventional hydraulic pump at 85% of the HP level of 2500 HP due to the parasitic losses. However, the electric driven hydraulic fracking operation **100** may have the single hydraulic pump **160**(*a-n*) that is rated at the HP level of 5000 HP, however, the parasitic loads are controlled by equipment running in parallel with the single hydraulic pump **160**(*a-n*), thus the single VFD **140**(*a-n*) associated with each corresponding single hydraulic pump **160**(*a-n*) provides all of its output electric power to the single hydraulic pump **160**(*a-n*), the single hydraulic pump **160**(*a-n*) actually continuously pumps the fracking media into the well at 5000 HP. Thus, the asset count required for the electric driven hydraulic fracking operation **100** is significantly reduced as compared to the hydraulic fracking operations that incorporate diesel engines due to the lack of parasitic losses for the electric driven hydraulic fracking operation **100**.

(50) Further, the conventional hydraulic fracking operations that incorporate diesel engines generate significantly more noise than the electric driven hydraulic fracking operation **100**. The numerous diesel engines required in the conventional hydraulic fracking operations generate increased noise levels in that the diesel engines generate noise levels at 110 Dba. However, the gas turbine engines incorporated into the power generation system **110** of the electric driven hydraulic fracking operation **100** generate noise levels that are less than 85 Dba. Often times, the fracking site has noise regulations associated with the fracking site in that the noise levels of the fracking operation cannot exceed 85 Dba. In such situations, an increased cost is associated with the conventional hydraulic fracking operations that incorporate diesel engines in attempts to lower the noise levels generated by the diesel engines to below 85 Dba or having to build sound walls to redirect the noise in order to achieve noise levels below 85 Dba. The electric driven fracking operation **100** does not have the increased cost as the noise levels of the oilfield gas turbine engines include silencers and stacks, thus they already fall below 85 Dba.

(51) Further, the increase in the quantity of conventional hydraulic pumps further increases the asset count which increases the cost as well as the cost of operation of the increase in quantity of conventional hydraulic pumps. Rather than having eight single hydraulic pumps **160**(*a-n*) rated at the HP level of 5000 HP to obtain a total HP level of 40000 HP for the fracking site, the conventional hydraulic fracking systems require sixteen conventional hydraulic pumps rated at the HP level of 2500 HP to obtain the total HP level of 40000 HP. In doing so, a significant cost is associated with the increased quantity of conventional hydraulic pumps. Further, conventional hydraulic pumps that fail to incorporate a single VFD **140**(*a-n*), a single shaft electric motor **150**(*a-n*), and a single hydraulic pump **160**(*a-n*) onto a single pump trailer **130**(*a-n*) further increase the cost by increasing additional trailers and rigging required to set up the numerous different components at the fracking site. Rather, the electric driven hydraulic fracking operation **100** incorporates the power distribution trailer **120** to consolidate the power generated by the power generation system **110** and then limit the distribution and the cabling required to distribute the electric power to each of the single pump trailers **130**(*a-n*).

(52) In addition to the fracking equipment positioned on the fracking trailer **170** that is electrically driven by the electric power generated by the power generation system **110** and each of the VFDs **140**(*a-n*), single shaft electric motors **150**(*a-n*), and the single hydraulic pumps **160**(*a-n*) that are

also electrically driven by the electric power generated by the power generation system **110**, a plurality of auxiliary systems **190** may be positioned at the fracking site may also be electrically driven by the electric power generated by power generation system **110**. The auxiliary systems **190** may assist each of the single hydraulic pumps **160**(*a-n*) as well as the fracking equipment positioned on the fracking trailer **170** as each of the hydraulic pumps **160**(*a-n*) operate to execute the fracking operation to prepare the well for the later extraction of the fluid from the well. In doing so, the auxiliary systems **190** may be systems in addition to the fracking equipment positioned on the fracking trailer **170** and the single hydraulic pumps **160**(*a-n*) that are required to prepare the well for the later execution of the fluid from the well.

(53) For example, the auxiliary systems **190**, such as a hydration system that provides adequate hydration to fracking media as the single hydraulic pumps **160**(*a-n*) continuously pump the fracking media into the well. Thus, auxiliary systems **190** may include but are not limited to hydration systems, chemical additive systems, blending systems, sand storage and transporting systems, mixing systems and/or any other type of system that is required at the fracking site that is addition to the fracking equipment positioned on the fracking trailer **170** and the single hydraulic pumps **160**(*a-n*) that may be electrically driven by the electric power generated by the power generation system **110** that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(54) The electric power generated by the power generation system **110** may thus be distributed by the power distribution trailer **120** such that the electric power generated by the power generation system **110** may also be incorporated to power the auxiliary systems **190**. In doing so, the electric power generated by the power generation system **110** may be incorporated to not only drive the pump trailers **130**(*a-n*) via the single VFDs **140**(*a-n*) positioned on each pump trailer **130**(*a-n*) but to also power the auxiliary systems **190**. Thus, the hydraulic fracking operation **100** may be completely electric driven in that each of the required systems positioned on the fracking site may be powered by the electric power generated by the electric power that is consolidated to the power generation system **110**.

(55) As noted above, each of the single VFDs **140**(*a-n*) may include a sophisticated control system that may control in real-time the operation of the single shaft electric motors **150**(*a-n*) and the single hydraulic pumps **160**(*a-n*) in order for the single shaft electric motors **150**(*a-n*) and the single hydraulic pumps **160**(*a-n*) to optimally operate to continuously pump the fracking media into the well to execute the fracking operation to prepare the well for the later extraction of the fluid from the well. However, the fracking control center **180** that may be positioned at the fracking site and/or remote from the fracking site may also control the single VFDs **140**(*a-n*) and in doing so control the real-time operation of the single shaft electric motors **150**(*a-n*) and the single hydraulic pumps **160**(*a-n*) in order for the single shaft electric motors **150**(*a-n*) and the single hydraulic pumps **160**(*a-n*) to optimally operate to continuously pump the fracking media into the well to execute the fracking operation to extract the fluid from the well. In doing so, the fracking control center **180** may intervene to control the single VFDs **140**(*a-n*) when necessary. The fracking control center **180** may also control the fracking equipment positioned on the fracking trailer **170** as well as the auxiliary systems **190** in order to ensure that the fracking operation is optimally executed to prepare the well for the later extraction of the fluid from the well.

(56) Communication between the fracking control center **180** and the single VFDs **140**(*a-n*), the fracking equipment positioned on the fracking trailer **170**, and/or the auxiliary systems **190** may occur via wireless and/or wired connection communication. Wireless communication may occur via one or more networks **105** such as the internet or Wi-Fi wireless access points (WAP. In some embodiments, the network **105** may include one or more wide area networks (WAN) or local area networks (LAN). The network may utilize one or more network technologies such as Ethernet, Fast Ethernet, Gigabit Ethernet, virtual private network (VPN), remote VPN access, a variant of IEEE 802.11 standard such as Wi-Fi, and the like. Communication over the network **105** takes place

