THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1) Apparatus for performing electrolysis and generating heat, the apparatus including an electrolysis cell including:
   a) a cell housing defining an electrolyte cavity, the electrolyte cavity containing an electrolyte in use;
   b) a plurality of substantially parallel spaced apart electrode plates provided within the electrolyte cavity, the electrode plates defining at least one anode and at least one cathode at least partially submersed within the electrolyte in use;
   c) at least two connectors, which in use are connected to an electrical power supply thereby allowing an electrical current to be supplied to the electrolyte to thereby perform electrolysis and heating of the electrolyte;
   d) at least one cell outlet in fluid communication with the electrolyte cavity, the at least one cell outlet being coupled to a heat recovery module in use; and,
   e) at least one cell inlet allowing electrolyte to be supplied to the electrolyte cavity wherein the apparatus further includes:
      i) a switch; and,
      ii) a load coupled to the at least two connectors via the switch,
      iii) a trigger circuit coupled to the at least two connectors, the trigger circuit including:
         (1) a sensor for sensing at least one of:
            (a) current flow in the connectors and;
            (b) electrical potential across the connectors; and
         (2) an electronic controller for selectively activating the switch by:
            (a) comparing the at least one sensed current and sensed electrical potential to a threshold; and
            (b) operating the switch to thereby couple the at least two connectors to the load to divert at least some current through the load in the event that the threshold is exceeded to thereby prevent damage to the electrolysis cell.
2) Apparatus according to claim 1, wherein the inlet is coupled to the heat recovery module so that electrolyte is recirculating through the electrolyte cavity and the heat recovery module.

3) Apparatus according to claim 1 or claim 2, wherein the inlet and outlet are arranged so that electrolyte supplied to the cavity flows between the electrode plates.
4) Apparatus according to claim 3, wherein the inlet and outlet are arranged on opposing sides of the electrolyte cavity facing edges of the electrode plates.
5) Apparatus according to claim 4, wherein the inlet and outlet are arranged in lower and upper ends of the cell housing respectively with the electrode plates aligned substantially vertically within the electrolyte cavity and spaced substantially horizontally, in use.
6) Apparatus according to any one of the claims 1 to 5, wherein the electrode plates are at least one of:
    a) laminar;
    b) curved; and,
    c) undulating.
7) Apparatus according to any one of the claims 1 to 6, wherein the electrode plates are separated by a distance of at least one of:
    a) between 0.1 mm and 10 mm;
    b) between 1 mm and 2 mm; and,
    c) between 2 mm and 5 mm.
8) Apparatus according to any one of the claims 1 to 7, wherein the electrode plates have thickness of at least one of:
    a) between 0.1 mm and 10 mm;
    b) between 1 mm and 2 mm; and,
    c) between 2 mm and 5 mm.
9) Apparatus according to any one of the claims 1 to 8, wherein the anodes are thicker than the cathodes.
10) Apparatus according to any one of the claims 1 to 9, wherein the at least two connectors are electrically connected to electrode plates so that adjacent plates act as anodes and cathodes in use.
11) Apparatus according to claim 10, wherein each cathode is positioned between two anodes.
12) Apparatus according to any one of the claims 1 to 11, wherein the cell housing includes an opening and a cover removably mounted in the opening to allow at least some of the electrode plates to be removed from the electrolyte cavity.

13) Apparatus according to any one of the claims 1 to 12, wherein the apparatus includes an electrode support, the electrodes being coupled to the electrode support so that the electrodes are at least partially submerged in electrolyte in use.

14) Apparatus according to claim 13, wherein the electrode support is coupled to a cover allowing the electrodes to be removed from the electrolyte cavity.

15) Apparatus according to any one of the claims 1 to 14, wherein the cell housing defines a pressure vessel and wherein the pressure inside the electrolyte cavity is greater than atmospheric pressure.

16) Apparatus according to any one of the claims 1 to 15, wherein, in use, the apparatus operates at a temperature that is at least one of:

a) at least 40ºC;

b) at least 60ºC;

c) at least 80ºC; and,

d) at least 100ºC.

