CLAIMS

1. A frame element for forming a photovoltaic (PV) panel having structural integrity, the frame element comprising:

a body providing rigidity to the frame element:

the body having an attachment surface for securing a frame element to another frame element or surface to which the formed PV panel is to be secured and an edge receiving profile for receiving an edge of a PV module or laminate;

the body having constrained therein a reinforcing member along substantially the length of the frame element, the reinforcing member being conductive and insulated from the PV panel by the body,

wherein the or each conducting reinforcing member comprises a busbar for a selected polarity to which a PV panel is operably connected.

2. The frame element as claimed in Claim 1, in which the reinforcing member is tubular.

3. The frame element as claimed in Claim 1 or Claim 2, in which at least two isolated reinforcing members are provided within the body.

4. The frame element as claimed in Claim 1, in which substantially rectangular reinforcing members are positioned proximate one another to attenuate electromagnetic interference (EMI) associated with the conducting of power from the PV panels along said busbars.

5. The frame element as claimed in Claim 4, in which reinforcing members are positioned substantially perpendicularly to one another to provide structural reinforcement in two major axes, both axes being parallel to the longitudinal axis of a frame element.

6. The frame element as claimed in any one of the preceding claims, in which positive and negative polarity busbars are provided in one or both of the axes defined by frame elements forming a substantially planar PV panel or an array thereof.

7. A photovoltaic (PV) panel of enhanced structural integrity having at least one frame element of the type claimed in Claim 1, the attachment surface of at least one frame element including attachment means selected from any one of :

a fixing member for securing one frame element to another;

a ground-engaging foot or fixing;

a fence post having frame element receiving channels defined therein; or

a locking member for securing a frame element to a shipping container lock receiver.

8. The PV panel as claimed in Claim 7, in which the attachment means is operationally adapted to secure a panel to a building or enclosure surface.

9. The PV panel as claimed in Claim 7 or Claim 8, in which the or each frame element is fixed to a framework.

10. The PV panel as claimed in Claim 7, comprising a plurality of PV panels of the type claimed in Claim 7 positioned within frame receiving channels of a series of fence posts.

11. The PV panel as claimed in any one of Claims 7 to 9, in which PV panels are adapted to form a self-supporting enclosure.

12. A modular photovoltaic (PV) system comprising:

a PV panel formed using structural frame elements of the type claimed in Claim 1;

attachment means for engaging the attachment surface of the frame element;

in which each PV panel is secured to a structural frame element having at least one

reinforcing member defined therein, and

in which the attachment means is selected from any one of :

a fixing member for securing one structural frame element to another;

a ground-engaging foot or fixing;

a fence post having frame receiving channels defined therein; or

a locking member for securing a frame element to a shipping container lock receiver.

13. An enclosure for a photovoltaic (PV) device on which PV panels operably form at least two of the major faces thereof, the enclosure comprising:

structural frame elements of the type claimed in Claim 1 and an attachment means for securing the enclosure to the ground or to a building surface;

a plurality of PV panels secured to the structural frame elements to define vertical faces of the enclosure;

sealingly disposed within the enclosure, control circuitry for regulating the electrical energy generated via the PV panels and energy accumulators connected to the control circuitry; and

a regulated electrical outlet means,

in which at least two of the PV panels are disposed on said major faces, of which at least one is directed towards the path followed by the sun (due south in northern latitudes) and the other of said at least two PV panels is selected from PV panels disposed substantially perpendicular to the first PV panel and PV panels mounted to a roof section.

14. The enclosure as claimed in Claim 13, in which the enclosure is selected from any one of: a prefabricated purpose-built enclosure, a garden shed, a domestic dwelling, a shipping container, a pre-fabricated metal building (including barns, livestock shelters and silos), industrial buildings, warehouses and distribution centres.

15. The enclosure as claimed in Claim 13 or Claim 14, in which the enclosure is adapted as a remote monitoring or signal repeating station in which the energy accumulators ensure power is maintained for data collection, storage and transmission.

16. The enclosure as claimed in Claim 14 or Claim 15, in which one of the major faces includes an access door.

17. The enclosure as claimed in any one of Claims 13 to 16, in which the structural frame elements releasably retain the PV panels and include hinge elements at their peripheries to facilitate access to the interior of the enclosure.