using one or more network communication protocols including reliable streaming protocols such as transmission control protocol (TCP), Ethernet, Modbus, CanBus, EtherCAT, ProfiNET, and/or any other type of network communication protocol that will be apparent from those skilled in the relevant art(s) without departing from the spirit and scope of the present disclosure. Wired connection communication may occur but is not limited to a fiber optic connection, a coaxial cable connection, a copper cable connection, and/or any other type of direct wired connection that will be apparent from those skilled in the relevant art(s) without departing from the spirit and scope of the present disclosure. These examples are illustrative and not intended to limit the present disclosure.
(57) Electric Power Distribution and Control
(58) FIG. **3** illustrates a block diagram of an electric driven hydraulic fracking system that provides an electric driven system to execute a fracking operation in that the electric power is consolidated in a power generation system and then distributed such that each component in the electric driven hydraulic fracking system is electrically powered. An electric driven hydraulic fracking system **300** includes a power generation system **310**, a power distribution trailer **320**, a plurality of pump trailers **330**(*a*-*n*), a plurality of single VFDs **340**(*a*-*n*), a switchgear configuration **305**, a plurality of trailer auxiliary systems **315**(*a*-*n*), a plurality of switchgears **325**(*a*-*n*), a switchgear transformer configuration **335**, and fracking equipment **370**. The electric power is consolidated in the power generation system **310** and then distributed at the appropriate voltage levels by the power distribution trailer **320** to decrease the medium voltage cabling required to distribute the electric power. The single VFDs **340**(*a*-*n*) and the trailer auxiliary systems **315**(*a*-*n*) positioned on the pump trailers **330**(*a*-*n*) as well as the fracking control center **380** and auxiliary systems **390** are electrically powered by the electric power that is consolidated and generated by the power generation system **310**. The electric driven hydraulic fracking system **300** shares many similar features with the hydraulic fracking operation **100** and the single pump configuration **200**; therefore, only the differences between the electric driven hydraulic fracking system **300** and the hydraulic fracking operation **100** and single pump configuration **200** are to be discussed in further detail.
(59) As noted above, the power generation system **310** may consolidate the electric power **350** that is generated for the electric driven hydraulic fracking system **300** such that the quantity and size of the power sources included in the power generation system **310** is decreased. As discussed above, the power generating system **310** may include numerous power sources as well as different power sources and any combination thereof. For example, the power generating system **310** may include power sources that include a quantity of gas turbine engines. In another example, the power generation system **310** may include a power source that includes an electric power plant that independently generates electric power for an electric utility grid. In another example, the power generation system **310** may include a combination of gas turbine engines and an electric power plant. The power generation system **310** may generate the electric power **350** at a power level and a voltage level.
(60) The power generation system **310** may generate electric power at a power generation voltage level in which the power generation voltage level is the voltage level that the power generation system is capable of generating the electric power **350**. For example, the power generation system **310** when the power sources of the power generation system **310** include a quantity of gas turbine engines may generate the electric power **350** at the voltage level of 13.8 kV which is a typical voltage level for electric power **350** generated by gas turbine engines. In another example, the power generation system **310** when the power sources of the power generation system include an electric power plan may generate the electric power **350** at the voltage level of 12.47 kV which is a typical voltage level for electric power **350** generated by an electric power plant. The power generation system may generate the electric power **350** at any voltage level that is provided by the power sources included in the power generation system **310** that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure. The power

generation system **310** may then provide the electric power **350** at the voltage level 13.8 kV to the power distribution trailer **320** via a medium voltage cable.

(61) In continuing for purposes of discussion, the power distribution trailer **320** may then distribute the electric power **350** at the power generation voltage level to a plurality of single VFDs **340**(*a-n*), where n is an integer equal to or greater than two, with each single VFD **340**(*a-n*) positioned on a corresponding single trailer **330**(*a-n*) from a plurality of single trailers, where n is an integer equal to or greater than two. The power distribution trailer **320** may include a switchgear configuration **305** that includes a plurality of switchgears **325**(*a-n*), where n is an integer equal to or greater than two, to distribute the electric power **350** generated by the at least one power source included in the power distribution trailer **310** at the power generation voltage level **360** to each corresponding single VFD **340**(*a-n*) positioned on each corresponding trailer **330**(*a-n*).

(62) Since the electric power **350** is consolidated to the power generation system **310**, the switch gear configuration **305** of the power distribution trailer **320** may distribute the electric power **350** at the power generation voltage level as generated by the power generation system **310** to each of the single VFDs **340**(*a-n*) as electric power **360** at the power generation voltage level such that the each of the single VFDs **340**(*a-n*) may then drive the single shaft electric motors and the single hydraulic pumps as discussed in detail below. For example, the switch gear configuration **305** of the power distribution trailer **320** may distribute the electric power **350** at the power generation voltage level of 13.8 kV to each of the single VFDs **340**(*a-n*) as electric power **360** at the power generation voltage level of 13.8 kV when the power distribution system **310** has power sources that include gas turbine engines. In another example, the switch gear configuration **305** of the power distribution trailer **320** may distribute the electric power **350** at the power generation level of 12.47 kV to each of the single VFDs **340**(*a-n*) as electric power **360** at the power generation level of 12.47 kV when the power distribution **310** has power sources that include an electric power plant.

(63) In order for the electric power to be consolidated to the power generation system **310** as well as to provide an electric driven system in which each of the components of the electric driven hydraulic fracking system **300** is driven by the electric power generated by the power generation system **310**, the power distribution trailer **320** provides the flexibility to distribute the electric power **350** generated by the power generation system **310** at different voltage levels. In adjusting the voltage levels that the electric power **350** generated by the power generation system **310** is distributed, the power distribution trailer **320** may then distribute the appropriate voltage levels to several different components included in the electric driven hydraulic fracking system **300** to accommodate the electric power requirements of the several different components included in the electric driven hydraulic fracking system **300**. For example, the power distribution trailer **320** may distribute the electric power **360** generated by the power generation system **310** at the voltage level of 13.8 kV as generated by the power generation system **310** via the switch gears **325**(*a-n*) to each of the single VFDs **340**(*a-n*) for the each of the single VFDs **340**(*a-n*) to drive the single shaft electric motors and the single hydraulic pumps. In another example, the power distribution trailer **320** may distribute the electric power **360** generated by the power generation system **310** at the voltage level of 12.47 kV as generated by the power generation system **310** via the switch gears **325**(*a-n*) to each of the single VFDs **340**(*a-n*) for each of the single VFDs **340**(*a-n*) to drive the single shaft electric motors and the single hydraulic pumps.

(64) However, the electric power distribution trailer **320** may also distribute the electric power **350** generated by the power generation system **310** at a decreased voltage level from the voltage level of the electric power **350** originally generated by the power generation system **310**. Several different components of the electric driven hydraulic fracking system **300** may have power requirements that require electric power at a significantly lower voltage level than the electric power **350** originally generated by the power generation system **310**. In doing so, the power distribution trailer **320** may include a switchgear transformer configuration **335** that may step-down the voltage level of the electric power **350** as originally generated by the power distribution trailer

