CLAIMS

1. A vehicular power system comprising:

a motive power unit; and

an auxiliary power unit comprising:

a container;

a fuel cell disposed within the container, the fuel cell comprising:

a plurality of half-cells each comprising a cathode and a solid electrolyte; and

an anode bath comprising molten metal, wherein the half-cells are at least partially submerged in the bath, and wherein upon operation of the auxiliary power unit, an oxygen-bearing reactant flows through the half-cells to electrochemically react with at least one of the molten metal and a fuel-bearing reactant within the bath;

a furnace nested within the container and thermally cooperative with the fuel cell such that upon operation of the furnace, the molten metal in the bath is maintained in a substantially molten metal state;

a perforate lid defining a plurality of apertures therein such that each aperture defined in the perforate lid receives a corresponding one of the half-cells such that together the perforate lid and the plurality of half-cells define a modular assembly, the perforate lid cooperative with the container such that the half-cells are releasably accepted therein;

at least one seal disposed within the auxiliary power unit to ensure substantially complete fluid isolation of the bath within the container; and

electrical circuitry cooperative with the fuel cell such that an electric current produced by the fuel cell may be delivered through the electrical circuitry to a vehicular load.

2. The vehicular power system of claim 1, wherein the molten metal is selected from the group consisting of tin, antimony, bismuth, tin and combinations thereof.

3. The vehicular power system of claim 1, wherein the furnace is disposed between the container and the fuel cell.

4. The vehicular power system of claim 3, further comprising a thermal insulator disposed adjacent a surface of the container to reduce thermal communication between the bath and an ambient environment proximate the auxiliary power unit.

5. The vehicular power system of claim 1, wherein the cathode and the electrolyte of each half-cell define an elongate tubular structure with a closure at a distal end thereof that is submerged within the bath and a proximal end thereof defining an aperture that is not submerged within the bath but fluidly cooperative with the oxygen-bearing reactant.

6. The vehicular power system of claim 5, wherein the elongate tubular structure defines a flanged surface adjacent the proximal end.

7. The vehicular power system of claim 1, wherein the bath further comprises a sequestering agent disposed therein.

8. The vehicular power system of claim 1, wherein the auxiliary power unit further comprises at least one of (a) an electrical generator or alternator and (b) a processor-based controller to regulate the flow of the electric current to the vehicular load through the electrical circuitry.

9. A vehicle comprising:

a platform comprising a wheeled chassis, a guidance apparatus cooperative with the wheeled chassis and a passenger compartment that is thermally cooperative with a climate control system;

a motive power unit secured to the platform; and

an auxiliary power unit secured to the platform, the auxiliary power unit comprising:

a container;

a fuel cell disposed within the container, the fuel cell comprising:

a plurality of half-cells each comprising a cathode and a solid electrolyte; and

an anode bath comprising molten metal, wherein the half-cells are at least partially submerged in the bath, and wherein upon operation of the auxiliary power unit, an oxygen-bearing reactant flows through the half-cells to electrochemically react with at least one of the molten metal and a fuel-bearing reactant within the bath;

a furnace nested within the container and thermally cooperative with the fuel cell such that upon operation of the furnace, the molten metal in the molten metal anode bath is maintained in a substantially molten metal state;

a perforate lid defining a plurality of apertures therein such that each aperture defined in the perforate lid receives a corresponding one of the half-cells such that together the perforate lid and the plurality of half-cells define a modular assembly, the perforate lid cooperative with the container such that the half-cells are releasably accepted therein;

at least one seal disposed within the auxiliary power unit to ensure substantially complete fluid isolation of the bath within the container;

at least one of an electrical generator or alternator;

a processor-based controller; and

electrical circuitry cooperative with (a) the fuel cell, (b) the at least one of an electrical generator or alternator and (c) the controller such that an electric current produced by the fuel cell may be delivered through the electrical circuitry to at least one of the motive power unit and the climate control system.

10. The vehicle of claim 9, wherein the motive power unit comprises a diesel engine such that the diesel engine and the auxiliary power unit are both fluidly cooperative with a common fuel source that is stored on the vehicle.

11. A method of providing auxiliary power to a vehicle that comprises a motive power unit and an auxiliary power unit, the method comprising:

operating a furnace to provide heat to the auxiliary power unit that comprises a fuel cell disposed within a container that is mounted to the vehicle, wherein the heat ensures that a metal contained within an anode bath of the fuel cell is in a substantially molten state;

passing an oxygen-bearing reactant through a plurality of half-cells and into the bath, wherein each half-cell comprises a cathode and a solid electrolyte, and wherein the plurality of half-cells are at least partially submerged in the bath such that an elongate tubular structure defined by the half-cells includes a distal end that defines a closure that is submerged within the bath and a proximal end thereof defining an aperture that is not submerged within the bath but fluidly cooperative with the oxygen-bearing reactant to facilitate flow thereof within the tubular structure between the proximal and distal ends, the elongate tubular structure defining a flanged surface adjacent the proximal end such that each of the tubular structures fits within and is structurally supported by a perforate lid that is formed as an upper portion of the container;

oxidizing at least a portion of the molten metal with the oxygen-bearing reactant;

reducing the oxidized molten metal with a fuel-bearing reactant that is present within the bath; and

supplying electrical current produced by the fuel cell to at least one of an electrical load and a climate control system situated on the vehicle.

12. The method of claim 11, wherein operation of the auxiliary power unit takes place during periods when the motive power unit is not being operated.

13. The method of claim 11, wherein the fuel-bearing reactant used in the auxiliary power unit is the same as that used for the motive power unit.

14. The method of claim 11, wherein each aperture defined in the perforate lid receives a corresponding one of the half-cells by contact with the flanged surface such that the half-cells are releasably accepted therein.