CLAIMS

What is claimed is:

1. A microscale energy cogeneration system comprising:

an energy generating system housing having an air inflow orifice and an air discharge orifice;

a micro/nano-turbine located at least partially within an interior of the energy generating system housing;

a micro electric generator in rotational communication with the micro/nano-turbine;

a heat exchanger located at least partially within an interior of the energy generating system housing, the heat exchanger having a cold side and a hot side;

a compressor arranged to provide compressed air to the cold side of the heat exchanger;

a combustor chamber arranged to receive the compressed air from the cold side of the heat exchanger, the combustor chamber being arranged to utilize fuel in conjunction with the compressed air to operate the micro/nano-turbine; and

wherein exhausted hot gas from the micro/nano-turbine is discharged through the air discharge orifice of the energy generating system housing;

wherein the micro electric generator is adapted to produce electric power output during operation of the microscale distributed energy cogeneration system,

wherein the water system is adapted to convert supplied water into potable water during operation of the microscale distributed energy cogeneration system.

2. The microscale energy cogeneration system as recited in claim 1, wherein the compressor is arranged to receive air from the air inflow orifice.

3. The micro scale distributed energy cogeneration system as recited in claim 1, wherein the micro electric generator is adapted to produce alternating current.

4. The microscale energy cogeneration system as recited in claim 1, further comprising a water system in communication with the exhaust air discharged from the micro/nano-turbine, the water system comprising a water boiler and condenser to produce potable water.

5. The micro scale distributed energy cogeneration system as recited in claim 1, further comprising an air heating system in communication with the exhaust hot gas discharged from the micro/nano-turbine, the air heating system comprising a heat exchanger and fan setup configured to heat air flowing therethrough.

6. The micro scale distributed energy cogeneration system as recited in claim 1, wherein the fuel for the microscale energy cogeneration system is one of natural gas, diesel, gasoline, liquefied petroleum gas (LPG).

7. The micro scale distributed energy cogeneration system as recited in claim 1, the micro scale distributed energy cogeneration system is configured causing a shaft of the micro/nano-turbine and a rotor of the micro electric generator to rotate in unison during operation of the micro scale distributed energy cogeneration system.

8. The micro scale distributed energy cogeneration system as recited in claim 1, wherein the micro scale distributed energy cogeneration system is installed within one of: a hybridizing car, a

boat, an outdoor application, a building or a home.

9. The micro scale distributed energy cogeneration system as recited in claim 1, wherein the micro scale distributed energy cogeneration system is in signal communication with a switchboard controller and meter.

10. The micro scale distributed energy cogeneration system as recited in claim 1, wherein the micro scale distributed energy cogeneration system is in signal communication with a control center by way of a Transmission Control Protocol/Internet Protocol (TCP/IP) network.

11. The micro scale distributed energy cogeneration system as recited in claim 1, wherein the micro scale distributed energy cogeneration system is of a size and weight that is portable, the micro scale distributed energy cogeneration system further comprising a handle.

12. The micro scale distributed energy cogeneration system as recited in claim 1, wherein several portable energy cogeneration units of different users are interconnected to a common power distribution grid are interconnected to a switchboard controller and meter and adapted to balance out an energy demand of the different users.

13. The micro scale distributed energy cogeneration system as recited in claim 1, wherein the micro scale distributed energy cogeneration system is in electric communication with an electrical power grid.

14. The micro scale distributed energy cogeneration system as recited in claim 1, wherein the micro scale distributed energy cogeneration system is in electric communication with an electrical power grid, wherein the micro scale distributed energy cogeneration system is adapted to operated in accordance with at least one of:

(a) to provide excess electric power to the electrical power grid.

(b) to consume electric power from the electrical power grid in a condition where the consumption of power from the micro scale distributed energy cogeneration system is lower than the energy produced by the micro scale distributed energy cogeneration system.

