What Is Claimed Is:

1. A power system that generates at least one of electrical energy and thermal energy comprising:

at least one vessel capable of a maintaining a pressure of below, at, or above atmospheric;

reactants, the reactants comprising:

a. at least one source of nascent $H_2O$;

b. $H_2O$ or at least one source of $H_2O$;

c. atomic hydrogen or at least one source of atomic hydrogen;

a molten metal injector system comprising at least one injector reservoir that supplies molten metal for injection, a molten metal pump with an injector tube that provides a molten metal stream from molten metal in the injector reservoir, and at least one non-injector reservoir that receives the molten metal stream, wherein the molten metal stream is in contact with the reactants;

at least one ignition system comprising a source of electrical power to supply opposite voltages to the injector and non-injector reservoir electrodes that supplies current and power flow through the stream of molten metal to the molten metal stream to ignite a plasma forming reaction of the reactants;

at least one reactant supply system to replenish reactants that are consumed in the plasma forming reaction of the reactants;

at least one power converter or output system of at least one of the light and thermal output from the plasma to electrical power and/or thermal power.

2. The power system of Claim 1 further comprising a heater to melt a metal to comprise the molten metal.

3. The power system of Claim 1 further comprising a molten metal recovery system.

4. The power system of Claim 1 wherein the molten metal recovery system comprises at least one molten metal overflow channel from the non-injection reservoir to the injector system reservoir that further creates breaks in the molten metal overflow stream to interrupt any current path through the overflowing molten metal.

5. The power system of Claim 1 wherein the molten metal recovery system comprises the non-injector reservoir having its inlet to receive molten metal from the injector tube of the injector system at an elevation above the injector tube and further comprising a drip edge to break-up the overflow stream.

6. The power system of Claim 5 wherein non-injector reservoir inlet lies in a plane and the plane is aligned perpendicular to the initial direction of the molten metal stream from the injection tube.

7. The power system of Claim 6 wherein the non-injector reservoir and the injector tube of the injector system are both aligned along an axis at an angle greater than zero from a horizontal axis that is transverse to the Earth's gravitational axis.

8. The power system of Claim 7 wherein the angle is in the range of 25° to 90°.

9. The power system of Claim 1 wherein the injector reservoir comprises an electrode in contact with the molten metal therein, and the non-injector reservoir comprises an electrode that makes contact with the molten metal provided by the injector system.

10. The power system of Claim 9 wherein the ignition system comprises a source of electrical power to supply opposite voltages to the injector and non-injector reservoir electrodes that supplies current and power flow through the stream of molten metal to cause the reaction of the reactants to form a plasma inside of the vessel.

11. The power system of Claim 10 wherein the source of electrical power comprises at least one supercapacitor.

12. The power system of Claim 1, wherein the injector reservoir is in fluid communication with a first electromagnetic pump and the non-injector reservoir is in fluid communication with a second electromagnetic pump, wherein each electromagnetic pump independently comprises one of a

a. DC or AC conduction type comprising a DC or AC current source supplied to the molten metal through electrodes and a source of constant or in-phase alternating vector-crossed magnetic field, or

b. induction type comprising a source of alternating magnetic field through a shorted loop of molten metal that induces an alternating current in the metal and a source of in-phase alternating vector-crossed magnetic field.

13. The power system of Claim 1 wherein a current from the molten metal ignition system power is in the range of 10 A to 50,000 A.

14. The power system of Claim 13 wherein the circuit of the molten metal ignition system is closed by the molten metal stream to cause ignition to further cause an ignition frequency in the range of 0 Hz to 10,000 Hz.

15. The power system of Claim 1 wherein the molten metal comprises at least one of silver, silver-copper alloy, and copper.

