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Mobile platform for charging electric vehicles

Abstract

A mobile platform that is equipped to charge an electrical vehicle and supply liquid fuel to an internal combustion engine vehicle. The mobile platform includes a chassis configured to be pulled by a tow vehicle. A battery bank is positioned on the chassis. A renewable energy recharging device and a liquid fuel powered recharging device are each positioned on the chassis to recharge the battery bank. An electrical terminal is operatively connected to the battery bank to deliver electric power from the battery bank to an electric vehicle. A fuel tank is positioned on the chassis to store liquid fuel and a fuel line extends from the fuel tank to deliver the liquid fuel to an internal combustion engine vehicle.

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Background/Summary

RELATED APPLICATIONS (1) This application claims priority to U.S. Provisional Application No. 63/160,389 filed Mar. 12, 2021, and U.S. Provisional Application No. 63/194,317 filed May 28, 2021, the disclosures of which are incorporated herein by reference in their entireties.

BACKGROUND
(1) Electrical vehicles use one or more electric motors for propulsion instead of internal combustion engines. These vehicles are becoming more common due in part to advances in technology that have increased distances that a vehicle can travel on a charge.
(2) When using an electric vehicle, the vehicle operator is required to find a charging station to recharge the battery prior to the vehicle battery becoming completely drained of electrical power. Maintaining a charge on the battery is relatively easy when the operator is traveling in proximity of

their home. Many homes are equipped with charging stations that provide the necessary charging. Further, the operator is aware of fixed utility power-based charging stations within their geographic area that are available for use when needed.

(3) The use of electrical vehicles is more worrisome for travelers that are traveling greater distances away from their homes. For example, a traveler who is traveling a distance that is farther away than the range of the battery. This type of traveling requires that the operator find a charging station along their route. This is problematic causing the traveler to experience “range anxiety” because of the uncertainty of being able to find a charging station. The range anxiety is a result of relatively few charging stations that are currently available for travelers, the unknown aspect of whether a charging station will be available when needed (or if it is already being used by another traveler), and when a charge will be needed for the vehicle. This range anxiety has caused travelers to forgo long trips that require recharging of their vehicle. Range anxiety has also caused travelers to not purchase electric vehicles but rather stay with vehicles with internal combustion engines because of the ease in sourcing fuel while traveling a route.

(4) A main focus of electric vehicle owners is to reduce the environmental impact caused by using a vehicle. Electric vehicles provide a solution for addressing climate change, as well as various other environmental issues that are caused by the use of internal combustion engines (e.g., fuel spills, destructive mining techniques). The use of electric charging stations to recharge the vehicles further forwards this cause of the vehicle owner as the environmental impact is greatly reduced. Further, producing the electric power at the location where the vehicle is being charged eliminates the large electric power grid losses. Recharging methods should focus on renewable energy solutions that include efficiently produced local power at the point of demand not reliant on massive electric transmission infrastructure costs to deploy charging systems. These systems may also provide environmentally sound medium term traditional grid reinforcement after natural disaster events that limit power grid stability and functionality.

SUMMARY

(5) One aspect is directed to a mobile platform comprising a chassis configured to be pulled by a tow vehicle. A battery bank is positioned on the chassis. A renewable energy recharging device is positioned on the chassis to recharge the battery bank. A liquid fuel powered recharging device is positioned on the chassis to recharge the battery bank. An electrical terminal is operatively connected to the battery bank to deliver electric power from the battery bank to an electric vehicle. A fuel tank is positioned on the chassis to store liquid fuel. A fuel line extends from the fuel tank to deliver the liquid fuel.

(6) In another aspect, the chassis comprises a frame with a hitch for engagement with the tow vehicle and wheels mounted to the frame.

(7) In another aspect, the renewable energy recharging device comprises a solar panel that is mounted on a top of the fuel tank.

(8) In another aspect, the fuel tank is physically larger than the battery bank.

(9) In another aspect, the liquid fuel-powered recharging device comprises a fuel-powered generator.

(10) In another aspect, the liquid fuel-powered recharging device comprises an electric generator comprising: a combustion engine; an exhaust port for gases produced by the combustion engine; and an exhaust hose comprising an elongated shape with first and second ends with the first end mounted to the exhaust port and with the exhaust hose extending through a floor in the chassis and with the second end positioned at the bottom side of the chassis.

(11) In another aspect, the combustion engine of the electric generator operates on the liquid fuel that is stored in the fuel tank.

(12) In another aspect, a muffler is mounted to the exhaust hose to suppress sound from the electric generator and with the muffler mounted to a bottom side of the chassis.

(13) In another aspect, a sound chamber is mounted to the chassis and the second end of the

exhaust hose terminates within the sound chamber.
(14) In another aspect, a cabinet is positioned on the chassis and comprises an enclosed interior space with the liquid fuel-powered recharging device positioned within the interior space of the cabinet.
(15) In another aspect, the renewable energy recharging device is a first renewable energy recharging device and further comprising a second renewable energy recharging device positioned on the chassis to recharge the battery bank.
(16) One aspect is directed to a mobile platform comprising a wheeled chassis and a battery bank mounted on the chassis. A charge terminal is electrically connected to the battery bank and comprises a plug to charge electric vehicles. A generator is mounted on the chassis with the generator comprising an internal-combustion engine and configured to recharge the battery bank. A renewable energy charging device is mounted on the chassis to recharge the battery bank. A fuel tank is mounted on the chassis to store liquid fuel with the fuel tank comprising one or more fuel lines to dispense the liquid fuel to internal combustion vehicles.
(17) In another aspect, a cabinet is mounted on the chassis and positioned between a front hitch of the chassis and the fuel tank.
(18) In another aspect, a fuel line extends from the fuel tank to the fuel-power generator with the fuel line configured to supply the liquid fuel from the fuel tank to the fuel-powered generator.
(19) In another aspect, the fuel tank is physically larger than the battery bank.
(20) One aspect is directed to a method of charging vehicles with a mobile platform. The method comprises: towing the mobile platform from a first geographic location to a second geographic location; extending an electrical terminal from the mobile platform to an electric vehicle; supplying electrical energy from a battery bank on the mobile platform through the electrical terminal and to the electric vehicle; extending a fuel line from the mobile platform to an internal combustion engine vehicle; supplying liquid fuel from a fuel tank on the mobile platform through the fuel line and to the internal combustion engine vehicle; producing electrical energy through a renewable energy recharging device positioned on the chassis and recharging the battery bank; and powering a liquid fuel powered recharging device positioned on the chassis and producing electrical energy and recharging the battery bank.
(21) In another aspect, the method further comprises supplying fuel from the fuel tank to the liquid fuel powered recharging device when a fuel level on the fuel powered recharging device falls below a predetermined level.
(22) In another aspect, the method further comprises simultaneously supplying the electrical energy from the battery bank to the electric vehicle and supplying the liquid fuel from the fuel tank to the internal combustion engine vehicle.
(23) In another aspect, the method further comprises simultaneously recharging the battery bank with the renewable energy recharging device and the liquid fuel powered recharging device.
(24) In another aspect, producing the electrical energy through the renewable energy recharging device comprises producing the electrical energy through solar panels mounted on the chassis.
(25) One example is directed to a mobile platform comprising a battery bank, one or more renewable energy recharging devices to recharge the battery bank, one or more fuel-powered recharging devices to recharge the battery bank, and a fuel tank to supply liquid fuel to the one or more fuel-powered recharging devices. A wheeled chassis supports the battery bank, the one or more renewable energy recharging devices, the one or more fuel-powered recharging devices, and the fuel tank. One or more electrical terminals are configured to deliver an electric charge from the battery bank to an electric vehicle.
(26) In another example, one or more fuel output lines are configured to dispense fuel from the fuel tank to a fuel-powered vehicle.
(27) In another example, the renewable energy recharging devices comprise solar panels and wind turbines.