310 to a lower voltage level that satisfies the power requirements of those components that may not be able to handle the increased voltage level of the electric power **350** originally generated by the power distribution trailer **310**. In doing so, the electric power distribution trailer **320** may provide the necessary flexibility to continue to consolidate the electric power **350** to the power generation system **310** while still enabling each of the several components to be powered by the electric power generated by the power generation system **310**.
(65) For example, the switchgear transformer configuration **335** may convert the electric power **350** generated by the at least one power source of the power generation system **310** at the power generation voltage level to at an auxiliary voltage level that is less than the power generation voltage level. The switchgear transformer configuration **335** may then distribute the electric power **355** at the auxiliary voltage level to each single VFD **340**(*a-n*) on each corresponding single trailer **330**(*a-n*) to enable each single VFD **340**(*a-n*) from the plurality of single VFDs **340**(*a-n*) to communicate with the fracking control center **380**. The switchgear transformer configuration **335** may also distribute the electric power **355** at the auxiliary voltage level to a plurality of auxiliary systems **390**. The plurality of auxiliary systems **390** assists each single hydraulic pump as each hydraulic pump from the plurality of single hydraulic pumps operate to prepare the well for the later extraction of the fluid from the well.
(66) In such an example, the switchgear transformer configuration **335** may convert the electric power **350** generated by the power generation system **310** with power sources include gas turbine engines at the power generation voltage level of 13.8 kV to an auxiliary voltage level of 480V that is less than the power generation voltage level of 13.8 kV. The switchgear transformer configuration **335** may then distribute the electric power **355** at the auxiliary voltage level of 480V to each single VFD **340**(*a-n*) on each corresponding single trailer **330**(*a-n*) to enable each single VFD **340**(*a-n*) from the plurality of single VFDs **340**(*a-n*) to communicate with the fracking control center **380**. The switchgear transformer configuration **335** may also distribute the electric power **355** at the auxiliary voltage level of 480V to a plurality of auxiliary systems **390**. In another example, the switchgear transformer configuration **335** may convert the electric power **350** generated by the power generation system **310** with power sources that include an electric power plant at the power generation voltage level of 12.47 kV to an auxiliary voltage level of 480V that is less than the power generation voltage level of 12.47 kV. In another example, the switchgear transformer configuration **33** may convert the electric power **350** at the power generation voltage level generated by the power generation system **310** to the auxiliary voltage level of 480V, 120V, 24V and/or any other auxiliary voltage level that is less than the power generation voltage level. The switchgear transformer configuration **335** may convert the electric power **350** at the power generation voltage level generated by the power generation system **310** to any auxiliary voltage level that is less than the power generation voltage level to assist each single VFD **340**(*a-n*) in executing operations that do not require the electric power **360** at the power generation voltage level that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.
(67) Unlike each of the single VFDs **340**(*a-n*) that may convert the electric power **360** at the power generation voltage level to drive the single shaft electric motors and the single hydraulic pumps, the fracking control center **380**, the auxiliary systems **390**, the trailer auxiliary systems **315**(*a-n*) as well as the operation of features of the single VFDS **340**(*a-n*) that are unrelated to the driving of the single shaft electric motors and the single hydraulic pumps require the electric power to be stepped down to the electric power **355** at the auxiliary voltage level. The switchgear transformer configuration **335** may provide the necessary flexibility to step-down the electric power **360** at the power generation voltage level to the generate the electric power **355** at the auxiliary voltage level such that the remaining components of the electric driven hydraulic fracking system **300** may also be electrically driven by the electric power consolidated to the power generation system **310**.
(68) In stepping down the electric power **350** generated by the power generation system **310** at the

power generation voltage level, the switchgear transformer configuration **335** may provide the electric power **355** at the auxiliary voltage level to the auxiliary systems **390**. In doing so, the auxiliary systems **390** may be electrically driven by the electric power **355** at the auxiliary voltage level such that the electric power consolidated by the power generation system **310** may drive the auxiliary systems **390**. The auxiliary systems **390** may include but are not limited hydration systems, chemical additive systems, fracturing systems, blending systems, mixing systems and so on such that each of the auxiliary systems **390** required to execute the fracking operation may be electrically driven by the electric power consolidated by the power generation system **310**. Further, the power distribution trailer **320** may also route a communication link **365** to each of the auxiliary systems **390** such that the fracking control center **380** may intervene and control each of the auxiliary systems **390** via the communication link **365** if necessary.
(69) The switchgear transformer configuration **335** may also provide the electric power **355** at the auxiliary voltage level to the fracking control center **380**. In providing the auxiliary voltage level to the fracking control center **380**, the fracking control center **380** may remotely control the auxiliary systems **390**, the single VFDs **340**(*a-n*), as well as the trailer auxiliary systems **315**(*a-n*) as requested by the fracking control center **380**. The power distribution trailer **320** may route the communication link **365** to the auxiliary systems **390**, the single VFDs **340**(*a-n*), and the trailer auxiliary systems **315**(*a-n*) such that the fracking control center **380** may communicate with each of the auxiliary systems **390**, the single VFDs **340**(*a-n*), and the trailer auxiliary systems **315**(*a-n*) and thereby control via the communication link **365**. As discussed above, the communication link **365** may be a wireline and/or wireless communication link.
(70) The switchgear transformer configuration **335** may also provide the electric power **355** at the auxiliary voltage level to each of the single VFDs **340**(*a-n*). As discussed above and below, the single VFDs **340**(*a-n*) convert the electric power **360** generated by the power generation system **310** at the power generation voltage level to drive the single shaft electric motors and the single hydraulic pumps. However, the single VFD **340**(*a-n*) may also operate with different functionality without having to drive the single shaft electric motors and the single hydraulic pumps. For example, the auxiliary systems **315**(*a-n*) positioned on the pump trailers **330**(*a-n*) and/or included in the single VFDs **340**(*a-n*) may operate as controlled by a corresponding VFD controller **345**(*a-n*) that is positioned on the corresponding single trailer **330**(*a-n*) and associated with the corresponding single VFD **340**(*a-n*).
(71) In doing so, the single VFD controllers **345**(*a-n*) may operate the auxiliary systems **315**(*a-n*) when the single VFD **340**(*a-n*) is simply provided the electric power **355** at the auxiliary voltage level rather than having to operate with the electric power **360** at the power generation voltage level. In doing so, the fracking control center **380** may also communicate with the VFD controllers **345**(*a-n*) and the single VFDs **340**(*a-n*) as well as the trailer auxiliary systems **315**(*a-n*) via the communication link **365** when the stepped-down electric power **355** at the auxiliary voltage level is provided to each of the single VFDs **340**(*a-n*). In addition to operating auxiliary systems **315**(*a-n*) when the corresponding single VFD **340**(*a-n*) is provided the electric power **355** at the auxiliary voltage level, the VFD controller **345**(*a-n*) may also operate the trailer auxiliary systems **315**(*a-n*) as well as control the corresponding single shaft electric motor **150**(*a-n*) that then drives each of the corresponding hydraulic pumps **160**(*a-n*) to continuously pump the fracking media into the well to execute the fracking operation to extract the fluid from the well when the electric power **360** at the power generation voltage level is provided to the single VFDs **340**(*a-n*).
(72) For example, the single VFDs **340**(*a-n*) may operate at a reduced capacity when the switchgear transformer configuration **335** provides the electric power **355** at the auxiliary voltage level. In doing so, the single VFDs **340**(*a-n*) may operate in a maintenance mode in which the electric power **355** at the auxiliary voltage level is sufficient for the single VFDs **340**(*a-n*) to spin the single shaft electric motors but not sufficient to drive the single shaft electric motors at the RPM levels that the single shaft electric motors are rated. In operating the single VFDs **340**(*a-n*) in

the maintenance mode with the electric power **355** at the auxiliary voltage level, the hydraulic pumps as well as the fracking equipment **370** may be examined and maintenance may be performed on the hydraulic pumps and the fracking equipment **370** to ensure the hydraulic pumps **160**(*a-n*) and the fracking equipment **370** are operating adequately. The VFD controllers **345**(*a-n*) of the single VFDs **340**(*a-n*) may execute the functionality of the single VFDs **340**(*a-n*) when operating in the maintenance mode. The fracking control center **380** may also remotely control the single VFDs **340**(*a-n*) via the communication link **365** to execute the functionality of the single VFDs **340**(*a-n*) when operating in the maintenance mode.

(73) In another example, the trailer auxiliary systems **315**(*a-n*) may be operated when the single VFDs **340**(*a-n*) are operating at the reduced capacity when the switchgear transformer configuration **335** provides the electric power **355** at the auxiliary voltage level. The trailer auxiliary systems **315**(*a-n*) may be auxiliary systems positioned on the pump trailers **330**(*a-n*) and/or included in the single VFDs **340**(*a-n*) such that auxiliary operations may be performed on the single VFDs **340**(*a-n*), the single shaft electric motors, and/or the single hydraulic pumps to assist in the maintenance and/or operation of the single VFDs **340**(*a-n*) the single shaft electric motors and/or single hydraulic pumps when the electric power **355** at the auxiliary voltage level is provided to the single VFDs **340**(*a-n*). For example, the trailer auxiliary systems **315**(*a-n*) may include but are not limited to motor blower systems, the lube oil controls, oil heaters, VFD fans, and/or any other type of auxiliary system that is positioned on the pump trailers **330**(*a-n*) and/or included in the single VFDs **340**(*a-n*) to assist in the maintenance and/or operation of the single VFDs **340**(*a-n*), single shaft electric motors, and/or single hydraulic pumps that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(74) As discussed above, FIG. **3** summarizes the functionality of the of distribution of the electric power **350** as generated by the power generation system **310** and then distributed by the power distribution trailer **320** with regard to how the electric power **350** is provided to each of the single VFDs **340**(*a-n*) positioned on each of the corresponding pump trailers **330**(*a-n*). FIG. **4** illustrates a block diagram of an electric driven hydraulic fracking system **400** that further describes the incorporation of the power distribution trailer **320** into the electric driven hydraulic fracking system **400**. The power distribution trailer **320** includes a power distribution trailer controller **430**, an auxiliary system transformer **410**, an additional system transformer **420** that provides electric power **350** to an additional system **440**, and the incorporation of a black start generator **405**.