16. The power system of Claim 1 wherein the molten metal has a melting point below 700 °C.

17. The power system of Claim 16 wherein the molten metal comprises at least one of bismuth, lead, tin, indium, cadmium, gallium, antimony, or alloys such as Rose's metal, Cerrosafe, Wood's metal, Field's metal, Cerrolow 136, Cerrolow 117, Bi-Pb-Sn-Cd-In-Tl, and Galinstan.

18. The power system of Claim 1 further comprising a vacuum pump and at least one heat exchanger.

19. The power system of Claim 1 wherein at least one reservoir comprises boron nitride.

20. The power system of Claim 1 wherein the reactants comprise a vessel gas comprising at least one of hydrogen, oxygen, and water.

21. The power system of Claim 20 wherein the vessel gas further comprises an inert gas.

22. The power system of Claim 21 further comprising a reactants supply and an inert gas supply wherein the supplies maintain the vessel gas at a pressure in the range of 0.01 Torr to 200 atm.

23. The power system of Claim 1 wherein the at least one power converter or output system of the reaction power output comprises at least one of the group of a thermophotovoltaic converter, a photovoltaic converter, a photoelectronic converter, a magnetohydrodynamic converter, a plasmadynamic converter, a thermionic converter, a thermoelectric converter, a Sterling engine, a supercritical $CO_2$ cycle converter, a Brayton cycle converter, an external-combustor type Brayton cycle engine or converter, a Rankine cycle engine or converter, an organic Rankine cycle converter, an internal-combustion type engine, and a heat engine, a heater, and a boiler.

24. The power system of Claim 1 wherein the vessel comprises a light transparent photovoltaic (PV) window to transmit light from the inside of the vessel to a photovoltaic converter and at least one of a vessel geometry and at least one baffle to cause a pressure gradient to at least partially prevent the molten metal from coating the PV window.

25. The power system of Claim 1 wherein the vessel geometry comprises a decreasing cross sectional area towards the PV window.

26. The power system of Claim 23 comprising concentrator photovoltaic cells that comprise at least one compound chosen from crystalline silicon, germanium, gallium arsenide (GaAs), gallium antimonide (GaSb), indium gallium arsenide (InGaAs), indium gallium arsenide antimonide (InGaAsSb), indium phosphide arsenide antimonide (InPAsSb), InGaP/InGaAs/Ge; InAlGaP/AlGaAs/GaInNAsSb/Ge; GaInP/GaAsP/SiGe; GaInP/GaAsP/Si; GaInP/GaAsP/Ge; GaInP/GaAsP/Si/SiGe; GaInP/GaAs/InGaAs; GaInP/GaAs/GaInNAs; GaInP/GaAs/InGaAs/InGaAs; GaInP/Ga(In)As/InGaAs; GaInP-GaAs-wafer-InGaAs; GaInP-Ga(In)As-Ge; GaInP-GaInAs-Ge; a Group III nitride; GaN; AlN; GaAlN, and InGaN.

27. The power system of Claim 23 wherein the magnetohydrodynamic power converter comprises a nozzle connected to the reaction vessel, a magnetohydrodynamic channel, electrodes, magnets, a metal collection system, a metal recirculation system, a heat exchanger, and optionally a gas recirculation system.

28. The power system of Claims 1 or 27 wherein at least one component of the power system comprises at least one of a ceramic and a metal.

29. The power system of Claim 28 wherein the ceramic comprises at least one of a metal oxide, alumina, zirconia, magnesia, hafnia, silicon carbide, zirconium carbide, zirconium diboride, silicon nitride, and a glass ceramic.

30. The power system of Claim 28 wherein the metal comprises at least one of a stainless steel and a refractory metal.

31. The power system of Claim 27 wherein the molten metal comprises silver and the magnetohydrodynamic converter further comprises a source of oxygen to form silver particles nanoparticles and accelerate the nanoparticles through magnetohydrodynamic nozzle to impart a kinetic energy inventory of the power produced in the vessel.

32. The power system of Claim 31 wherein the reactants supply system additionally supplies and controls the source of oxygen to form the silver nanoparticles.