(28) In another example, the fuel tank is physically larger than the battery bank.
(29) In another example, a fuel line extends from the fuel tank and comprises one or more filters for removing impurities from the fuel.
(30) One example is directed to a mobile platform comprising a wheeled chassis. A battery bank is mounted on the chassis. One or more charge terminals are electrically connected to the battery bank and configured with a plug to mount to an electric vehicle to charge the electric vehicle. A fuel tank is mounted on the chassis. Renewable energy and fuel-powered recharging devices are mounted on the chassis to recharge the battery bank.
(31) In another example, one or more fuel hoses extend from the fuel tank to deliver fuel from the fuel tank to a fuel-powered vehicle.
(32) One example is directed to a mobile platform comprising a wheeled chassis comprising a top side and a bottom side, a fuel tank mounted on the top side of the chassis, an electric generator mounted on the top side of the chassis with the electric generator comprising a combustion engine and an exhaust port for gases produced by the combustion engine, and an exhaust hose comprising an elongated shape with first and second ends with the first end mounted to the exhaust port of the electric generator and with the exhaust hose extending through a floor in the chassis and with the second end positioned at the bottom side of the chassis.
(33) In another example, the combustion engine of the electric generator operates on the fuel that is stored in the fuel tank.
(34) In another example, a cabinet is mounted to the top side of the chassis with the cabinet comprising an enclosed interior space and with the electric generator positioned in the interior space.
(35) In another example, the cabinet comprises a floor and the exhaust hose extends through the floor.
(36) In another example, the exhaust hose comprises a double layer construction with an inner hose and an outer hose.
(37) In another example, the exhaust hose is mounted to a muffler with the muffler mounted to the bottom side of the chassis.
(38) In another example, a sound chamber is mounted to the chassis and with the second end of the exhaust hose terminating within the sound chamber.
(39) One example is directed to a mobile platform comprising a wheeled chassis comprising a top side and a bottom side, a fuel tank mounted on the top side of the chassis, a cabinet mounted to the top side of the chassis with the cabinet comprising outer walls and a floor that form an interior space, an electric generator positioned in the interior space of the cabinet with the electric generator comprising a combustion engine, and an exhaust hose mounted to the electric generator and extending through the cabinet to exhaust gases produced by the combustion engine out of the interior space of the cabinet.
(40) In another example, the exhaust hose comprises an elongated shape with first and second ends with the first end mounted to an exhaust port on the electric generator and with the exhaust hose extending through an opening in the cabinet and with the second end positioned outward away from the interior space of the cabinet.
(41) In another example, the opening is in the floor of the cabinet.
(42) In another example, the cabinet comprises one or more doors that are selectively positionable between open and closed positions.
(43) In another example, the combustion engine of the electric generator operates on the fuel that is stored in the fuel tank.
(44) In another example, the exhaust hose comprises a double layer construction with an inner hose and an outer hose.
(45) In another example, a muffler is mounted to the exhaust hose with the muffler mounted to the chassis away from the cabinet.

(46) In another example, a sound chamber is mounted to the chassis and with the second end of the exhaust hose terminating within the sound chamber.
(47) In another example, the sound chamber comprises side walls that extend downward from the chassis and formed an interior space.
(48) In another example, the interior space comprises an open side opposite from the chassis.
(49) In another example, the side walls of the chamber are constructed from layers of different materials that each have a different sound absorption ability.
(50) One example is directed to a mobile platform comprising a wheeled chassis comprising a top side and a bottom side, a cabinet mounted to the top side of the chassis with the cabinet comprising outer walls and a floor that form an interior space, an electric generator positioned in the interior space of the cabinet with the electric generator comprising a combustion engine, and an exhaust hose mounted to the electric generator and extending through the cabinet to exhaust gases produced by the combustion engine out of the interior space of the cabinet.
(51) In another example, a sound chamber is mounted to the chassis and with the exhaust house terminating within the sound chamber.
(52) In another example, the sound chamber is spaced away from the cabinet.
(53) In another example, the sound chamber is mounted to the bottom side of the chassis.
(54) In another example, the sound chamber comprises side walls that extend downward from the chassis and form an interior space.
(55) In another example, the interior space comprises an open side opposite from the chassis.
(56) In another example, the side walls of the chamber are constructed from layers of different materials that each have a different sound absorption ability.
(57) In another example, a muffler is mounted to the exhaust hose with the muffler mounted to the chassis away from the cabinet.
(58) In another example, the muffler is positioned along the exhaust hose between the cabinet and the sound chamber.
(59) In another example, a fuel tank is mounted on the top side of the chassis.
(60) The features, functions and advantages that have been discussed can be achieved independently in various aspects or may be combined in yet other aspects, further details of which can be seen with reference to the following description and the drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a schematic diagram of a mobile platform.
(2) FIG. **2** is a schematic diagram of a mobile platform.
(3) FIG. **3** is a schematic diagram of a fuel system of a mobile platform.
(4) FIG. **4** is a side schematic view of a mobile platform.
(5) FIG. **4**A is a top schematic view of the mobile platform of FIG. **4**.
(6) FIG. **5** is a schematic diagram of a mobile platform operatively connected to a second mobile platform.
(7) FIG. **6** is a schematic diagram of a second mobile platform operatively connected to a mobile platform.
(8) FIG. **7** is a side schematic view of a mobile platform operatively connected to a second mobile platform.
(9) FIG. **8** is a top schematic view of FIG. **7** of the mobile platform operatively connected to a second mobile platform.
(10) FIG. **9** is a schematic diagram of a control unit.
(11) FIG. **10** is a schematic diagram of a communications network.

(12) FIG. **11** is a flowchart diagram of a method of handling a charge request at a mobile platform.
(13) FIG. **12** is a schematic diagram of a server.
(14) FIG. **13** is a flowchart diagram of a method of handling a charge request at a server.
(15) FIG. **14** is a schematic diagram of mobile platforms that form a network that can accommodate a traveler.
(16) FIG. **15** is a schematic diagram of a fuel system of a mobile platform.
(17) FIG. **16** is a perspective view of a generator positioned in a cabinet that is on a top side of a chassis.
(18) FIG. **17** is a perspective view of a generator positioned in a cabinet and with an exhaust hose extending from the generator and through a floor of the cabinet.
(19) FIG. **18** is a schematic section view cut along line X-X of FIG. **17** illustrates the exhaust hose with inner and outer members.
(20) FIG. **19** is a perspective view of a muffler positioned at a bottom side of the chassis and mounted with arms and with an exhaust hose extending through the chassis and into the muffler.
(21) FIG. **20** is a perspective view of an exhaust house mounted to an inlet of a muffler and with an inner member of the exhaust hose exposed.
(22) FIG. **21** illustrates a perspective view of an outlet of the exhaust hose formed by a pipe positioned below a chassis.
(23) FIG. **22** is a perspective view of a sound chamber formed by sidewalls and positioned below a chassis.
(24) FIG. **23** is a perspective view of a bracket and mount that connect an arm that supports a muffler to a chassis.
(25) FIG. **24** is a perspective view of a sound chamber positioned below a chassis.
(26) FIG. **25** is a schematic bottom view of a sound chamber formed by sidewalls that extend around an interior space.
(27) FIG. **26** is a schematic partial section view of a sidewall of a sound chamber that is formed by multiple layers of different materials.
(28) FIG. **27** is a perspective view of an interior space of a chamber that is formed by sidewalls.
(29) FIG. **28** is a perspective view of an interior space of a chamber that is formed by sidewalls.