18. The enclosure as claimed in any one of Claims 13 to 17, in which each face having a PV panel thereon has associated therewith a dedicated and appropriately rated charge controller to manage the solar power harvested from each panel within a face to maximise the efficiency of the charging output generated.

19. The enclosure as claimed in any one of Claims 13 to 18, in which the enclosure is adapted to receive, store and charge batteries from electric vehicles (EVs).

20. The enclosure as claimed in any one of Claims 13 to 18, in which the enclosure is adapted to receive, store and charge EVs from electric kick-scooters, electric motorcycles and electric cars (obviating the necessity of external or mains powered electrical connections).

21. The enclosure as claimed in Claim 13, in which the enclosure has an octagonal cross-section whereby framed PV panels are hinged to form access door

to a centrally disposed charging structure on which electric kick scooters are suspended for storage and charging.

22. The enclosure as claimed in any one of Claims 13 to 21, in which the enclosure is open on one of its faces and in which at least one face of PV panels comprises an arrangement of formed PV panels in back-to-back configuration so as to receive indirect or reflected solar radiation within the open mouth of the enclosure and whereby EVs have access to charging facilities at the open mouth thereof.

23. The enclosure as claimed in any one of Claims 13 to 22, in which the enclosure includes a communications module.

24. The enclosure as claimed in any one of Claims 13 to 22, in which the enclosure includes payment verification means.

25. A photovoltaic (PV) power generator apparatus on which PV panels operably form at least two of the major faces thereof, the generator comprising:

a cabinet housing defining said major faces and a roof section thereof, the cabinet having structural frame elements of the type claimed in Claim 1 and an attachment means selected from a ground-engaging element and a building surface securing support;

a plurality of PV panels secured to the structural frame elements to define selected major vertical faces of the cabinet housing;

sealingly disposed within the housing, control circuitry for regulating the electrical energy generated via the PV panels and energy accumulators connected to the control circuitry; and

a regulated electrical outlet means,

in which at least two of the PV panels are disposed on said major faces, of which at least one is directed towards the path followed by the sun (due south in

northern latitudes) and the other of said at least two PV panels is selected from PV panels disposed substantially perpendicular to the first PV panel and PV panels mounted on a roof section.

26. The PV power generator apparatus as claimed in Claim 25, in which the energy accumulators comprise a bank of batteries having deep-cycle characteristics and a bank of batteries having high power delivery characteristics and wherein combining cell technologies with charge controllers and voltage monitoring circuitry optimises both charging and delivery of power in sub-optimal conditions.

27. The PV power generator as claimed in Claim 25 or Claim 26 having at least one major vertically disposed face, in which PV panels operably form at least the major faces thereof to optimise the harvesting of solar radiation in sub-optimal conditions with respect to diurnal and seasonal variances of direct and indirect incidence of solar radiation.

28. The PV power generator as claimed in any one of Claims 25 to 27, in which each face having a PV panel thereon has associated therewith a dedicated and appropriately rated charge controller to manage the solar power harvested from each panel within a face to maximise the efficiency of the charging output generated.

29. The PV power generator as claimed in any one of Claims 25 to 28, in which a storage cell array delivers a direct current (DC) power output to devices or a local power connector or via an inverter to provide an alternating current (AC) power output.

30. The PV power generator as claimed in any one of Claims 25 to 29, in which the first battery bank comprising a working bank of frequent and deep cycling cells, having superior weight to kWh ratios and the second battery bank comprising a reserve bank providing additional charging capacity and lower charging temperature capabilities that the working bank cells, each bank having charge balancers to compensate for charge state differences during a charging and discharging cycle.

31. The PV power generator as claimed in as claimed in any one of Claims 25 to 30, in which the first battery bank comprising lithium ion or lithium iron phosphate batteries and the second battery bank comprising Absorbent Glass Mat (AGM) cells, each provided in a configuration associated with the required system voltage.

32. The PV power generator as claimed in any one of Claims 25 to 31, in which the total surface area of PV panel is optimised to generate a daily average power generation of at least 200Wh.

33. The PV power generator as claimed in any one of Claims 25 to 32, in which a storage cell array delivers a direct current (DC) power output to devices or a local power connector or via an inverter to provide an alternating current (AC) power output.