33. The power system of Claim 31 wherein at least a portion of the kinetic energy inventory of the silver nanoparticles is converted to electrical energy in the magnetohydrodynamic channel, the nanoparticles coalesce as molten metal in the metal collection system, the molten metal at least partially absorbs the oxygen, the metal comprising absorbed oxygen is returned to the injector reservoir by the metal recirculation system, and the oxygen is released by the plasma in the vessel.

34. The power system of Claim 33 wherein plasma is maintained in the magnetohydrodynamic channel and metal collection system to enhance the absorption of the oxygen by the molten metal.

35. The power system of Claims 12 wherein the electromagnetic pump comprises a two-stage pump comprising a first stage that comprises a pump of the metal recirculation system, and a second stage that comprises the pump of the metal injector system.

36. The power system of Claim 1 wherein the hydrogen product formed by reaction of the atomic hydrogen and catalyst comprises at least one of the following products:

a. a hydrogen product with a Raman peak at 1900 to 2000 $cm^{-1}$;

b. a hydrogen product with a plurality of Raman peaks spaced at an integer multiple of 0.23 to 0.25 eV;

c. a hydrogen product with an infrared peak at 1900 to 2000 $cm^{-1}$;

d. a hydrogen product with a plurality of infrared peaks spaced at an integer multiple of 0.23 to 0.25 eV;

e. a hydrogen product with at a plurality of UV fluorescence emission spectral peaks in the range of 200 to 300 nm having a spacing at an integer multiple of 0.23 to 0.3 eV;

f. a hydrogen product with a plurality of electron-beam emission spectral peaks in the range of 200 to 300 nm having a spacing at an integer multiple of 0.2 to 0.3 eV;

g. a hydrogen product with a plurality of Raman spectral peaks in the range of 5000 to 20,000 $cm^{-1}$ having a spacing at an integer multiple of $1000 \pm 200$ $cm^{-1}$;

h. a hydrogen product with a X-ray photoelectron spectroscopy peak at an energy in the range of 490 to 525 eV;

i. a hydrogen product that causes an upfield MAS NMR matrix shift;

j. a hydrogen product that has an upfield MAS NMR or liquid NMR shift of greater than -5 ppm relative to TMS;

k. a hydrogen product comprising macro-aggregates or polymers $H_n$ (n is an integer greater than 3);

l. a hydrogen product comprising macro-aggregates or polymers $H_n$ (n is an integer greater than 3) having a time of flight secondary ion mass spectroscopy (ToF-SIMS) peak of 16.12 to 16.13;

m. a hydrogen product comprising a metal hydride wherein the metal comprises at least one of Zn, Fe, Mo, Cr, Cu, and W;

n. a hydrogen product comprising at least one of $H_{16}$ and $H_{24}$;

o. a hydrogen product comprising an inorganic compound $M_xX_y$ and $H_2$ wherein M is a cation and X in an anion having at least one of electrospray ionization time of flight secondary ion mass spectroscopy (ESI-ToF) and time of flight secondary ion mass spectroscopy (ToF-SIMS) peaks of $M(M_xX_yH_2)n$ wherein n is an integer;

p. a hydrogen product comprising at least one of $K_2CO_3H_2$ and $KOHH_2$ having at least one of electrospray ionization time of flight secondary ion mass spectroscopy (ESI-ToF) and time of flight secondary ion mass spectroscopy (ToF-SIMS) peaks of $K\left(K_2H_2CO_3\right)_n^+$ and $K\left(KOHH_2\right)_n^+$, respectively;

q. a magnetic hydrogen product comprising a metal hydride wherein the metal comprises at least one of Zn, Fe, Mo, Cr, Cu, W, and a diamagnetic metal;

r. a hydrogen product comprising a metal hydride wherein the metal comprises at least one of Zn, Fe, Mo, Cr, Cu, W, and a diamagnetic metal that demonstrates magnetism by magnetic susceptometry;