DETAILED DESCRIPTION

(30) The present application is directed to systems and methods of economically delivering electric vehicle charging functionality from a mobile platform. The mobile platform provides for moving and positioning at various desired geographical positions, such as positions at locations that can alleviate “range anxiety” for electric vehicle users. The mobile platform includes a battery bank for storing electrical energy. Charging terminals are electrically connected to the battery bank and provide for charging vehicles. The mobile platform also includes one or more charging devices to maintain a charge on the battery system. The charging devices are powered by renewable energy forms, such as solar and wind. When the renewable energy sources are not able to provide the adequate amount of charging, a low or near-zero emission back-up fuel powered generator provides the necessary charge on the battery. This redundant system reduces and/or eliminates the need for fixed infrastructure or utility based power for long term, high volume, high speed recharging.

(31) FIG. **1** illustrates a schematic representation of a mobile platform **100**. The mobile platform **100** includes a battery bank **5** that stores electric energy. One or more charging terminals **12** are operatively connected to the battery bank **5** and are configured to plug into the electrical vehicles during charging. One or more renewable energy devices **10** provides power for charging the battery bank **5**. The renewable energy devices **10** are powered by renewable energy sources that are net neutral or positive in terms of pollution and environmental impact. Examples include solar and wind power devices.

(32) A fuel-power back-up generator **4** (hereinafter generator **4**) also provides power for charging the battery bank **5**. The generator **4** is used at times when the renewable energy devices **10** are not

able to meet the charging demand on the battery bank **5**. One or more fuel tanks **30** provide easy to access liquid fuel such as diesel and gasoline to run the generator **4**.

(33) The mobile platform **10** is mounted on a chassis **40** that supports each of the battery bank **5**, renewable energy devices **10**, generator **4**, and fuel tank **30**. The chassis **40** is configured to be pulled by a vehicle and includes wheels **41** or other like members (e.g., skids, tracks) that provide for the mobility.

(34) FIG. **2** schematically illustrates a mobile platform **100** for charging vehicles **200**. The battery bank **5** is configured to provide electrical charging capability to supply electrical power to one or more vehicles **200**. Multiple charge terminals provide for simultaneously charging multiple vehicles **200**. The battery bank **5** can include a single battery or can include two or more separate batteries that are electrically connected together. In one example, the battery bank **5** includes multiple lithium-ion batteries that are electrically connected together. In another example, the batteries are lithium iron phosphate (LiFePO.sub.4) batteries. These batteries include LiFePO.sub.4 as the cathode material, and a graphititic carbon electrode with metallic backing as the anode. In one example, the battery bank **5** can include various other types of batteries suitable for multiple charge/discharge cycles.

(35) One or more renewable energy devices **10** charge the battery bank **5**. The renewable energy devices **10** can include one or more photovoltaic solar panels **10**, wind turbines **10**, or other methods of collecting energy. In one example, the solar panels **10** are mounted to the top of the mobile platform **100** to be exposed to the sun. The solar panels **10** can be attached to an adjustable frame **11** that is powered by a motor to adjust the angular position to increase the amount of sun exposure. The solar panels **10** can be folded into a protected orientation when not in use, such as when the mobile platform **100** is being transported between geographic locations.

(36) In one example, one or more sides of the solar panels **10** are affixed in an array and mounted on the fuel tank **30**. The solar panels **10** are attached at hinges that allow for folding and/or manual adjustment to position the panels **10** towards the sun. In one example, sides of one or more of the solar panels **10** are affixed to the top of the fuel tank **30** and also mechanically hinged together to provide for adjusting the positioning. In one example, the solar panels **10** are electrically, hydraulically, and/or mechanically powered to be adjusted to point more directly at the sun to gather more power or close. In one example, the solar panels **10** are adjusted electromechanically and or hydraulically using sensors to automatically point the panels **10** more directly at the sun to gather more power or close. In one example, the positioning of the solar panels **10** are controlled by a control unit **60**. The control unit **60** can be connected to a network (e.g., Internet) to gain information used to determine the alignment and/or positioning (e.g., deployed, stored) of the solar panels **10**. Information includes but is not limited to weather (e.g., hail, freezing rain, snow, high winds, tornedo).

(37) In one example, electric resistance heating elements are attached on the back of a teflon or hydrophobic coated aluminum sheet attached to the back-side of the solar panels **10**. When freezing rain or snow piles up after bad weather (on the closed array stack), the control unit **60** activates the heating elements to melt the snow or ice layer on the aluminum sheet and an electromechanical drive opens the solar panels **10**. The ice or snow self-sheds off the solar panels **10** as the array re-deploys (from gravity and the thin layer of melted water between the aluminum and the snow and ice). This requires much less electric current than melting the entire ice/snow pack and the molecularly tied mass's self-shedding reduces the power required to redeploy (the array). With a small amount of power input the solar panels **10** are ice/snow free and the array is back to making power.

(38) The wind turbines **10** can be mounted directly to one or more of the chassis **40**, fuel tank **30**, and cabinet **43**. In another example, the wind turbines **10** are mounted on a retractable pole **45**. During times when the wind turbine **10** is not producing electricity, the pole **45** is retracted inward against the chassis **40**. For example, the pole **45** is retracted inward when the mobile platform **100**

is being moved between locations. The pole **45** is extended to place the wind turbine **10** in an elevated position when producing electricity.

(39) A charge controller **7** is positioned between the renewable energy devices **10** and the battery bank **5**. In one example, the charge controller **7** takes the energy from the renewable energy devices **10** and converts the energy to be suitable for charging the battery bank **5**. The charge controller **7** can also limit supplying overcurrent and overcharging the battery bank **5**.

(40) The generator **4** is powered by liquid fuel to provide electrical power for charging the battery bank **5**. In one example, the generator **4** is powered by a linear, turbine, rotary, or Otto cycle engine and the liquid fuel transforms heat energy into mechanical energy to the generator **4** to provide electrical power for charging the battery bank **5**. The generator **4** can be powered by various liquid fuels, such as gasoline, alcohol, and diesel. In one example, the generator **4** is configured to output electrical energy that is output to one or both of the battery bank **5** and a power harvester **9**. In another example, the generator **4** powers a battery charger **8** that charges the battery bank **5**.

(41) The power harvester **9** controls the charge supplied to the one or more charging terminals **12**. The power harvester **9** receives the charge from the battery bank **5** and supplies the charge to the one or more charge terminals **12**. The power harvester **9** can also receive power from the generator **4** or other sources. The power harvester **9** can invert the charge for either AC or DC charging capabilities.

(42) The charge terminals **12** extend from the power harvester **9** and are configured to plug into the electric vehicles **200**. The charge terminals **12** can include cables of various lengths to reach the electric vehicles **200** that are in proximity to the mobile platform **100**. Plugs are mounted at the ends of the cables for engaging the corresponding receptacles in the electric vehicles **200**.

(43) The mobile platform **100** is configured to accommodate different charging levels. Examples includes 4.6 kW, 7.2 kW, and 9.6 kW charging. The mobile platform **100** is further configured to provide for AC or DC charging with necessary voltages as required.

(44) The fuel tank **30** provides fuel to power the generator **4**. The fuel tank **30** can be configured to hold various types of fuel, such as but not limited to diesel, alcohol, and gasoline fuels. The size of the fuel tank **30** can vary. In one example, the fuel tank **30** is sized to hold about 900 gallons of fuel. In another example, the fuel tank **30** is sized to hold about 500 gallons of fuel. The fuel tank **30** can include a single receptacle for holding the fuel, or two or more separate receptacles each configured to hold fuel. In one example, additional smaller tanks hold other fluids as needed, such as lubricating oil, grease, coolants, detergents, fuel additives, and diesel exhaust fluid (DEF). In one example, the fuel tank **30** is larger than the battery bank **5** and takes up a greater space on the chassis **40**.

(45) In addition to providing fuel to the generator **4**, one or more fuel outlets **31** extend from the fuel tank **30** for dispensing fuel to vehicles **200** with internal combustion engines. The vehicles **200** can include both hybrid and traditional vehicles with internal combustion engines. In one example, the other fluids can also be dispensed to the vehicles **200**. The outlets **31** include a hose and a nozzle **32** at a distal end for controlling the flow of fuel and other vehicle fluids needed for their operation.