15. A method of providing electric power, the method comprising steps of:

obtaining a microscale distributed energy cogeneration system, the microscale distributed energy cogeneration system comprising:

an energy generating system housing having an air inflow orifice and an air discharge orifice;

a micro/nano-turbine located at least partially within an interior of the energy generating system housing;

a micro electric generator in rotational communication with the micro/nano-turbine;

a heat exchanger located at least partially within an interior of the energy generating system housing, the heat exchanger having a cold side and a hot side;

a compressor arranged to provide compressed air to the cold side of the heat exchanger;

a combustor chamber arranged to receive the compressed air from the cold side of the heat exchanger, the combustor chamber being arranged to utilize fuel in conjunction with the compressed air to operate the micro/nano-turbine; and

wherein exhausted hot gas from the micro/nano-turbine is discharged through the air discharge orifice of the energy generating system housing;

wherein the micro electric generator is adapted to produce electric power output during operation of the microscale distributed energy cogeneration system,

wherein the water system is adapted to convert supplied water into potable water during operation of the microscale distributed energy cogeneration system.

providing compressed air to the cold side of the heat exchanger;

running the micro/nano-turbine using an output from the combustor chamber, wherein the combustor chamber is operated by a combination of fuel and compressed air received from the cold side of the heat exchanger;

driving a rotor of the micro electric generator in a rotational motion, wherein the micro electric generator is driven by the running of the micro/nano-turbine; and

producing an electric power output power from the micro electric generator.

16. A method of providing electric power as recited in claim 15, the method further comprising steps of:

producing potable water by:

delivering water to the water system,

boiling the water using the water boiler, wherein the water boiler is heated by exhaust from the micro/nano-turbine and

subsequently cooling the boiled water a condenser.

17. The method of providing power as recited in claim 15, wherein the step of producing an electric power output power from the micro electric generator produces an alternating current.

18. The method of providing power as recited in claim 15, the micro scale distributed energy cogeneration system further comprising an air heating system in communication with the exhaust air discharged from the micro/nano-turbine,

the method further comprising steps of:

heating air by passing the air through the air heating system, and

distributing the heated air using a fan.

19. The method of providing power as recited in claim 15, the method further comprising a step of:

fueling the microscale energy cogeneration system using one of natural gas, diesel, gasoline, and LPG.

20. The method of providing power as recited in claim 15, the method further comprising a step of:

rotating a shaft of the micro/nano-turbine and a rotor of the micro electric in unison during operation of the micro scale distributed energy cogeneration system.

21. The method of providing power as recited in claim 15, the method further comprising a step of:

interconnecting several portable energy cogeneration units of different users as a set; and

managing electric power generated by the interconnected several portable energy cogeneration units to balance out an energy demand of the different users.

22. The method of providing power as recited in claim 15, the method further comprising a step of:

providing excess electric power to the electrical power grid in a condition where the consumption of the electric power output is lower than the electric power output produced by the micro scale distributed energy cogeneration system; and

obtaining electric power from the electrical power grid in a condition where the consumption of the electric power output is greater than the electric power output produced by the micro scale distributed energy cogeneration system.

CLAIMS

1. A portable microscale distributed energy cogeneration modular system comprising:

- a first unit (100) comprising a first energy generating system housing (102) having an air inflow orifice, an air discharge orifice, said first housing (102) internally receiving
  - a micro-turbine (122);
  - a micro electric generator (124) in rotational communication with the micro-turbine (122);
  - a heat exchanger (140) having a cold side (142) and a hot side (144);
  - a compressor (120) arranged to receive air from the air inflow orifice and to provide compressed air to the cold side (142) of the heat exchanger (140);
  - a combustor chamber (150) arranged to receive the compressed air from the cold side (142) of the heat exchanger (140), the combustor chamber being arranged to utilize fuel in conjunction with the compressed air to operate the micro-turbine;

  wherein a first flow (164) of exhausted hot air from the micro-turbine (122) is discharged through the air discharge orifice of the first energy generating system housing (102);

  wherein the micro electric generator (124) is adapted to produce electric power output during operation of the microscale distributed energy cogeneration modular system,
- a second unit (200) comprising a water system adapted to convert supplied water into potable water during operation of said first unit (100), the water system being in communication with a second flow (162) of exhaust hot air discharged from the micro-turbine (122), the water system comprising a water boiler (270) and a condenser (272) to produce potable water, said water boiler (270) and said condenser (272) being housed in a second housing (202),

characterized in that

the water system is in communication with said second flow (162) of exhaust hot air discharged from the micro-turbine (122) by means of an exhaust passage (108) placed downstream said micro-turbine (102) and said heat exchanger (140), said exhaust passage

(108) comprising an heated air exhaust port (107) formed on each of said first (102) and second (202) housing so as to couple the first (100) and second (100) unit at said ports, and in that the portable microscale distributed energy cogeneration modular system (100) is suitable to be interconnected with other identical systems, in electric communication with a common power distribution grid by a switchboard controller and meter (620), and adapted to balance out an energy demand of the different users.