(75) The switchgear transformer configuration **335** as discussed generally in FIG. **3** is discussed in more detail below with regard to FIG. **4** in that the electric power **350** distributed by the power distribution trailer **320** may be further customized to provide electric power **350** at several different voltage levels to different systems included in the electric driven hydraulic fracking system **400**. The electric driven hydraulic fracking system **400** shares many similar features with the hydraulic fracking operation **100**, the single pump configuration **200**, and the electric driven hydraulic fracking system **300**; therefore, only the differences between the electric driven hydraulic fracking system **400** and the hydraulic fracking operation **110**, the single pump configuration **200**, and the electric driven hydraulic fracking system **300** are to be discussed in further detail.

(76) As noted above, the trailer auxiliary systems **315**(*a-n*) as well as the operation of features of the single VFDS **340**(*a-n*) that are unrelated to the driving of the single shaft electric motors and the single hydraulic pumps require the electric power **350** to be stepped down to the electric power **355** at the auxiliary voltage level. The switchgear transformer configuration **335** may provide the necessary flexibility to step-down the electric power **360** at the power generation voltage level to generate the electric power **355** at the auxiliary voltage level such that the remaining components of the electric driven hydraulic fracking system **300** may also be electrically driven by the electric power **350** consolidated to the power generation system **310**. Specifically, the switchgear transformer configuration **335** includes the auxiliary transformer **410** and the additional system transformer **420** as well as any other transformer necessary to customize the electric power **350**

distributed by the power distribution trailer **320** to differentiate the power generation voltage level **360** of the electric power **350** to the appropriate voltage levels, such as the voltage level of 480V, required to power other systems that do not have the capability to step-down the power generation voltage level **360** to lower voltages and/or simply require significantly lower voltages to operate.

(77) For example, the auxiliary system transformer **410** may step-down the electric power **350** generated at the voltage level of 13.8 kV and distribute the electric power **355** at the auxiliary voltage level of 480V to each single VFD **340**(*a-n*) on each corresponding single trailer **330**(*a-n*) to enable each single VFD **340**(*a-n*) from the plurality of single VFDs **340**(*a-n*) to communicate with the fracking control center **380**. The auxiliary system transformer **410** may also step-down the electric power **350** to the electric power **355** at the auxiliary voltage level of 480V to each single VFD **340**(*a-n*) such that each single VFD **340**(*a-n*) may operate at a reduced capacity to enable each VFD controller **345**(*a-n*) operate the trailer auxiliary systems **315**(*a-n*) without having to actually operate in a full capacity via the electric power **350** generated at the voltage level of 13.8 kV. In doing so, the auxiliary system transformer **410** may enable the VFD controller **345**(*a-n*) to operate the trailer auxiliary systems **315**(*a-n*) such as the motor blower systems, the lube oil controls, oil heaters, VFD fans, and/or any other type of auxiliary system that is positioned on the pump trailers **330**(*a-n*) and/or included in the single VFDs **340**(*a-n*) without having to have the electric power **360** at the voltage level of 13.8 kV provided to the single VFDs **340**(*a-n*).

(78) The auxiliary system transformer **410** may also step-down the electric power **350** generated at the power generation voltage level and distribute the electric power **355** at the auxiliary voltage level to each single VFD **340**(*a-n*) on each corresponding single trailer **330**(*a-n*) to enable a transformer included with each single VFD **340**(*a-n*) to be pre-magnetized before opening each single VFD **340**(*a-n*) to the electric power **360** at the power generation voltage level. Each single VFD **340**(*a-n*) when activated by the electric power **360** at the power generation voltage level may generate a significant in-rush of current due to the significant amount of current that each single VFD **340**(*a-n*) may generate once activated by the electric power **360** at the power generation voltage level. The significant in-rush of current generated by each single VFD **340**(*a-n*) once activated by the electric power **360** at the power generation voltage level may then propagate back to the power generation system **310** and have a negative impact on the power generation system **310**.

(79) For example, the power generation system **310** is an electric power plant that generates the electric power **360** at the power generation voltage level of 12.47 kV and provides such electric power **350** to the power distribution trailer **320** to be distributed to each single VFD **340**(*a-n*). The electric power plant **310** often times independently generates electric power for an electric utility grid. A significant in-rush of current generated from each single VFD **340**(*a-n*) after each single VFD **340**(*a-n*) is activated by the electric power **360** at the power generation voltage level of 12.47 kV that is then propagated back to the electric power plant **310** may negatively impact the electric utility grid that the electric power plant **310** independently generates electric power for. Thus, the operators of the electric power plant **310** require that the in-rush of current that is propagated back to the electric power plant **310** generated by each single VFD **340**(*a-n*) be significantly mitigated.

(80) In order to significantly mitigate the in-rush of current that is propagated back to the power generation system **310** after each single VFD **340**(*a-n*) is activated by the electric power **360** at the power generation voltage level, each single VFD **340**(*a-n*) may include a transformer (not shown). The auxiliary system transformer **410** may provide the electric power **355** at the auxiliary voltage level to each transformer included with each single VFD **340**(*a-n*). Each transformer may isolate each corresponding single VFD **340**(*a-n*) from the electric power **360** at the power generation voltage level while each transformer is pre-magnetized with the electric power **355** at the auxiliary voltage level as provided by the auxiliary system transformer **410**. Each transformer may then activate each corresponding single VFD **340**(*a-n*) with the electric power **355** at the auxiliary voltage level by pre-charging the capacitors associated with each single VFD **340**(*a-n*) with the

electric power **355** at the auxiliary voltage level.

(81) In doing so, each single VFD **340**(*a-n*) may essentially be exposed to the electric power **355** at the auxiliary voltage level and pre-charge to a voltage threshold of the electric power **355** at the power generation voltage level. For example, the each single VFD **340**(*a-n*) may pre-charge with the electric power **355** at the auxiliary voltage level to the voltage threshold of 20% to 25% of the electric power **360** at the power generation voltage level. The voltage threshold may be any percentage of the electric power **360** at the power generation voltage level that each single VFD **340**(*a-n*) is to pre-charge to prevent an in-rush of current that may negatively impact the power generation system **310** that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(82) After each single VFD **340**(*a-n*) has pre-charged to the voltage threshold based on the electric power **355** at the auxiliary voltage level as provided by the auxiliary system transformer **410**, each corresponding transformer may then transition to enable each single VFD **340**(*a-n*) to then be exposed to the electric power **360** at the power generation voltage level. In doing so, each single VFD **340**(*a-n*) may then be powered by the electric power **360** at the power generation voltage level and thereby decrease to the VFD voltage level of at least 4160V to drive the single shaft electric motor **150**(*a-n*) and the single hydraulic pump **160**(*a-n*). However, the in-rush of current that may propagate back to the power generation system **310** may be significantly reduced due to the pre-charge of each single VFD **340**(*a-n*) due to each corresponding transformer providing the electric power **355** at the auxiliary voltage level to each single VFD **340**(*a-n*) as provided by the auxiliary system transformer **410** before exposing each single VFD **340**(*a-n*) to the electric power **360** at the power generation voltage level. Thus, any negative impact to the power generation system **310** after each single VFD **340**(*a-n*) is exposed to the electric power **360** at the power generation voltage level is significantly decreased.