(46) In one example, the fuel tank **30** is part of a fuel system that includes one or more pumps **3**, and one or more filters **1**, **2**. Fuel is moved from the fuel tank **30** by the pump **3** and through the filters **1**, **2**. The fuel can then be dispensed through one or more of the outlets **31**. Alternatively or additionally, the fuel can be returned to the fuel tank **30** for later use.

(47) FIG. **3** schematically illustrates a system for moving fuel within the mobile platform **100**. The fuel is stored in the tank **30** and moved with a pump **3** into a fuel line **33** and through one or more filters **1**, **2**. The fuel can move into the outlet **31** and be dispensed through the nozzle **32**. Alternatively or additionally, a portion or all the fuel can be moved through a return line **34** back into the fuel tank **30**. The process of moving the fuel along the fuel line **33** and filters **1**, **2** maintains the fuel in ready condition for use with the generator **4** and/or dispensing through the nozzle **32** to a

vehicle **200**. This process also maintains the condition of the fuel and remove impurities in the fuel that are known to harm engines.

(48) Various types of filters **1**, **2** can be used along the fuel line **33**. The filters **1**, **2** can be configured to remove various particulates in the fuel, including but not limited to scale, mud, debris, bacteria and mold. In one example, one or both filters **1**, **2** are configured to remove particulates greater than 2 microns from the fuel. In one example, an upstream filter is configured to remove larger particulates and the downstream filter is configured to remove smaller particulates. One or both filters **1**, **2** can be configured to separate water from the fuel, such as a coalescing filter that removes the water from the fuel, and a water absorbing filter that absorbs the water in the fuel.

(49) In one example, the mobile platform **100** is configured to dispense fuel at a flow rate of between 20-40 gallons/minute. In one example, the fuel system includes one or more pumps **3** that provide a pressure of about 25-30 psi.

(50) In one example as illustrated in FIG. **15**, the fuel system includes two filtrations that each can be accomplished by one or more filters **1**, **2**. In one example, the first filtration is a large particulate filter **1** with a minimum beta rating of 50. The one or more filters **1** in the first filtration are composed of pleated, dual composition fiberglass and/or celluloid material to provide primary extraction of particulates from two microns and upward. The second downstream filtration is split into two independent composite filters **2***a*, **2***b* that include a secondary particulate filtration down to 0.5 microns in size with a beta rating of 6. The second filtration also provides for water extraction filtration using a super absorbent polymer that provides a total water in the fuel to be below 10 parts per million (ppm). In one example, the two filters **2***a*, **2***b* provide for both particulate and water filtration. In another example, a first set of filters **1** provides for particulate removal and a second set of filters **2** provides for water removal.

(51) In one example, splitting of the fuel flow to two independent filters **2***a*, **2***b* lessens pressure in the system. This lesser pressure provides for the filters **2***a*, **2***b* to become more efficient. The redundant filters also provide for dispensing fuel if one of the two filters **2***a*, **2***b* reaches its saturation point and blocks fuel movement along its branch of the fuel line.

(52) The fuel system can also include a fuel contaminant detection analyzer **39**. The analyzer **39** samples the fuel flow to give real-time readings of particulates and/or water in the fuel to a control unit **60**. This can also provide for historic documentation to verify the cleanliness of the fuel that is dispensed as it relates to both particulate and water content. This validates and documents the fuel quality having met the power plant manufacturer's specifications during operation. In the ignition process of internal combustion engines, fuel contamination is a known impediment to clean efficient operation. Clean fuel promotes thermal efficiency, more power, and lower emissions in all currently used internal combustion engines. Flame cleanliness effects flame kernel initiation and development that are essential to a successful combustion process. Particularly under lean burn/EGR diluted conditions.

(53) The mobile platform **100** is configured to be moved by a tow vehicle. The chassis **40** includes a hitch device **42** to be connected to a vehicle that can pull the mobile platform **100** to the desired geographic location. The size of the mobile platform **100** provides for moving along various roads. In one example, the mobile platform **100** includes a total weight of less than 10,000 lbs. when the fuel tank **30** is full of fuel. This provides for the mobile platform **100** to be towed by a wider range of vehicles. This can also provide for the mobile platform **100** to be towed by a driver that does not have a Commercial Drivers License (CDL).

(54) As illustrated in FIGS. **4** and **4**A, the mobile platform **100** includes a sleek design. A mechanical cabinet **43** is mounted on the chassis **40** and includes an interior space **46** that houses various components. The cabinet **43** can include one or more doors to allow access to the interior space **46** to access the components for use and servicing as needed. The front of the chassis **40** includes the hitch device **42** for mounting to a tow vehicle.

(55) The mobile platform **100** is configured for charging one or more electric vehicles **200**. The mobile platform **100** can include one or more charging terminals **12** to charge a single vehicle **200**, or simultaneously charge multiple vehicles **200**. Further, the mobile platform **100** can include one or more fuel outlets **31** for providing fuel to vehicles **200**.

(56) The mobile platform **100** is configured to operate using the power stored in the battery bank **5**, and the recharging abilities of the renewable energy devices **10** and the generator **4**. The mobile platform **100** can also be paired with a with a second mobile platform **13** for additional charging capacity.

(57) FIG. **5** illustrates the mobile platform **100** connected to a second mobile platform **13**. The second mobile platform **13** includes additional electric capacity that can be transferred to the mobile platform **100** and/or dispensed directly to electric vehicles **200** to increase charging capacity. The second mobile platform **13** does not include fuel, but rather obtains fuel from the mobile platform **100**. The second mobile platform **13** is also configured to be moved by a vehicle both in tandem with the first platform **100** and as a single stand-alone unit to different geographic locations as necessary and as required by law (e.g., some jurisdictions do not allow for tandem trailers and therefore this configuration would not be feasible at these locations).

(58) FIG. **6** schematically illustrates the second mobile platform **13** connected to the mobile platform **100**. The second mobile platform **13** includes a battery bank **5′**. In one example, the battery bank **5′** has a greater capacity than the battery bank **5** in the mobile platform **100**. This is possible because the battery bank **5′** occupies the additional space on the chassis **40′** that is not otherwise taken by a fuel tank **30**. The battery bank **5′** is charged by one or more renewable energy devices **10′**, such as solar panels, wind turbines, or other energy sources. The number of renewable energy devices **10′** can vary. A charge controller **7′** is positioned between the renewable energy devices **10′** and the battery bank **5′** and functions in a similar manner as the charge controller **7** on the mobile platform **100**. One or more generators **4′** also provide for powering a battery charger **8′** for charging the battery bank **5′** and/or providing power directly to the power harvester **9′**. The generator **4′** obtains fuel from the mobile platform **100** to operate.

(59) The second mobile platform **13** includes one or more charging terminals **12′** for charging electric vehicles **200**. Additionally or alternatively, the second mobile platform **13** transfers electrical power to the battery bank **5** and/or power harvester **9** in the mobile platform **100**.

(60) As with the mobile platform **100**, the second mobile platform **13** recharges the battery bank **5′** using the one or more renewable energy devices **10′**. If the renewable energy devices **10′** are not able to meet the charging demands, the one or more generators **4′** are powered to provide the additional needed energy.

(61) In one example, the components of the second mobile platform **13** are basically the same as the mobile platform **100**. The exception is the second mobile platform **13** does not include a fuel tank **30**. In one example, the chassis **40**, **40′** of the two devices **100**, **13** is the same. This provides for manufacturing a single chassis design that can be used in multiple different contexts. Further, one or more of the components for charging are the same on the two platforms **100**, **13** and can be positioned and attached to the chassis **40**, **40′** in the same manner.