2. The portable microscale distributed energy cogeneration modular system as recited in claim 1, wherein the micro electric generator is adapted to produce alternating current.

3. The portable microscale distributed energy cogeneration modular system as recited in claim 1, further comprising a third unit (300), said third unit comprising an air heating system in communication with the second flow of exhaust hot air discharged from the micro-turbine (122), the air heating system comprising a second heat exchanger (372) and fan setup (374) configured to heat air flowing therethrough.

4. The portable microscale distributed energy cogeneration modular system as recited in claim 1, wherein the fuel for the portable microscale distributed energy cogeneration modular system is one of natural gas, diesel, gasoline, liquefied petroleum gas (LPG).

5. The portable microscale distributed energy cogeneration modular system as recited in claim 1 and configured to cause a shaft (126) of the micro-turbine and a rotor of the micro electric generator to rotate in unison during operation of the portable microscale distributed energy cogeneration modular system.

6. The portable microscale distributed energy cogeneration modular system as recited in claim 1 and suitable to be installed within one of: a hybridizing car, a boat, an outdoor application, a building or a home.

7. The portable microscale distributed energy cogeneration modular system as recited in claim 1 and suitable to be in signal communication with a switchboard controller and meter (620).

8. The portable microscale distributed energy cogeneration modular system as recited in

claim 1 and suitable to be in signal communication with a control center by way of a Transmission Control Protocol/Internet Protocol (TCP/IP) network.

9. The portable microscale distributed energy cogeneration modular system as recited in claim 1, wherein the microscale distributed energy cogeneration system is suitable to be in electric communication with an electrical power grid.

10. The portable microscale distributed energy cogeneration modular system as recited in claim 1 and suitable to be in electric communication with an electrical power grid, wherein the portable microscale distributed energy cogeneration modular system is adapted to operate in accordance with at least one of:

(a) to provide excess electric power to the electrical power grid

(b) to consume electric power from the electrical power grid in a condition where the consumption of power from the portable microscale distributed energy cogeneration modular system is lower than the energy produced by the portable microscale distributed energy cogeneration modular system.

11. A method of providing electric power, the method comprising steps of:

- obtaining a portable microscale distributed energy cogeneration modular system according to any of the claims from 1 to 10,
- providing compressed air to the cold side (142) of the heat exchanger (140);
- running the micro-turbine (122) using an output from the combustor chamber (150), wherein the combustor chamber is operated by a combination of fuel and compressed air received from the cold side of the heat exchanger;
- driving a rotor of the micro electric generator (124) in a rotational motion, wherein the micro electric generator is driven by the running of the micro-turbine; and
- producing an electric power output power from the micro electric generator,

wherein the conversion of the supplied water in potable water comprises:

- delivering the supplied water to the water system,
- boiling the supplied water using the water boiler (270), wherein the water boiler is heated by the second flow (162) of exhaust exhaust hot air discharged from the micro-turbine (122) and subsequently
- cooling the boiled water in the condenser (272),

the method further comprising a step of:

- interconnecting several portable microscale distributed energy cogeneration systems of different users as a set; and
- managing electric power generated by the interconnected several portable energy cogeneration units to balance out an energy demand of the different users.

12. The method of providing power as recited in claim 11, wherein the step of producing an electric power output from the micro electric generator produces an alternating current.

13. The method of providing power as recited in claim 11, the portable microscale distributed energy cogeneration modular system further comprising a third unit (300) comprising an air heating system in communication with the second flow of exhaust air discharged from the micro-turbine, the method further comprising steps of:

- heating air by passing the air through the air heating system, and
- distributing the heated air using a fan.

14. The method of providing power as recited in claim 11, the method further comprising a step of:

fueling the portable microscale energy cogeneration modular system using one of natural gas, diesel, gasoline, and LPG.

15. The method of providing power as recited in claim 11, the method further comprising a step of:

rotating a shaft of the micro-turbine and a rotor of the micro electric in unison during operation of the portable microscale distributed energy cogeneration modular system.

16. The method of providing power as recited in claim 11, the method further comprising a step of:

providing excess electric power to the electrical power grid in a condition where the consumption of the electric power output is lower than the electric power output produced by the portable microscale distributed energy cogeneration modular system; and

obtaining electric power from the electrical power grid in a condition where the

consumption of the electric power output is greater than the electric power output produced by the portable microscale distributed energy cogeneration modular system.