s. a hydrogen product comprising a metal that is not active in electron paramagnetic resonance (EPR) spectroscopy wherein the EPR spectrum comprises at least one of very high g factors, very low g factors, extraordinary line width, and proton splitting;

t. a hydrogen product comprising a hydrogen molecular dimer wherein the EPR spectrum shows at least one peak at 2800-3100 G and $\Delta H$ of 10 G to 500 G;

u. a hydrogen product comprising a gas having a negative gas chromatography peak with hydrogen carrier;

v. a hydrogen product having a quadrupole moment/e of $\frac{1.70127\,a_0^2}{p^2} \pm 10\%$ wherein p is an integer;

w. a protonic hydrogen product comprising a molecular dimer having an end over end rotational energy for the integer J to J + 1 transition in the range of (J+1)44.30 $cm^{-1}$ ±20 $cm^{-1}$ wherein the corresponding rotational energy of the molecular dimer comprising deuterium is ½ that of the dimer comprising protons;

x. a hydrogen product comprising molecular dimers having at least one parameter

from the group of (i) a separation distance of hydrogen molecules of 1.028 Å $\pm 10\%$, (ii) a vibrational energy between hydrogen molecules of 23 $cm^{-1}$ $\pm 10\%$, and (iii) a van der Waals energy between hydrogen molecules of 0.0011 eV $\pm 10\%$;

y. a hydrogen product comprising a solid having at least one parameter from the group of (i) a separation distance of hydrogen molecules of 1.028 Å $\pm 10\%$, (ii) a vibrational energy between hydrogen molecules of 23 $cm^{-1}$ $\pm 10\%$, and (iii) a van der Waals energy between hydrogen molecules of 0.019 eV $\pm 10\%$;

z. a hydrogen product having at least one of

1. FTIR and Raman spectral signatures of (i) (J+1)44.30 $cm^{-1}$ $\pm 20$ $cm^{-1}$, (ii) (J+1)22.15 $cm^{-1}$ $\pm 10$ $cm^{-1}$ and (iii) 23 $cm^{-1}$ $\pm 10\%$;

2. an X-ray or neutron diffraction pattern showing a hydrogen molecule separation of 1.028 Å $\pm 10\%$, and

3. a calorimetric determination of the energy of vaporization of 0.0011 eV $\pm 10\%$ per molecular hydrogen;

aa. a solid hydrogen product having at least one of

1. FTIR and Raman spectral signatures of (i) (J+1)44.30 cm-1 $\pm 20$ cm-1, (ii) (J+1)22.15 cm-1 $\pm 10$ cm-1 and (iii) 23 cm-1 $\pm 10\%$;

2. an X-ray or neutron diffraction pattern showing a hydrogen molecule separation of 1.028 Å $\pm 10\%$, and

3. a calorimetric determination of the energy of vaporization of 0.019 eV $\pm 10\%$ per molecular hydrogen.

37. The power system of Claim 1 wherein the hydrogen product formed by reaction of the atomic hydrogen and catalyst has at least one of the following:

a. the hydrogen product has a Fourier transform infrared spectrum (FTIR) comprising at least one of the $H_2(1/4)$ rotational energy at 1940 $cm^{-1}$ $\pm 10\%$ and libation bands in the finger print region wherein other high energy features are absent;

b. the hydrogen product has a proton magic-angle spinning nuclear magnetic resonance spectrum ($^1$H MAS NMR) comprising an upfield matrix peak;

c. the hydrogen product has a thermal gravimetric analysis (TGA) result showing the decomposition of at least one of a metal hydride and a hydrogen polymer in the temperature region of 100 °C to 1000 °C;

d. the hydrogen product has an e-beam excitation emission spectrum comprising the $H_2(1/4)$ ro-vibrational band in the 260 nm region comprising a plurality of peaks spaced at 0.23 eV to 0.3 eV from each other;