(62) FIGS. **7** and **8** illustrate schematically the mobile platform **100** connected to the second mobile platform **13**. The mobile platform **100** includes a fuel line **44** that extends outward and provides fuel to the second mobile platform **13**. This fuel line **44** is operatively connected to the generator **4′**. The mobile platform **100** also includes electrical wiring **49** that connects to the second mobile platform **13** to receive electrical power that can be dispensed from the mobile platform **100**.

(63) The second mobile platform **13** is configured to be connected to the rear of the mobile platform **100** and/or connected to a tow vehicle. The second mobile platform **13** includes a hitch **42′** that can connect to a hitch **48** on the rear of the mobile platform **100** or a tow vehicle. The second mobile platform **13** includes a chassis **40′** that supports the various components. The chassis **40′** includes wheels **41′** or other like devices for moving the second mobile platform **13**. In one

example, a mechanical cabinet **43′** in the front of the second mobile platform **13** houses some of the components. The battery bank **5′** is the largest component and takes up a majority of the space on the chassis **40′**. The battery bank **5′** can be housed in a separate cabinet **141** and include racking trays **142** that hold the battery piles that form the battery bank **5′**.

(64) The mobile platform **100** includes a control unit **60** as illustrated in FIG. **9**. The control unit **60** controls the operation of the mobile platform **100** and the connected second mobile platform **13**. The control unit **60** includes a control circuit **61** and a memory circuit **62**. The control circuit **61** controls overall operation of the mobile platform **100** and/or second mobile platform **13** according to program instructions stored in the memory circuit **62**. The control circuit **61** can include one or more circuits, microcontrollers, microprocessors, hardware, or a combination thereof. Memory circuit **62** includes a non-transitory computer readable storage medium storing program instructions, such as a computer program product, that configures the control circuit **61** to implement one or more of the techniques discussed herein. Memory circuit **62** can include various memory devices such as, for example, read-only memory, and flash memory. Memory circuit **62** can be a separate component as illustrated in FIG. **9** or can be incorporated with the control circuit **61**. Alternatively, the control circuit **61** can omit the memory circuit **62**, e.g., according to at least some embodiments in which the control circuit **61** is dedicated and non-programmable.

(65) The control unit **60** is configured to provide for communication functionality for travelers in need of charging their electric vehicles **200**. Communications can include both incoming and outgoing communications. A communications circuit **63** provides for this communication functionality and enables communication over a communication network. The communications circuit **63** can include one or more interfaces that provide for different methods of communication. The communications circuit **63** can include a cellular interface that enables communication with a mobile communication network (e.g., a WCDMA, LTE, WiMAX, or other radio communications network). The communication circuit **63** can include a WLAN interface configured to communicate with a local area network, e.g., via a wireless access point. An exemplary WLAN interface could operate according to the 802.11 family of standards, which is commonly known as a WiFi interface. The communication circuit **63** can further include a personal area network interface, such as a Bluetooth interface. The communication circuit **63** can also include a Near Field Communication interface that provides for short-range wireless connectivity technology that uses magnetic field induction to permit devices to share information with each other over short distances.

(66) In one example as illustrated in FIG. **9**, the communications circuit **63** is incorporated into the control unit **60**. In another example, the communications circuit **63** is a separate system that is operatively connected to and controlled by the control unit **60**.

(67) A user interface **64** provides for an operator to control one or more aspects of the mobile platforms **100**, **13**. The operator can include the traveler that is given instructions on how to use the mobile platform **100**, **13** and/or a trained technician that operates the equipment. The user interface **64** can include one or more input devices **65** such as but not limited to a keypad, touchpad, roller ball, and joystick. The one or more input devices **65** provide for the traveler to enter commands to the control circuit **61**. The user interface **64** can also include one or more displays **66** for displaying information to the traveler. The user interface **64** can also include a communication device that provides for communicating with the remote entities.

(68) One or more sensors **67** detect different aspects of one or both platforms **100**, **13**. The data from the one or more sensors **67** can be stored in the memory circuit **62**. One or more sensors **67** various aspects of the components of the mobile platforms **100**, **13** including but not limited to the charge remaining on the battery banks **5**, **5′**, production capacity of the renewable energy charging devices **10**, **10′** and amount of fuel remaining in the fuel tank **30**. One or more sensors **67** can also determine aspects about the mobile platforms **100**, **13** and its environment, such as the directional orientation, temperature, light sensor to detect an amount of sunlight, wind speed indicator, and

geographic location (e.g., GPS sensor). A power source **69** provides power to the mobile platforms **100**, **13**. In another example, power is obtained from the battery banks **5**, **5′**.
(69) In one example, each of the mobile platform **100** and second mobile platform **13** include their own control units **60** that control their operation. In another example, the mobile platform **100** includes a control unit **60** and the second mobile platform **13** includes no or limited processing capability with no or limited functionality. The limited processing capability of the platform **13** can include a basic control circuit, memory circuit, and communication circuit to send and receive messages with the mobile platform **100** and/or a remote server **80**.
(70) The mobile platform **100** is configured to communicate with travelers, remote server **80**, and various other nodes over a wireless communication network **70** as illustrated in FIG. **10**. The wireless communication network **70** includes a packet data network (PDN) **71**. The PDN **71** can include a public network such as the Internet, or a private network. The wireless communications network **70** can include a mobile communication network **72** (e.g., a WCDMA, LTE, or WiMAX network). The mobile communication network (MCN) **72** includes a core network **73** and a radio access network (RAN) **74** including one or more base stations. The MCN **72** can be a conventional cellular network operating according to any communication standards now known or later developed. For example, the MCN **72** can comprise a Wideband Code Division Multiple Access (WCDMA) network, a Long Term Evolution (LTE) network, or WiMAX network. The MCN **72** is further configured to access the packet data network (PDN) **71**.
(71) The communications circuits **63** can also communicate through a Wireless Local Area Network (WLAN) **75** that operates according to the 802.11 family of standards, which is commonly known as a WiFi interface. Communications can also be available through one or more satellites **76**. The satellites **76** can communicate through one or more of ground stations **77** to the PDN **71** or directly to one or more of the nodes.
(72) When a traveler requires charging, the traveler contacts the mobile platform **100** through the wireless communication network **70**. In one example, the traveler is required to establish an account prior to utilizing the platform **100**. FIG. **11** illustrates a method of the mobile platform **100** receiving a charge request. The charge request received at the mobile platform **100** includes one or more of the amount of charging required, the geographic location where charging is needed, and the time the charging is needed (block **300**). The control unit **60** determines whether the time is available for charging (block **302**). This includes determining whether each of the charge terminals **12** will be in use during the requested time. If there is no capacity, the charge request will be denied (block **304**). An alternate time may be offered to the traveler.
(73) If the requested time is available, the control unit **60** determines the expected charge capacity of the battery bank **5** at that requested time (block **306**). This can include a calculation of the current capacity when the charge request is received, and the expected number of charging events that will occur prior to the requested time. If the expected capacity is adequate to cover the charge request (block **308**), the charge request is accepted and the traveler is notified. The control unit **60** waits for the time of the request as adequate charge is available in the battery bank **5** to handle the request (block **310**).
(74) If the current capacity and expected use is not adequate (block **308**), a determination is made of the additional amount of charging necessary to meet the charge request (block **311**). If the necessary amount cannot be produced prior to the requested time, the charge request is denied (block **314**). If the necessary charge amount can be produced, it is determined whether the additional amount can be produced by renewable energy devices **10** (block **316**). If this can occur, the battery bank **5** is charged with the renewable energy devices **10** (block **318**).
(75) If the renewable energy devices **10** are not adequate to meet the demand, the battery bank **5** is charged with both renewable energy devices **10** and the generator **4** (block **320**). In one example, the generator **4** is used just enough to supplement the renewable energy devices **10** to meet the required demand. In one example, renewable energy devices **10** may not be available to provide