17) Apparatus according to any one of the claims 1 to 16, wherein the apparatus includes a heat recovery module.

18) Apparatus according to claim 17, wherein the heat recovery module acts as a condenser for condensing vaporised electrolyte.

19) Apparatus according to claim 17 or claim 18, wherein the heat recovery module acts as a separator for separating vaporised electrolyte from gaseous electrolysis products.

20) Apparatus according to any one of the claims 17 to 19, wherein the heat recovery module includes an outlet that allows gaseous electrolysis products to be extracted in use.

21) Apparatus according to any one of the claims 17 to 20, wherein the heat recovery module includes a heat exchanger for recovering heat from the electrolyte to at least one of:

a) condensed vaporised electrolyte; and,

b) perform work using recovered heat.

22) Apparatus according to any one of the claims 17 to 21, wherein the heat recovery module heats a heat transfer medium using heat recovered from the electrolyte.

23) Apparatus according to claim 22, wherein the recovered heat is used by a thermal engine including:

a) a boiler that in use generates pressurised vapour using the recovered heat; and,

b) a thermal engine coupled to a generator that in use generates electricity using pressurised vapour from the boiler.

24) Apparatus according to any one of the claims 17 to 23, wherein the heat recovery module includes a thermal engine.

25) Apparatus according to any one of the claims 1 to 24, wherein the apparatus includes a power supply for supplying the electrical current.

26) Apparatus according to claim 25, wherein the power supply includes a thermal engine.

27) Apparatus according to any one of the claims 1 to 26, wherein the electrical current is direct current having an electrical potential of at least one of:

a) at least 2 V;
b) at least 5 V;
c) at least 10 V;
d) between 15 and 25 V;
e) up to 30 V;
f) up to 40 V; and,
g) up to 60 V.

28) Apparatus according to any one of the claims 1 to 27, wherein the electrical current is applied to generate an electric field having a field strength of at least one of:

a) at least 3000 Volts per meter;
b) at least 12000 Volts per meter; and
c) at least 24000 Volts per meter.

29) Apparatus according to any one of the claims 1 to 28, wherein the electrical current is direct current having an electrical current of at least one of:

a) at least 0.5 A;
b) at least 1 A;
c) at least 2A;
d) between 2 A and 10 A;
e) about 5 A;
f) up to 10 A;
g) up to 20 A; and,
h) up to 50 A.

30) Apparatus according to any one of the claims 1 to 29, wherein the electrical current is applied to generate an electric field having a current density of at least one of:
   a) at least 500 Ampere per square meter;
   b) at least 1000 Ampere per square meter; and
   c) about 3000 Ampere per square meter or higher.

31) Apparatus according to any one of the claims 1 to 30, wherein the load is at least one of:
   a) an electrolysis cell;
   b) a resistive load;
   c) a battery, and
   d) an electrical machine.

32) Apparatus according to any one of the claims 1 to 31, wherein, in use, the electrolysis cell is adapted to operate at a temperature of at least 60ºC, a pressure of at least atmospheric pressure, and with a direct current having an applied electric field of at least 3000 V/m and a current density of at least $500A/m^2$.

33) Apparatus according to any one of the claims 1 to 32, wherein the apparatus include a pyroelectric material that in use generates electrical energy in response to temperature changes within the apparatus.

34) Apparatus according to claim 33, wherein the pyroelectric material is provided in the electrolyte cavity and is electrically connected to the at least two connectors.

35) Apparatus according to claim 34, wherein the pyroelectric material is at least one of electrically insulated and electrically connected to the electrolyte.

36) Apparatus according to any one of the claims 33 to 35, wherein at least one electrode is made of a pyroelectric material.

37) Apparatus according to claim 36, wherein electrodes are unevenly spaced to enhance the pyroelectric effect.

38) Apparatus according to any one of the claims 1 to 37, wherein the apparatus includes two dissimilar metals in electrical and thermal contact with the apparatus that in use generates electrical energy in response to temperature changes within the apparatus.