e. the hydrogen product has an e-beam excitation emission spectrum comprising the $H_2(1/4)$ ro-vibrational band in the 260 nm region comprising a plurality of peaks spaced at 0.23 eV to 0.3 eV from each other wherein the peaks decrease in intensity at cryo-temperatures in the range of 0 K to 150 K;

f. the hydrogen product has a photoluminescence Raman spectrum comprising the second order of the $H_2(1/4)$ ro-vibrational band in the 260 nm region comprising a plurality of peaks spaced at 0.23 eV to 0.3 eV from each other;

g. the hydrogen product has a photoluminescence Raman spectrum comprising the second order of the $H_2(1/4)$ ro-vibrational band comprising a plurality of peaks in the range of 5000 to 20,000 $cm^{-1}$ having a spacing at an integer multiple of 1000 $\pm 200$ $cm^{-1}$;

h. the hydrogen product has a Raman spectrum comprising the $H_2(1/4)$ rotational peak at 1940 $cm^{-1}$ $\pm 10\%$;

i. the hydrogen product has an X-ray photoelectron spectrum (XPS) comprising the total energy of $H_2(1/4)$ at 490-500 eV;

j. the hydrogen product comprises macro-aggregates or polymers $H(1/4)_n$ (n is an integer greater than 3);

k. the hydrogen product comprises macro-aggregates or polymers $H(1/4)_n$ (n is an integer greater than 3) having a time of flight secondary ion mass spectroscopy (ToF-SIMS) peak of 16.12 to 16.13;

l. the hydrogen product comprises a metal hydride wherein the metal comprises at least one of Zn, Fe, Mo, Cr, Cu, and W and the hydrogen comprises H(1/4);

m. the hydrogen product comprises at least one of $H(1/4)_{16}$ and $H(1/4)_{24}$;

n. the hydrogen product comprises an inorganic compound $M_xX_y$ and $H(1/4)_2$ wherein M is a cation and X is an anion and at least one of the electrospray ionization time of flight secondary ion mass spectrum (ESI-ToF) and the time of flight secondary ion mass spectrum (ToF-SIMS) comprises peaks of $M(M_xX_yH(1/4)_2)n$ wherein n is an integer;

o. the hydrogen product comprises at least one of $K_2CO_3H(1/4)_2$ and $KOHH(1/4)_2$

and at least one of the electrospray ionization time of flight secondary ion mass spectrum (ESI-ToF) and the time of flight secondary ion mass spectrum (ToF-SIMS) comprises peaks of $K\left(K_2H_2CO_3\right)_n^+$ and $K\left(KOHH_2\right)_n^+$, respectively;

p. the hydrogen product is magnetic and comprises a metal hydride wherein the metal comprises at least one of Zn, Fe, Mo, Cr, Cu, W, and a diamagnetic metal, and the hydrogen is H(1/4);

q. the hydrogen product comprises a metal hydride wherein the metal comprises at least one of Zn, Fe, Mo, Cr, Cu, W, and a diamagnetic metal and H is H(1/4) wherein the product demonstrates magnetism by magnetic susceptometry;

r. the hydrogen product comprises a metal that is not active in electron paramagnetic resonance (EPR) spectroscopy wherein the EPR spectrum shows at least one peak at 2800-3100 G and ΔH of 10 to 500 G;

s. the hydrogen product comprises a $[H_2(1/4)]_2$ wherein the EPR spectrum shows at least one peak at 2800-3100 G and ΔH of 10 G to 500 G;

t. the hydrogen product comprises or releases $H_2(1/4)$ gas having a negative gas chromatography peak with hydrogen carrier;

u. the hydrogen product comprises $H_2(1/4)$ having a quadrupole moment/e of $\frac{1.70127 a_0^2}{4^2} \pm 10$;