charging capacity. For example, if charging is needed at night and solar panels are not effective, or during a period of time with no wind when wind turbines are ineffective. During these times, if demand or inclement circumstances require such as after a hurricane or natural disaster, the charging may occur completely through the generator **4**.
(76) In one example, the control unit **60** accesses information through the communication network **70** to determine whether the renewable energy devices **10** can meet the demand. This can include accessing the weather forecast to determine the amount of sunlight and/or wind. These inputs can then be used to more accurately calculate the expected amount of power that can be produced to charge the battery bank **5**.
(77) The control unit **60** can also contact emergency services in the event of an occurrence involving the platform **100**, **13**. Further, emergency services can have access to some or all of the information at the mobile platform **100** when responding to an event.
(78) In one example, a remote server **80** oversees the charging operations of one or more mobile platforms **100**. The remote server **80** monitors the status of the mobile platforms **100**, receives the charge requests from the travelers, and determines how to accommodate the travelers.
(79) As illustrated in FIG. **12**, the server **80** includes one or more processing circuits (illustrated as processing circuit **81**) that may include one or more microprocessors, microcontrollers, Application Specific Integrated Circuits (ASICs), or the like, configured with appropriate software and/or firmware. A computer readable storage medium (shown as memory circuit **82**) stores data and computer readable program code that configures the processing circuit **81** to implement the techniques described above. Memory circuit **82** is a non-transitory computer readable medium and may include various memory devices such as random access memory, read-only memory, and flash memory. A communications circuit **83** connects the server **80** to the PDN **71** and can be configured to communicate with the PDN **71** according to one or more 802.11 standards. The communications circuit **83** can support a wired connection (e.g., Ethernet), a wireless connection, or both. A database **84** stores information about the platforms **100**, **13**, and travelers. The database **84** is stored in a non-transitory computer readable storage medium (e.g., an electronic, magnetic, optical, electromagnetic, or semiconductor system-based storage device). The database **84** can be local or remote relative to the server **80**. A clock **85** can measure various timing requirements regarding the use of the platforms **100**, **13**. The clock **85** can be incorporated with the processing circuit **81** or can be a separate component independent from the processing circuit **81**.
(80) The server **80** monitors aspects about the platforms **100**, **13** and maintains a record for each platform **100**, **13** in the database **84**. The records can include aspects about the platforms **100**, **13**, such as but not limited to model number, date of manufacture, charge capacity of the battery banks **5**, **5′**, size of the fuel tank **30**, charging capacity of the renewable energy devices **10**, **10′**, charging capacity of the generators **4**, **4′**, and weight. The database **84** can also maintain the current status of the platforms **100**, **13** such as but not limited to geographic location, amount of charge in battery banks **5**, **5′**, and amount of fuel in the fuel tank **30**. The control units **60** periodically transmit this information to the server **80** to maintain a current and accurate record of the status. Additionally or alternatively, the server **80** can query the control units **60** for information.
(81) The server **80** can also monitor the status of the platforms **100**, **13** to track their performance. This can include but is not limited to functionality, filter cleanliness status, battery age, and performance. For example, if a battery bank **5** is unable to hold a charge about a predetermined amount, or a renewable energy device **10** is not able to provide a predetermined charging capacity, the server **80** may indicate these issues and provide for them to be replaced and/or removed from use.
(82) The server **80** can also maintain an account for each traveler that is using a mobile platform **100**, **13**. A traveler can create an account prior to using a platform **100**, **13**. The account can include the travelers name, address, type of electric vehicle, charging requirements, type of fuel, billing information, etc. Once established, the traveler is able to charge their electric vehicle **200** at one of

the platforms **100**, **13**.
(83) The server **80** is configured to provide a web interface for access by a traveler to create an account, request a charge, and determine the status the ability to charge their vehicle **200**. The server **80** is configured with a browser-based interface or an applications program interface (API). The browser-based interface can include a website through which the contents of the database **84** can be accessible. Although the website can be hosted by the server **80**, it can also be hosted at another location accessible through the PDN **71**.
(84) Travelers can access the server **80** through a variety of devices **95**. The devices **95** can include laptop computers, personal computers, personal digital assistants, mobile computing/communication, tablet devices, and various other-like computing devices. Each of the travelers uses a respective device **95** and accesses the server **80** through the PDN **71**, or alternatively some other network. In one embodiment, one or more of the entities can use his or her respective device **95** to access the server **80** through a separate portal. Each traveler's portal can include a secure interface to access the information that is assigned to them. The server **80** accesses the traveler's records and determines one or more platforms **100**, **13** that can provide charging for the traveler.
(85) FIG. **13** illustrates a method of the server **80** handling a charge request from a traveler. In this example, the server **80** monitors a network of mobile platforms **100** that are deployed at different locations within a geographic area. The charge request is received by the server (block **400**). The charge request includes the amount of charge required, the geographic location, and the time needed.
(86) Upon receiving the request, the server **80** determines one or more mobile platforms **100** that are in the desired geographic area (block **402**). This can include determining the mobile platforms **100** that are within a particular range, such as within a predetermined number of miles of the requested location.
(87) The server **80** then determines the availability of these mobile platforms **100** to meet the demands of the request (block **404**). These demands include being available during the requested time and having the necessary charging capacity. If charging is not available (block **406**), the server **80** notifies the traveler and denies the charge request (block **408**). If charging is available, the server **80** notifies the traveler and confirms the request (block **410**). The server **80** can also notify the mobile platform **100** and reserve the time for the traveler for the charging event.
(88) In one example upon receiving the request and determining the applicable mobile platforms **100** in the geographic area, the server **80** sends a request to the mobile platform **100**. The mobile platform **100** then determines whether it can accommodate the charge request in a manner described above for FIG. **11**. The mobile platform **100** then signals the server **80** who can communicate with the travelers. In another example, the determination of the capacity of the mobile platform **100** is performed by the server **80** based on information received from the mobile platform **100**.
(89) FIG. **14** illustrates one example of a traveler T traveling south on Interstate 95. The traveler contacts the server **80** requesting charging of their vehicle **200** within the near future. Upon receiving the charging request, the server **80** determines the one or more mobile platforms **100** in the geographic area. The server **80** determines their capacity, whether the request can be accepted, and then signals the traveler back. The traveler can then choose the best option and confirm. For example, upon receiving the charge request the server **80** determines that each of mobile platforms **100***a*, **100***b*, and **100***c* are in the geographic area. The server **80** confirms that each is available and has the capacity to meet the charge request. In one example, the server **80** determines which option is the best and sends this to the traveler (e.g., mobile platform **100***c* because it is on Interstate 95 on which the traveler is traveling). In another example, the server **80** gives each of the options to the traveler who then determines which mobile platform **100** to use for the charging.
(90) In one example, the server **80** determines that there are no mobile platforms **100** within the

