

SMART-GRID COMBINATION POWER SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims the benefit of U.S. Provisional Application No. 61/281,775, filed Nov. 23, 2009.

TECHNICAL FIELD

[0002] The present disclosure generally relates to portable power generation systems that utilize, at least in part, sustainable power sources.

BACKGROUND

[0003] As background, large-scale single-source generation of power from sustainable (or “clean”) energy sources, whether by sun, wind, or hydro, has become increasingly common. However, such power generation is impossible in many areas of the world because of weather and/or terrain limitations. Effective solar power generation requires adequate sunlight; effective wind power generation requires adequate sustained wind speeds; and effective hydro power generation requires adequate flow rates. Additionally, production of power by such single-source systems typically requires large amounts of space. Solar farms and wind farms spread for miles upon miles; hydroelectric dams traverse entire rivers. Such large-scale infrastructure displaces people and wildlife and is exceptionally vulnerable to sabotage and terrorism. The construction of such facilities may also generate significant amounts of pollution and other adverse effects. Furthermore, because of their size and cost of construction, such power generation systems, once constructed, are effectively immobile. They may provide the power needs of an area for decades, but cannot be moved to quickly provide power for other areas. Size also limits the feasibility of generating power in heavily developed areas. This is especially apparent for current power generation methods as they relate to the needs of any shipping port. With shipping vessels idling to power needed onboard utilities while docked, power generation becomes increasingly unclean.

[0004] Often, however, areas need power generation capabilities quickly or for limited periods of time. For example, in many combat zones, a permanent power generation and distribution system is neither in place nor needed. Similarly, in areas of natural disaster, the permanent power generation and distribution system may have been in place, but disabled by the disaster. Additionally, many festivals, whether musical or otherwise, are held on farms and rural areas that do not have the permanent electrical infrastructure necessary to support the power needs of the festivals. Likewise, inefficient fuel oil or diesel engines powering idle ships at port causes untold damage to the environment of the surrounding wetlands and shoreline. The addition of a smart hybrid energy generation system will help offset the waste caused by conventional methods.

[0005] At present, the temporary power generation systems currently utilized in combat zones, disaster areas, and festivals essentially amount to assemblies of gas-fueled generators. Such generators generate significant amounts of noise and air pollution. Especially in combat zones and disaster areas, such pollution heightens the level of stress associated with already-stressful situations. With increasing pressure on coastal wetlands, pollution caused by ports will eventually

contribute to the loss of valuable resources in such ecosystems. Thus, there is a need for easily-installed, portable, clean power generation systems that can be employed in areas that need timely or temporary power generation, such as combat zones, disaster areas, ports, and festival locations.

SUMMARY

[0006] In one embodiment, a portable clean power generation and aggregation comprises: a plurality of power generation units operable to generate DC electrical power, further comprising a solar power generation unit, comprising a solar power generator, a solar power generator controller, and a current and voltage sensor; a wind power generation unit, comprising a wind power generator, a wind power generator controller, and a current and voltage sensor; a hydro power generation unit, comprising a hydro power generator, a hydro power generator controller, and a current and voltage sensor; a fuel-based gas power generation unit, comprising a fuel-based power generator, a fuel-based power generator controller, and a current and voltage sensor. The system further comprises a power storage device electrically coupled to the plurality of power generation units and capable of storing DC electrical power generated by the plurality of power generation units; an inverter unit, comprising an inverter and an inverter controller, wherein the inverter unit is electrically coupled to the power generation units and the power storage device and wherein the inverter converts DC electrical power into AC electrical power; and a main controller, wherein the main controller is electrically coupled to the plurality of power generation units, the inverter controller, and the power storage device, whereby the main controller can monitor DC electrical power generation by the power generation units, can monitor DC electrical power received by the inverter, can measure charge of the power storage device and direct DC electrical power from the power storage device to the inverter, and can send electronic signals to selectively activate one or more of the power generation units, and whereby DC electrical power generated by the plurality of power generation units is aggregated between the plurality of power generation units and the inverter unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The embodiments set forth in the drawings are illustrative and exemplary in nature and not intended to limit the inventions defined by the claims. The following detailed description of the illustrative embodiments can be understood when read in conjunction with the following drawings, where like structure is indicated with like reference characters and in which:

[0008] FIG. 1 depicts a portable clean power generation and aggregation system according to one or more embodiments shown and described herein; and

[0009] FIG. 2 depicts a main controller according to one or more embodiments shown and described herein.

DETAILED DESCRIPTION

[0010] The embodiments described herein generally relate to portable power generation systems that utilize, at least in part, sustainable power sources such as a solar power generation unit, a wind power generation unit, a hydro power generation unit, and a fuel-based power generation unit. Due to its portability, the system may be conveniently and quickly transported to areas which may suddenly need power (e.g.,