v. the hydrogen product comprises $[H_2(1/4)]_2$ or $[D_2(1/4)]_2$ having an end over end rotational energy for the integer J to J + 1 transition in the range of (J+1)44.30 $cm^{-1}$ ±20 $cm^{-1}$ and (J+1)22.15 $cm^{-1}$ ±10 $cm^{-1}$, respectively;

w. the hydrogen product comprising $[H_2(1/4)]_2$ having at least one parameter from the group of (i) a separation distance of $H_2(1/4)$ molecules of 1.028 Å $\pm 10\%$, (ii) a vibrational energy between $H_2(1/4)$ molecules of 23 $cm^{-1}$ $\pm 10\%$, and (iii) a van der Waals energy between $H_2(1/4)$ molecules of 0.0011 eV $\pm 10\%$, and

x. the hydrogen product comprising a solid of $H_2(1/4)$ molecules having at least one parameter from the group of (i) a separation distance of $H_2(1/4)$ molecules of 1.028 Å $\pm 10\%$, (ii) a vibrational energy between $H_2(1/4)$ molecules of 23 $cm^{-1} \pm 10\%$, and (iii) a van der Waals energy between $H_2(1/4)$ molecules of 0.019 eV $\pm 10\%$;

y. the $[H_2(1/4)]_2$ product having at least one of

1. FTIR and Raman spectral signatures of (i) (J+1)44.30 cm-1 $\pm 20$ cm-1, (ii) (J+1)22.15 cm-1 $\pm 10$ cm-1 and (iii) 23 cm-1 $\pm 10\%$;

2. an X-ray or neutron diffraction pattern showing a H2(1/4) molecule separation of 1.028 Å $\pm 10\%$, and

3. a calorimetric determination of the energy of vaporization of 0.0011 eV $\pm 10\%$ per H2(1/4), and

z. the solid $H_2$(1/4) product having at least one of

1. FTIR and Raman spectral signatures of (i) (J+1)44.30 cm-1 $\pm 20$ cm-1, (ii) (J+1)22.15 cm-1 $\pm 10$ cm-1 and (iii) 23 cm-1 $\pm 10\%$;

2. an X-ray or neutron diffraction pattern showing a hydrogen molecule separation of 1.028 Å $\pm 10\%$, and

3. a calorimetric determination of the energy of vaporization of 0.019 eV $\pm 10\%$ per H2(1/4).

38. The power system of Claim 36 wherein the hydrogen product formed by reaction of the atomic hydrogen and catalyst comprises an oxyanion compound.

39. The power system of Claim 36 wherein the anion of hydrogen compound product formed by reaction of the atomic hydrogen and catalyst comprises at least one or more singly negatively charged anions, halide ion, hydroxide ion, hydrogen carbonate ion, nitrate ion, double negatively charged anions, are carbonate ion, oxide, and sulfate ion.

40. The power system of Claim 39 wherein the compound comprises the hydrogen product is embedded in a salt lattice.

41. The power system of Claim 40 wherein the salt lattice comprises at least one of an alkali salt, an alkali halide, an alkali hydroxide, alkaline earth salt, an alkaline earth halide, and an alkaline earth hydroxide.

42. The power system according to claim 1, wherein said ignition system comprises an electrode system comprising:

a. a first electrode attached to the injector reservoir and a second electrode attached to the non-injector reservoir;

b. the stream of the molten metal (*e.g.*, molten silver, molten gallium, etc.) in electrical contact with said first and second electrodes;

c. a circulation system comprising the molten metal pump to draw said molten metal

from the injector reservoir and convey it through a conduit (*e.g.*, a tube) to produce said stream of molten metal exiting said conduit; and

d. the source of electrical power configured to provide an electrical potential difference between said first and second electrodes;

wherein said molten metal stream is in simultaneous contact with said first and second electrodes to create an electrical current between said electrodes.

43. The power system according to claim 42, wherein said electrical power is sufficient to create an arc current.