geographic area. The server **80** will notify the traveler of the nearest mobile platform **100** and ask whether this is an option for the traveler.
(91) In one example, the platform **100** is applicable for use with autonomous electric vehicles **200**. In use, the electric vehicles **200** contact the server **80** and/or platform **100** to schedule charging. The server **80** and/or platform **100** communicate with the electric vehicle **200** to determine the time and location of the charging. The electric vehicle **200** is then able to arrive at the location and receive the necessary charging. In one example, this process occurs without any human interaction on the part of the electric vehicle **200** or the platform **100**/server **80**.
(92) In one example, the platform **100** is designed for autonomous operation. The one or more charge terminals **12** and fuel outputs **31** are mounted on robotic arms that can extend and retract. When a vehicle arrives at the platform **100** to receive charging, the charge terminal **12** can extend outward and engage with a plug in the vehicle. The charge terminal can include one or more sensors that detect the location of the plug and align accordingly to secure the engagement. Likewise, for standard vehicle arriving for fuel, the fuel output **31** includes a retractable arm that can extend outward to insert the nozzle **32** into the fuel inlet of the vehicle. The fuel output **31** can include one or more sensors for aligning and inserting the nozzle **32** as needed. The control unit **60** can be configured to receive signals from the various sensors to provide for the autonomous charging and/or fueling operations.
(93) The generator **4** is positioned in the cabinet **43**. During operation, the generator **4** creates exhaust gases that are moved out of the cabinet **43**. Sound suppression components also reduce the amount of noise created by the generator **4** that is audible outside of the cabinet **4**.
(94) FIG. **16** illustrates the cabinet **43** that is positioned on the chassis **40**. The cabinet **43** includes an interior space **46** that is formed by side walls **171**, a top wall (see FIG. **4**), and a floor **172**. One or more doors **173** are pivotally attached to one of the side walls **171** and movable between open and closed positions. In one example, the interior space **46** of the cabinet **43** extends across the width of the chassis **40**. Doors **173** are positioned on each lateral side to provide access to different sections of the interior space **46**. The interior space **46** is enclosed to protect the equipment within the interior space **46**, including the generator **4**. The doors **173** can be locked to limit access to the interior space **46**.
(95) As illustrated in FIG. **16**, the generator **4** is positioned on the floor **172** of the interior space **46**. Controls are positioned on the front side of the generator **4** and accessible to a user when the door **173** is in an open position. In one example, a fuel line extends from the fuel tank **30** to maintain fuel in the generator **4**. Additionally or alternatively, the generator **4** includes a fuel inlet and fuel tank to receive the fuel from an external source (e.g., filled via a gas can by a user).
(96) In one example, the generator **4** is a Generac Model No. G0071270 available from Generac Power Systems, Inc. In another example, the generator **4** is a Generac iQ3500 available from Generac Power Systems, Inc. Another example of a generator **4** is a Honda Model No. EU7000iS available from Honda Power Equipment.
(97) FIG. **17** illustrates a rear side of the generator **4** positioned in the interior space **46** of the cabinet **43**. The generator **4** includes an exhaust port **150**. Exhaust gases that result from the operation of the combustion engine in the generator **4** are outputted through the exhaust port **150**. An exhaust conduit **151** is attached to the exhaust port **150** to receive the exhaust gases and direct them out of the interior space **46** of the cabinet **43**. The conduit **151** extends through an opening **174** in the floor **172** of the cabinet **43**.
(98) In one example, a flange member **120** is attached to the floor **172** at the opening **174**. The flange member **120** includes an enlarged flange **121** that is secured to the floor **172** with one or more mechanical fasteners, and a neck **122** that extends upward from the flange **121**. The flange **121** is sealed to the floor **172** with one or more of a gasket, gel, and adhesive to prevent the exhaust gases from returning into the interior space **46**. The flange member **120** is attached to the floor **172** to prevent fluids that accumulate on the floor **172** from leaking through the opening **174**. The

flange member **120** is a single piece and includes a height measured between the bottom of the flange **121** and the top of the neck **122**. In the event of a fluid leak within the cabinet **43**, the flange member **120** prevents the fluid from leaking out of the interior space **46** through the opening **174**. In one example, the bottom **172** of the cabinet **43** is leak-proof to contain fluid within the interior space **46**. In one example, the bottom section of the cabinet **43** includes a pan **175** that prevents the escape of fluids. The pan **175** forms the floor **172** and a lower section of the side walls **171**, including at the one or more doors **173**. The pan **175** form a basin to hold the fluid. The height of the neck **122** of the flange member **120** includes a comparable height to maintain the fluid.
(99) In one example as illustrated in FIG. **18**, the conduit **151** includes an inner member **152** and an outer member **153** that extend around and form an interior space **154** through which the exhaust gases pass. In one example, the exhaust gas may heat the inner member **152**. The gap between the inner member **152** and the outer member **153** prevents the heating of the outer member **153**.
(100) FIG. **19** illustrates the outer member **153** of the conduit **151** extending along the length with the outer member **153** being exposed and extending over the interior inner member **152**. FIG. **20** illustrates the outer member **153** pulled back at a connector **129** to expose the inner member **152**.
(101) FIG. **19** illustrates the bottom of the chassis **40** below the cabinet **43**. The floor **172** of the cabinet **43** includes the opening **174** through which the conduit **151** exits. The conduit **151** extends into a muffler **180**. The conduit **151** is attached with a connector **129** to an inlet **181** of the muffler **180**.
(102) As illustrated in FIGS. **19** and **21**, a pipe **128** extends outward from an outlet **182** of the muffler **180**. The pipe **128** extends along the underside of the chassis **40** and includes an outlet **123** through which the exhaust gases are output. In one example, the outlet **123** is positioned at a rearward part of the chassis **40** underneath the fuel tank **30**. In one example, the outlet **123** is positioned in proximity to and in front of the wheels **41**.
(103) The noise resulting from the operating generator **4** is suppressed. The muffler **180** located along the exhaust line provides for sound suppression. The muffler **180** is suspended from the chassis **40** by arms **183**. Thus, the muffler **180** does not directly contact against the chassis **40**. As illustrated in FIGS. **22** and **23**, each of the arms **183** includes ends **184** that are positioned in rubber mounts **186** that are secured to the chassis **40** by brackets **185**. The rubber mounts **186** absorb movement and vibration of the muffler **180**. The rubber mounts **186** further space the arms **183** away from the chassis **40** to prevent contact that could cause noise. In one example, a pair of arms **183** mount the muffler **180** to the chassis **40** with each arm **183** connected to the chassis **40** by a pair of mounts **186** and brackets **185**.
(104) Sound is further suppressed by a chamber **190** that is positioned below the chassis **40**. The outlet **123** of the pipe **128** is positioned in the chamber **190** as illustrated in FIG. **21**. In one example as illustrated in FIGS. **22** and **24**, the chamber **190** is positioned below a floor of the chassis **40**. In one example, the chamber **190** is positioned below the fuel tank **30** and in front of the wheels **41**.
(105) As schematically illustrated in FIG. **25**, the chamber **190** is formed by side walls **192** that are mounted to and extend downward from a bottom of the chassis **40**. In one example, the side walls **192** are connected together to form a complete enclosure that extends around and forms an interior space **191**. The bottom of the chamber **190** is open to allow the exhaust gases that exit through the pipe **128** to exhaust into the environment. In another example, one or more openings are formed in the sides of the chamber **190**. The openings can be positioned at the corners of the side walls **192** to allow each side wall **192** to independently move relative to the other side walls **192**.
(106) In one example, the side walls **192** extend downward and contact against the surface **350** below the portable tank. In another example, the side walls **192** are spaced away from the surface **350**. The various walls can include the same or different sizes such that gaps between the walls and the surface **350** can vary at different points of the chamber **190**. In one example, the side walls **192** are spaced away from the surface **350** to prevent dragging against the surface **350** when the mobile