(83) In an embodiment, the electric driven hydraulic fracking system **400** may include a black start generator **405**. The black start generator **405** generates power and provides black start electric power **460** to the single VFDs **340**(*a-n*) via the power distribution trailer **320** without having to rely on the power generation system **310** to provide power to the single VFDs **340**(*a-n*). In doing so, the black start generator **405** may provide black start electric power **460** to the single VFDs **340**(*a-n*) while the power generation system **310** is inactive such that the voltage level of the black start electric power **460** is sufficient to thereby enable the single VFDs **340**(*a-n*) to operate, enable the transformers associated with the single VFDs **340**(*a-n*) to pre-magnetize and pre-charge the single VFDs **340**(*a-n*), enable the VFD controllers **345**(*a-n*) to operate the trailer auxiliary systems **315**(*a-n*), and/or enable any other functionality related to the single VFDs **340**(*a-n*) without having to activate the power generation system **310** that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure. In an embodiment, the black start electric power **460** may be at a voltage level that is substantially equivalent to the voltage level of the electric power **355** provided by the auxiliary transformer **410**. For example, the black start electric power **460** may at a black start voltage level of 480V. The black start electric power **460** may be at any voltage level that is sufficient to activate the single VFDs **340**(*a-n*) to operate in a decreased capacity as compared to when the single VFDs **340**(*a-n*) are provided with the electric power **360** at the power generation voltage level that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(84) As discussed in detail above, the auxiliary system transformer **410** may provide the electric power **355** at the auxiliary voltage level to each single VFD **340**(*a-n*) so that each single VFD **340**(*a-n*), each transformer associated with each single VFD **340**(*a-n*), each VFD controller **345**(*a-n*), the trailer auxiliary systems **315**(*a-n*), and so on may operate as discussed in detail above. However, such operation based on the electric power **355** at the auxiliary voltage level still requires that the power generation system **310** generate the electric power **350** at the power generation voltage level. In doing so, the power sources included in the power generation system **310** are

required to be activated and operating at a capacity necessary to generate the electric power **350** at the power generation voltage level. Such an operation of the power sources to generate the electric power **350** at the power generation voltage level consumes significant energy. However, such significant consumption of energy by the power sources of the power generation system **310** to generate the electric power **350** at the power generation voltage level may be unnecessary when each single VFD **340**(*a-n*) may simply require to operate with the electric power **355** at the auxiliary voltage level.

(85) For example, significant time may lapse before the fracking operation is to initiate in which the fracking equipment **370** is required to be activated and to begin fracking the fluid from the well thereby requiring the single shaft motors **150**(*a-n*) to drive the single fluid pumps **160**(*a-n*) in which the single VFDs **340**(*a-n*) are required to provide the VFD voltage level of 4160V. During that lapse of significant time of preparation before the fracking operation, the single VFDs **340**(*a-n*) may be activated via the electric power **355** at the auxiliary voltage level of 480V so that each single VFD **340**(*a-n*), each transformer associated with each single VFD **340**(*a-n*), each VFD controller **345**(*a-n*), the trailer auxiliary systems **315**(*a-n*), and so on may operate as discussed in detail above. However, to do so, having the power generation system **310** consume unnecessary energy to provide the electric power **355** at the auxiliary voltage level of 480V for such a significant amount of time before generating the electric power **360** at the power generation voltage level of 13.8 kV and/or 12.47 kV is unnecessary.

(86) Rather, the black start generator **405** may provide the black start electric power **460** to the single VFDs **340**(*a-n*) via the power distribution trailer **320** such that the single VFDs **340**(*a-n*), the transformer associated with the single VFDs **340**(*a-n*), the VFD controllers **345**(*a-n*), the trailer auxiliary systems **315**(*a-n*) and so on may operate at a reduced capacity while still contributing to the preparation of the fracking operation without requiring the activation of the power generation system **310**. For example, the black start generator **405** may provide black start electric power **460** at the black start voltage level to each of the single VFDs **340**(*a-n*) via the power distribution trailer **320** without having to activate the power generation system **310** to do so. In such an example, the back start electric power **460** at the black start voltage level provided to the single VFDs **340**(*a-n*) via the power distribution trailer **320** may enable each of the VFD controllers **345**(*a-n*) to be powered up as well as the ventilation systems of the trailer auxiliary systems **315**(*a-n*) may be activated. The single VFDs **340**(*a-n*) may pre-heat and feedback as to the status of the single VFDs **340**(*a-n*) may be provided to the fracking control center **380** via the VFD controllers **345**(*a-n*) as to the status of the single VFDs **340**(*a-n*) during pre-charge.

(87) In doing so, the power generation system **310** may idle as the single VFDs **340**(*a-n*) are preparing to arrive at a state to drive the single shaft electric motors **150**(*a-n*) to initiate the fracking operation. Activating the power generation system **310** from an idle state as the single VFDs **340**(*a-n*) prepare to arrive to a state to initiate the fracking operation is an unnecessary consumption of significant energy by the power generation system **310** when the black start generator **405** may provide the black start electric power **460** that is sufficient to prepare the single VFDs **340**(*a-n*) to an operating state as well as during the preparation period to initiate the fracking operation while consuming significantly less power than the power generation system **310**.

(88) The VFD controllers **345**(*a-n*) may provide feedback to the fracking control center **380** as to the status of the single VFDs **340**(*a-n*) as the black start generator **405** provides the black start electric power **460** to the single VFDs **340**(*a-n*) via the power distribution trailer **320**. The fracking control center **380** may also monitor the power generation system **310** to determine when the power sources included in the power generation system **310** reach a status of being able to generate the electric power **350** at the power generation voltage level. Once the fracking control center **380** determines that the power generation system **310** has reached a status to generate the electric power **350** at the power generation voltage level, the fracking control center **380** may execute a synchronized transfer scheme to transfer the electric power provided by the power distribution

trailer **320** to the single VFDs **340**(*a-n*) from the black start electric power **460** provided by the black start generator **405** to the electric power **350** at the power generation voltage level provided by the power generation system **310**. The fracking control center **380** may then deactivate the black start generator **405** such that the black start generator **405** no longer consumes unnecessary energy.

(89) The power distribution trailer **320** may also provide additional flexibility with regard to additional electric power that may be generated from the electric power **350** at the power generation voltage level as generated by the power generation system **310** such that the additional electric power is provided at additional voltage levels in addition to the electric power **360** at the power generation voltage level and the electric power **355** at the auxiliary voltage level. As mentioned above, the hydraulic fracking system **400** may operate as an isolated island in that all electric power required to operate all aspects of equipment required to execute the fracking operation may be provided from the power generation system **310** and then distributed by the power distribution trailer **320**. In doing so, the power distribution trailer **320** may customize the voltage levels of the electric power **350** at the power generation voltage level generated by the power generation system **310** to distribute the necessary electric power at the necessary voltage levels to all aspects and/or equipment required for the execution of the fracking operation thereby not requiring additional power sources and/or power generation systems.

(90) In doing so, the switchgear transformer configuration **335** may include an additional system transformer **420** that is in addition to the auxiliary system transformer **410**. The additional system transformer **420** is a transformer included in the switchgear transformer configuration **335** that provides electric power **450** at an additional voltage level that differs from the electric power **355** at the auxiliary voltage level as provided by the auxiliary transformer **410**. The additional system transformer **420** may provide electric power **450** at additional voltage levels that are higher than the auxiliary voltage level as well as additional voltage levels that are lower than the auxiliary voltage level. As a result, the additional system transformer **420** may provide the electric power **450** at the additional voltage level to an additional system **440** that requires electric power at a voltage level that differs from the electric power **355** at the auxiliary voltage level of 480V as provided by the auxiliary system transformer **410**. Thus, the additional system transformer **420** may provide the electric power **450** at the additional voltage level that is customized for the additional system **440** such that the additional system **440** may also be powered by electric power generated by the power generation system **310** and distributed by the power distribution trailer **320**.