platform **100** is being pulled by a vehicle.
(107) One or more of the side walls **192** can be connected to the chassis **40** with a hinge **193**.
(108) A hinge **193** can connect to the chassis **40** and to side walls **192** such that the side walls **192** can pivot relative to the chassis **40**. The pivoting movement can maintain the side walls **192** in a downward position when the mobile platform **100** is positioned on uneven ground or otherwise positioned over an obstacle on the surface **350**. The pivoting movement can also protect the sidewalls **192** and allow them to move when the mobile platform **100** is being towed by a vehicle and thus prevent damage when the side walls **192** contact against an object or the surface **350**. The pivoting movement also facilitates accessing the interior space **191** of the chamber **190**. In one example, each of the side walls **192** are attached with a hinge **193**. In another example, a limited number of side walls **192** are attached with a hinge **193**.
(109) The sidewalls **192** are constructed to suppress the sound. In one example, the side walls **192** are made of two or more layers of material that each suppress a portion of the sound. FIG. **26** illustrates an example in which the sidewall **192** is constructed from three layers. A first outer layer **197** is a hard rubber. An intermediate layer **198** is a softer rubber, such as neoprene. An inner layer **199** is a foam material and can include pyramid-like projections that further act to suppress the sound. In one example, the foam material is an open-celled foam. The outer layer **197** constructed of a more durable material can provide protection to the one or more inner layers **198**, **199**. The outer layer **197** can provide a shield against materials that could strike the chamber **190** during transport of the mobile platform **100**. The outer layer **197** also provides protection against water, ice, snow, etc. that could come in contact with the chamber **190** during use.
(110) Each of the different layers of the sidewalls **192** are constructed from different materials that have a different sound absorption ability. Therefore, the combination of different materials provides for an effective sound suppression.
(111) FIGS. **27** and **28** illustrate the interior space **191** of the chamber **190**. In this example, the inner layer **199** is exposed along a portion of the side walls **192**. In one example, the inner layer **199** extends along an upper section of the side walls **192** and is spaced away from a lower section. This spacing prevents the inner layer **199** from being damaged while the mobile platform **100** is moving. One or both of the outer and intermediate layers **197**, **198** extend beyond the inner layer **199**.
(112) As illustrated in FIG. **27**, the bottom of the chamber **190** is open. The surface **350** is visible below the interior space **191**. This provides for the exhaust gases to be distributed into the environment.
(113) In one example as illustrated in FIGS. **27** and **28**, an axle for a pair of the wheels **41** extends through the chamber **190**. This is caused to the position of the chamber **190** along the length of the mobile platform **100**. The chamber **190** is shaped and sized to extend around the axle and still provide for noise suppression.
(114) In one example disclosed above, the exhaust conduit **151** extends through a floor of the cabinet **43**. In another example, the exhaust conduit **151** extends through a side wall or top wall of the cabinet **43**.
(115) In one example disclosed above, a muffler **180** is positioned along the exhaust conduit **151**. In another example, there is no muffler **180** along the exhaust conduit **151**.
(116) In one example, one or more of the walls **192** of the sound chamber **190** are constructed from multiple layers of different materials. In another example, one or more of the walls **190** are constructed from a single material.
(117) In one example, the exhaust conduit **151** includes multiple overlapping sections. In another example, the exhaust conduit **151** includes a single section.
(118) Spatially relative terms such as “under”, “below”, “lower”, “over”, “upper”, and the like, are used for ease of description to explain the positioning of one element relative to a second element. These terms are intended to encompass different orientations of the device in addition to different

orientations than those depicted in the figures. Further, terms such as “first”, “second”, and the like, are also used to describe various elements, regions, sections, etc. and are also not intended to be limiting. Like terms refer to like elements throughout the description.
(119) As used herein, the terms “having”, “containing”, “including”, “comprising” and the like are open ended terms that indicate the presence of stated elements or features, but do not preclude additional elements or features. The articles “a”, “an” and “the” are intended to include the plural as well as the singular, unless the context clearly indicates otherwise.
(120) The present invention may be carried out in other specific ways than those herein set forth without departing from the scope and essential characteristics of the invention. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.

Claims

1. A mobile platform comprising: a chassis configured to be pulled by a tow vehicle; a battery bank positioned on the chassis; a renewable energy recharging device positioned on the chassis to recharge the battery bank; a liquid fuel-powered recharging device positioned on the chassis to recharge the battery bank; an electrical terminal operatively connected to the battery bank to deliver electric power from the battery bank to an electric vehicle; a fuel tank positioned on the chassis to store liquid fuel; a fuel line that extends from the fuel tank to deliver the liquid fuel; and the mobile platform configured to simultaneously distribute the liquid fuel from the fuel tank to a receiving vehicle and deliver the electric power from the battery bank to the electric vehicle.
2. The mobile platform of claim 1, wherein the chassis comprises: a frame with a hitch for engagement with the tow vehicle; and wheels mounted to the frame.
3. The mobile platform of claim 1, wherein the renewable energy recharging device comprises a photovoltaic solar panel that is mounted on a top of the fuel tank.
4. The mobile platform of claim 1, wherein the fuel tank is physically larger than the battery bank.
5. The mobile platform of claim 1, wherein the liquid fuel-powered recharging device comprises a gas-powered generator.
6. The mobile platform of claim 1, wherein the liquid fuel-powered recharging device comprises an electric generator comprising: a combustion engine; an exhaust port for gases produced by the combustion engine; and an exhaust hose comprising an elongated shape with first and second ends with the first end mounted to the exhaust port and with the exhaust hose extending through a floor in the chassis and with the second end positioned at the bottom side of the chassis.
7. The mobile platform of claim 6, wherein the combustion engine of the electric generator operates on the liquid fuel that is stored in the fuel tank.
8. The mobile platform of claim 6, further comprising a muffler mounted to the exhaust hose to suppress sound from the electric generator, the muffler mounted to a bottom side of the chassis.
9. The mobile platform of claim 6, further comprising a sound chamber mounted to the chassis and the second end of the exhaust hose terminates within the sound chamber.
10. The mobile platform of claim 1, further comprising a cabinet positioned on the chassis and comprising an enclosed interior space, the liquid fuel-powered recharging device positioned within the interior space of the cabinet.
11. The mobile platform of claim 1, wherein the renewable energy recharging device is a first renewable energy recharging device and further comprising a second renewable energy recharging device positioned on the chassis to recharge the battery bank.
12. A mobile platform comprising: a wheeled chassis; a battery bank mounted on the chassis; a charge terminal electrically connected to the battery bank and comprising a plug to charge electric vehicles; a generator mounted on the chassis, the generator comprising an internal-combustion engine and configured to recharge the battery bank; a renewable energy charging device mounted on the chassis to recharge the battery bank; and a fuel tank mounted on the chassis to store liquid

fuel, the fuel tank comprising one or more fuel lines to dispense the liquid fuel to internal combustion vehicles; wherein the mobile platform is configured to simultaneously charge the electric vehicles and to dispense the liquid fuel to the internal combustion vehicles.

13. The mobile platform of claim 12, further comprising a cabinet mounted on the chassis and positioned between a front hitch of the chassis and the fuel tank.

14. The mobile platform of **12**, further comprising a fuel line that extends from the fuel tank to the generator, the fuel line configured to supply the liquid fuel from the fuel tank to the generator.

15. The mobile platform of claim 12, wherein the fuel tank is physically larger than the battery bank.

16. A method of charging vehicles with a mobile platform, the method comprising: towing the mobile platform from a first geographic location to a second geographic location; extending an electrical terminal from the mobile platform to an electric vehicle; supplying electrical energy from a battery bank on the mobile platform through the electrical terminal and to the electric vehicle; extending a fuel line from the mobile platform to an internal combustion engine vehicle; supplying liquid fuel from a fuel tank on the mobile platform through the fuel line and to the internal combustion engine vehicle; producing electrical energy through a renewable energy recharging device positioned on the chassis and recharging the battery bank; powering a liquid fuel powered recharging device positioned on the chassis and producing electrical energy and recharging the battery bank; and simultaneously supplying the electrical energy from the battery bank to the electric vehicle and supplying the liquid fuel from the fuel tank to the internal combustion engine vehicle.

17. The method of claim 16, further comprising supplying fuel from the fuel tank to the liquid fuel powered recharging device when a fuel level on the fuel powered recharging device falls below a predetermined level.

18. The method of claim 16, further comprising simultaneously recharging the battery bank with the renewable energy recharging device and the liquid fuel powered recharging device.

19. The method of claim 16, wherein producing the electrical energy through the renewable energy recharging device comprises producing the electrical energy through photovoltaic solar panels mounted on the chassis.