(91) For example, the additional system **440** may include a motor control center for a blending operation required for the fracking operation. In such an example, the motor control center for the blending operation may include four 500 HP electric motors that require electric power **450** at the additional voltage level of 4160V in order to drive the blending equipment necessary to execute the blending operation during the fracking operation. The electric power **450** at the additional voltage level of 4160V differs from the electric power **360** at the power generation voltage level of 13.8 kV and/or 12.47 kV as provided by the switchgear configuration **305** as well as differs from the electric power **355** at the auxiliary voltage level of 480V as provided by the auxiliary system transformer **410**. Rather, the additional system transformer **420** provides additional customization to the electric power **450** provided at the additional voltage level of 4160V such that the additional system **440** that requires the customized electric power **450** provided at the additional voltage level of 4160V in the motor control center for the blending operation may be distributed by the power distribution trailer **320**.

(92) In another example, the additional system **440** may include a site lighting system to provide light to the fracking site. In such an example, the lighting system requires electric power **450** at the additional voltage level of 120V in to provide to the lighting system to emit light to the fracking site. The electric power **450** at the additional voltage level of 120V differs from the electric power **360** at the power generation voltage level of 13.8 kV and/or 12.47 kV as provided by the switchgear configuration **305** as well as differs from the electric power **355** at the auxiliary voltage

level of 480V as provided by the auxiliary system transformer **410**. Rather, the additional system transformer **420** provides additional customization to the electric power **450** provided at the additional voltage level of 120V such that the additional system **440** that requires the customized electric power **450** provided at the additional voltage level of 120V in the lighting system may be distributed by the power distribution trailer **320**. The additional transformer **420** may include any quantity of additional transformers in addition to the auxiliary system transformer **410** and may provide electric power **450** at any additional voltage level that is greater than and/or less than the electric power **355** at the auxiliary voltage level to provide such electric power as required by the any quantity of additional systems that will be apparent to those skilled in the relevant art(s) without departing from the spirit and scope of the disclosure.

(93) The power distribution trailer **320** includes the power distribution trailer controller **430**. The power distribution trailer controller **430** is the onboard control system for the power distribution trailer **320**. The power distribution trailer controller **430** may operate each of the auxiliary features of the power distribution trailer **320** such as the air flow of the power distribution trailer **320** to ensure that the equipment positioned on the power distribution trailer **320** is cooled and maintained at a temperature that prevents damage to the equipment positioned on the power distribution trailer **320**. In doing so, the power distribution trailer **320** may operate the auxiliary features of the power distribution trailer **320** in a similar manner as the VFD controllers **345**(*a-n*) operate the trailer auxiliary systems **315**(*a-n*) of the pump trailers **330**(*a-n*).

(94) The power distribution controller **430** may also centralize the data that is generated by the components included in the electric driven hydraulic fracking system **400**. As discussed in detail above, the power distribution trailer **320** distributes the electric power **350** at the power generation voltage level as generated by the power generation system **310** and then distributes the electric power **360** at the power generation voltage level and the electric power **355** at the auxiliary voltage level to the single VFDs **340**(*a-n*) that is then provided to the VFD controllers **345**(*a-n*) and the trailer auxiliary systems **315**(*a-n*). The power distribution trailer **320** also distributes the electric power **355** at the auxiliary voltage level to the auxiliary systems **390**. The power distribution trailer **320** also distributes the electric power **450** at the additional voltage level. In doing so, the power distribution trailer controller **430** communicates directly to each of the components included in the electric driven hydraulic fracking system **400** and thereby operates as a conduit of the communication of data generated by each of the components of the electric driven hydraulic fracking system **400** via communication link **365**.

(95) As a result, the power distribution controller **430** may act as a hub with regard to the data generated by the single VFDs **340**(*a-n*), the VFD controllers **345**(*a-n*), the trailer auxiliary systems **315**(*a-n*), the additional systems **440**, the auxiliary systems **390**, the fracking control center **380**, and/or the power generation system **310**. As the single VFDs **340**(*a-n*), the VFD controllers **345**(*a-n*), the trailer auxiliary systems **315**(*a-n*), the additional systems **440**, the auxiliary systems **390**, the fracking control center **380**, and/or the power generation system **310** operate and/or collect data and/or generate data, such data may be distributed to the power distribution controller **430**. The power distribution controller **430** may then distribute such data to the other components and/or execute operations based on the data received from each of the components included in the electrical driven hydraulic fracking system **400**.

(96) As the single VFDs **340**(*a-n*) operate and the single shaft electric motors **150**(*a-n*) drive the single hydraulic fluid pumps **160**(*a-n*) to execute the fracking operation, the single VFDs **340**(*a-n*) and the VFD controllers **345**(*a-n*) may communicate data as to the status of the numerous parameters of the single VFDs **340**(*a-n*), the single shaft electric motors **150**(*a-n*) and the single hydraulic fluid pumps **160**(*a-n*) as such components operate to execute the fracking operation to the power distribution controller **430**. The power distribution controller **430** may then operate as a conduit of such data and provide such data to the fracking control center **380** such that the fracking control center **380** may determine any actions that may be required based on the current status of

such components via communication link **365**.

(97) For example, the fracking control center **380** requires that 100 barrels per minute at 13000 PSI be driven by the fracking equipment **370**. The fracking control center **380** may then instruct the VFD controllers **345**(*a-n*) to ramp up the single VFDs **340**(*a-n*) such that the single shaft electric motors **150**(*a-n*) may ramp up to drive the single hydraulic pumps **160**(*a-n*) to drive the fracking equipment **370** at 100 barrels per minute at 13000 PSI. The VFD controllers **345**(*a-n*) may then provide data with regard to the current state of the single VFDs **340**(*a-n*), the trailer auxiliary systems **315**(*a-n*), the single shaft electric motors **150**(*a-n*), the single hydraulic pumps **160**(*a-n*) and so on with regard to the status of each component in real-time to the power distribution trailer controller **430**. The power distribution trailer controller **430** may then operate as a conduit of such data to the fracking control center **380** such that the fracking control center **380** may monitor the status of each component in real-time based on the data provided by the power distribution trailer controller **430** to determine if any actions that may be required based on the current status of such components.

(98) In another example, the power distribution trailer controller **430** may monitor the operation of the power sources included in the power generation system **310** to determine whether the electric power generated **350** at the power generation voltage level is sufficient for the single VFDs **340**(-*n*) to drive the single shaft electric motors **150**(*a-n*) to drive the single hydraulic pumps **160**(*a-n*). In such an example, the power generation system **310** may include several gas turbine engines. The power distribution controller **430** may determine that the status of one of the gas turbine engines is signaling that the gas turbine engine is failing. In doing so, the fracking control center **380** may execute a load sharing to share the load of the failed gas turbine engine with the remaining active gas turbine engines to maintain the fracking operation. The power distribution trailer controller **430** may determine the load sharing of the gas turbine engines as provided by the fracking control center **380**.

(99) In doing so, the power distribution trailer controller **430** may determine the MW of electric power **350** being generated by the remaining gas turbine engines which is less than the MW of electric power **350** generated when each of the gas turbine engines were operational. The power distribution trailer controller **430** may then determine the amount of MW being consumed by the single VFDs **340**(*a-n*) to drive the single shaft electric motors **150**(*a-n*) and the single hydraulic pumps **160**(*a-n*) in executing the fracking operation. The power distribution controller **430** may then instruct the VFD controllers **345**(*a-n*) to fade back the single VFDs **340**(*a-n*) such that the single VFDs **340**(*a-n*) consume the MW of electric power **360** as available from the remaining gas turbine engines to avoid a brown out and/or black out of the power generation system. In doing so, the fracking operation may continue uninterrupted despite a gas turbine engine failing.

(100) Thus, the power distribution trailer controller **430** may act as the conduit as well as monitor each of the single VFDs **340**(*a-n*), the VFD controllers **345**(*a-n*), the trailer auxiliary systems **315**(*a-n*), the additional systems **440**, the auxiliary systems **390**, the fracking control center **380**, and/or the power generation system **310**. As the single VFDs **340**(*a-n*), the VFD controllers **345**(*a-n*), the trailer auxiliary systems **315**(*a-n*), the additional systems **440**, the auxiliary systems **390**, the fracking control center **380**, and/or the power generation system **310** operate and/or collect data and/or generate data, such data may be distributed to the power distribution controller **430** via communication link **365**.

(101) FIG. **5** illustrates a block diagram of an of an electric driven hydraulic fracking system **500** that further describes the incorporation of the power distribution trailer into the electric driven hydraulic fracking system **500**. The power distribution trailer includes a bus A **510**, a bus B **520**, a plurality of feeders **530**(*a-n*), where n is equal to the quantity of VFD connections **550**(*a-n*). The approach in how the electric power **350** at the power generation voltage level is distributed by the switch gear configuration **305**, the auxiliary system transformer **410**, and/or the black start generator **405** to the single VFDs **340**(*a-n*) is discussed in more detail below. The electric driven

hydraulic fracking system **500** shares many similar features with the hydraulic fracking operation **100**, the single pump configuration **200**, the electric driven hydraulic fracking system **300**, and the electric driven hydraulic fracking system **400**; therefore, only the differences between the electric driven hydraulic fracking system **500** and the hydraulic fracking operation **100**, the single pump configuration **200**, the electric driven hydraulic fracking system **300**, and the electric driven hydraulic fracking system **400** are to be discussed in further detail.

(102) The power generation trailer **320** includes bus A **510** and bus B **520**. Bus A **510** may operate as an electric bus such that bus A **510** may propagate the electric power **355** at the auxiliary voltage level. In doing so, bus A **510** may be electrically connected to any component included in the power distribution trailer **320** that provides the electric power **355** at the auxiliary voltage level. For example, bus A **510** may be electrically connected to the auxiliary system transformer **410** and/or the black start generator **405** such that the auxiliary system transformer **410** and/or the black start generator **405** provides the electric power **355** at the auxiliary voltage level. Bus B **520** may operate as an electric bus such that bus B **520** may propagate the electric power **360** at the power generation voltage level. In doing so, bus B **520** may be electrically connected to any component included in the power distribution trailer **320** that provides the electric power **360** at the auxiliary voltage level. For example, bus B **520** may be electrically connected to the switchgear configuration **305** such that the switchgear configuration provides the electric power **360** at the power generation voltage level.

(103) Bus A **510** enables the different components included in the power distribution trailer **320** that provide the electric power **355** at the auxiliary voltage level, such as the auxiliary system transformer **410** and/or the black start generator **405**, to easily distribute the electric power **355** at the auxiliary voltage level to each of the feeders **530**(*a-n*). For example, the auxiliary system transformer **410** and/or the black start generator **405** may simply provide the electric power **355** at the auxiliary voltage level to Bus A **510** and then bus A **510** propagates the electric power **355** at the auxiliary voltage level to each of the feeders **530**(*a-n*). Rather than have the auxiliary system transformer **510** and/or the black start generator **405** electrically connect to each of the different feeders **530**(*a-n*) individually requiring significantly more cabling, the auxiliary system transformer **510** and/or the black start generator **505** may simply electrically connect to bus A **510** and then bus A **510** may propagate the electric power **355** at the auxiliary voltage level to each of the feeders **530**(*a-n*).

(104) Bus B **520** enables the different components included in the power distribution trailer **320** that provide the electric power **360** at the power generation voltage level, such as the switchgear configuration **305**, to easily distribute the electric power **360** at the power generation voltage level to each of the feeders **530**(*a-n*). For example, the switchgear configuration **305** may simply provide the electric power **360** at the power generation voltage level to Bus B **520** and then bus B **520** propagates the electric power **360** at the power generation voltage level to each of the feeders **530**(*a-n*). Rather than have the switchgear configuration **305** electrically connect to each of the different feeders **530**(*a-n*) individually requiring significantly more cabling, the switchgear configuration **305** may simply electrically connect to bus B **520** and then bus B **520** may propagate the electric power **360** at the power generation voltage level to each of the feeders **530**(*a-n*).

(105) Each of the feeders **530**(*a-n*) may provide the connections and include the appropriate relays and/or contacts to propagate the electric power **360** at the power generation voltage level as propagated from bus B **520**, the electric power **355**, **460** at the auxiliary voltage level as propagated from bus A **510**, and the communication link **365** to the each of the single VFDs **340**(*a-n*). The condensing of the electric power **360** at the power generation voltage level, the electric power **355**, **460** at the auxiliary voltage level, and the communication link **365** into a corresponding single feeder **530**(*a-n*) for each corresponding single VFD **340**(*a-n*) enables the electric power **360**, the electric power **355**, **460**, and the communication link **365** to be consolidated into a corresponding single cable **540**(*a-n*). Rather than have numerous cables running from the power distribution

trailer **320** to each of the different single VFDs **340**(*a-n*) such that each of the electric power **360**, the electric power **355**, **460**, and the communication link **365** is included in its own individual cable, each of the feeders **530**(*a-n*) may consolidate the electric power **360**, the electric power **355**, **460**, and the communication link **365** into a single corresponding cable **540**(*a-n*) thereby significantly reducing the amount of cables required to be ran between the power distribution trailer **320** and each corresponding single VFD **340**(*a-n*). Each of the cables **540**(*a-n*) may then electrically connect the electric power **360**, the electric power **355**, **460**, and the communication link **365** to each corresponding single VFD **340**(*a-n*) via the VFD connection **550**(*a-n*) associated with each single VFD **340**(*a-n*).

(106) The communication link **365** as included in the cables **540**(*a-n*) may provide communication from the VFD connection **550**(*a-n*) to the corresponding feeder **530**(*a-n*) and then to the power distribution trailer controller **430**. The communication link **365** may enable the power distribution trailer controller **430** to determine whether the appropriate electric power **360** at the voltage level of 13.8 kV and the appropriate electric power **355** at the auxiliary level of 480V is connected from the appropriate feeder **530**(*a-n*) to the appropriate VFD connection **550**(*a-n*). Often times, installers of the electrical electric driven hydraulic fracking system **500** may incorrectly connect cables **540**(*a-n*) such that the incorrect VFD connection **550**(*a-n*) is connected to the incorrect feeder **530**(*a-n*). In doing so, the incorrect electric power **360** at the power generation voltage level and/or the incorrect electric power **355** at the auxiliary voltage level may be connected to the incorrect single VFD **340**(*a-n*).

(107) For example, the installer in the confusion of installing the electric driven hydraulic fracking system **500** may incorrect connect cable **540** *a* from feeder **530** *a* to VFD connection **550** *n*. In doing so, the installer connected the incorrect electric power **360** at the power generation voltage level of 13.8 kV and/or the incorrect electric power **355** at the auxiliary voltage level of 480V to the incorrect single VFD **340** *n* via VFD connection **550** *n*. Rather than relying on manual policy and procedure for the installers to verify whether each cable **540**(*a-n*) correctly connects each VFD connection **550**(*a-n*) to each corresponding feeder **530**(*a-n*), the power distribution trailer controller **430** may poll each feeder **530**(*a-n*) and to thereby determine whether each feeder **530**(*a-n*) is connected to the appropriate VFD connection **550**(*a-n*) via the appropriate cable **540**(*a-n*) via the communication link **365** included in each cable **540**(*a-n*). In doing so, the power distribution trailer controller **430** may verify whether each feeder **530**(*a-n*) is connected to the appropriate VFD connection **550**(*a-n*) based on the polling via the communication link **365** included in each cable **540**(*a-n*). The power distribution trailer controller **430** may then confirm that each feeder **530**(*a-n*) is connected to each appropriate VFD connection **550**(*a-n*) when each communication link **365** confirms based on the polling of the power distribution trailer controller **430**. The power distribution trailer controller may then generate an alert and identify each feeder **530**(*a-n*) that is connected to the incorrect VFD connection **550**(*a-n*) when the communication link **365** identifies the incorrect connection based on the polling of the power distribution trailer controller **430**.

(108) As noted above, medium voltage cables may propagate the AC voltage signal **360** at the voltage level of 13.8 kV from the power distribution trailer **320** to each of the VFDs **340**(*a-n*). Low voltage cables may propagate the auxiliary voltage signal **355** at the auxiliary voltage level of 480V from the power distribution trailer **320** to each of the VFDs **340**(*a-n*). Communication cables may propagate communication signals **365** from the power distribution trailer **320** to each of the VFDs **340**(*a-n*). FIG. **6** illustrates a top-elevational view of connector configuration for each of the VFDs **340**(*a-n*) that may couple to a medium voltage cable, a low voltage cable, and a communication cable.

(109) The connector configuration **600** includes medium voltage connectors **610**(*a-b*) with each including a medium voltage plug and receptacle to eliminate the need of skilled personnel to connect the medium voltage cables to the VFDs **340**(*a-n*) using hand tools and being thereby exposed to the conductors. Rather than using manual terminations with delicate termination kits,

the medium voltage connections **610**(*a-b*) with plugs enable medium voltage cables to be easily connected to the VFDs **340**(*a-n*) to propagate the AC voltage signal **360** at the power generation voltage level without any risk of shorts and/or nicks in the cable. The medium voltage connections **610**(*a-b*) include lockable provisions that prevent unauthorized connection or disconnection of the medium voltage cables to the medium voltage connections **610**(*a-b*) and provide lock out tag out features for safe working on system components. The low voltage connections **620**(*a-b*) provide connections to the low voltage cables that propagate the auxiliary voltage signal **355** at the auxiliary voltage level of 480V to the VFDs **340**(*a-n*). The communication connection **630** provides a connection to the communication cable to propagate communication signals **365** to the VFDs **340**(*a-n*).

CONCLUSION

(110) It is to be appreciated that the Detailed Description section, and not the Abstract section, is intended to be used to interpret the claims. The Abstract section may set forth one or more, but not all exemplary embodiments, of the present disclosure, and thus, is not intended to limit the present disclosure and the appended claims in any way.

(111) The present disclosure has been described above with the aid of functional building blocks illustrating the implementation of specified functions and relationships thereof. The boundaries of these functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternate boundaries may be defined so long as the specified functions and relationships thereof are appropriately performed.

(112) It will be apparent to those skilled in the relevant art(s) the various changes in form and detail can be made without departing from the spirt and scope of the present disclosure. Thus the present disclosure should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

Claims

1. A hydraulic fracking system, comprising: gas turbine generators configured to output electric power; a power distribution system configured to receive electric power from the gas turbine generators, and distribute the electric power; variable frequency drives (VFDs) each configured to receive electric power from the power distribution system, and use the electric power to respectively drive an electric motor mechanically coupled to a hydraulic pump to execute a hydraulic fracking operation; and a controller configured to, in response to detecting a failure of a gas turbine generator of the gas turbine generators, execute a load sharing operation to maintain the hydraulic fracking operation by determining an amount of electric power being output by remaining gas turbine generators of the gas turbine generators, determining an amount of electric power being consumed by the VFDs, and reducing the amount of electric power being consumed by the VFDs based on the determined amount of electric power being output by the remaining gas turbine generators.

2. The hydraulic fracking system of claim 1, wherein the controller is further configured to detect the failure based on a signal from the gas turbine generator.

3. The hydraulic fracking system of claim 1, wherein the load sharing operation comprises the remaining gas turbine generators of the gas turbine generators continuing to output electric power and the VFDs fading back.

4. The hydraulic fracking system of claim 1, wherein the load sharing operation comprises fading back the VFDs to avoid a brown out.

5. The hydraulic fracking system of claim 1, wherein the load sharing operation comprises fading back the VFDs to avoid a black out.

6. The hydraulic fracking system of claim 1, wherein the controller is further configured to execute the load sharing operation by fading back the VFDs to an extent based on a combined electric

power output of the remaining gas turbine generators.

7. The hydraulic fracking system of claim 1, wherein the gas turbine generators are configured to output the electric power at a first voltage level, and wherein the power distribution system comprises switchgears configured to respectively distribute electric power at the first voltage level to the VFDs, and a switchgear transformer configured to convert electric power at the first voltage level to electric power at a second voltage level, and distribute the electric power at the second voltage level to auxiliary systems configured to respectively cool the VFDs.

8. The hydraulic fracking system of claim 7, wherein the switchgears and the switchgear transformer are disposed on a trailer.

9. The hydraulic fracking system of claim 7, wherein the VFDs and the auxiliary systems are disposed on trailers such that each trailer supports one of the VFDs and one of the auxiliary systems.

10. The hydraulic fracturing system of claim 7, wherein the auxiliary systems comprise fans.

11. A hydraulic fracking system, comprising: gas turbine generators configured to output electric power; a power distribution system configured to receive electric power from the gas turbine generators, and distribute the electric power; variable frequency drives (VFDs) each configured to receive electric power from the power distribution system, and use the electric power to respectively drive an electric motor mechanically coupled to a hydraulic pump to execute a hydraulic fracking operation; and a controller configured to, in response to detecting a failure of a gas turbine generator of the gas turbine generators, execute a load sharing operation to maintain the hydraulic fracking operation by fading back the VFDs to an extent based on a combined electric power output of operational gas turbine generators of the gas turbine generators.

12. The hydraulic fracking system of claim 11, wherein the controller is further configured to detect the failure based on a signal from the gas turbine generator.

13. The hydraulic fracking system of claim 11, wherein the load sharing operation comprises the operational gas turbine generators continuing to output electric power and the VFDs fading back.

14. The hydraulic fracking system of claim 12, wherein the controller is further configured to execute the load sharing operation by determining an amount of electric power being output by the operational gas turbine generators, determining an amount of electric power being consumed by the VFDs, and reducing the amount of electric power being consumed by the VFDs based on the determined amount of electric power being output by the operational gas turbine generators.

15. The hydraulic fracking system of claim 11, wherein the load sharing operation comprises fading back the VFDs to avoid a brown out.

16. The hydraulic fracking system of claim 11, wherein the load sharing operation comprises fading back the VFDs to avoid a black out.

17. The hydraulic fracking system of claim 11, wherein the gas turbine generators are configured to output the electric power at a first voltage level, and wherein the power distribution system comprises switchgears configured to respectively distribute electric power at the first voltage level to the VFDs, and a switchgear transformer configured to convert electric power at the first voltage level to electric power at a second voltage level, and distribute the electric power at the second voltage level to auxiliary systems configured to respectively cool the VFDs.

18. The hydraulic fracking system of claim 17, wherein the switchgears and the switchgear transformer are disposed on a trailer.

19. The hydraulic fracking system of claim 17, wherein the VFDs and the auxiliary systems are disposed on trailers such that each trailer supports one of the VFDs and one of the auxiliary systems.

20. The hydraulic fracturing system of claim 17, wherein the auxiliary systems comprise fans.