

What Is Claimed Is:

1. An electrochemical power system that generates at least one of electricity and thermal energy comprising a vessel, the vessel comprising
at least one cathode;
at least one anode;
at least one bipolar plate, and
reactants comprising at least two components chosen from:
 - a) at least one source of H_2O ;
 - b) a source of oxygen;
 - c) at least one source of catalyst or a catalyst comprising at least one of the group chosen from $n\text{H}$, O , O_2 , OH , $\text{OH}^\cdot$, and nascent H_2O , wherein n is an integer, and
 - d) at least one source of atomic hydrogen or atomic hydrogen;
one or more reactants to form at least one of the source of catalyst, the catalyst, the source of atomic hydrogen, and the atomic hydrogen, and
one or more reactants to initiate the catalysis of atomic hydrogen,
the electrochemical power system further comprising an electrolysis system and an anode regeneration system.
2. The electrochemical power system of Claim 1 wherein at least one reactant is formed during cell operation with separate electron flow and ion mass transport.
3. The electrochemical power system of Claim 1 comprising at least one of a porous electrode, a gas diffusion electrode, and a hydrogen permeable anode, wherein at least one of oxygen and H_2O is supplied to the cathode and H_2 is supplied to the anode.
4. The electrochemical power system of Claim 3 comprising at least one of a hydrided anode and a closed hydrogen reservoir having at least one surface comprising a hydrogen permeable anode.
5. The electrochemical power system of Claim 3 comprising back-to-back hydrogen permeable anodes with counter cathodes comprising a unit of a stack of cells that are electrically connected in at least one manner of series and parallel.
6. The electrochemical power system of Claim 3 further comprising at least one gas supply system each comprising a manifold, gas line, and gas channels connected to the electrode.
7. The electrochemical power system of Claim 1 wherein the anode comprises Mo that is regenerated during the charging phase from electrolyte reactants performing the regeneration reaction steps of :
$$\text{MoO}_3 + 3\text{MgBr}_2 \text{ to } 2\text{MoBr}_3 + 3\text{MgO} \text{ (-54 kJ/mole (298 K) -46 (600K))}$$

MoBr_3 to $\text{Mo} + 3/2\text{Br}_2$ (284 kJ/mole 0.95V/3 electrons)

$\text{MoBr}_3 + \text{Ni}$ to $\text{MoNi} + 3/2\text{Br}_2$ (283 kJ/mole 0.95V/3 electrons)

$\text{MgO} + \text{Br}_2 + \text{H}_2$ to $\text{MgBr}_2 + \text{H}_2\text{O}$ (-208 kJ/mole (298 K) -194 kJ/mole (600

K)).

8. The electrochemical power system of Claim 1 wherein the anode comprises Mo that is regenerated during the charging phase from electrolyte reactants comprising at least one of MoO_2 , MoO_3 , Li_2O , and Li_2MoO_4 .

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

at least one vessel;

reactants comprising:

a) at least one source of catalyst or a catalyst comprising nascent H_2O ;

b) at least one source of atomic hydrogen or atomic hydrogen;

c) at least one of a conductor and a conductive matrix; and

at least one set of electrodes to confine the hydride reactants,

a source of electrical power to deliver a short burst of high-current electrical energy;

a reloading system;

at least one system to regenerate the initial reactants from the reaction products, and

at least one direct plasma to electricity converter and at least one thermal to electric power converter.

10. The power system of Claim 9 wherein the vessel is capable of a pressure of at least one of atmospheric, above atmospheric, and below atmospheric.

11. The power system of Claim 9 wherein reactants comprise a source of H_2O and a conductive matrix to form at least one of the source of catalyst, the catalyst, the source of atomic hydrogen, and the atomic hydrogen.

12. A power system of Claim 11 wherein the reactants comprising a source of H_2O comprise at least one of bulk H_2O , a state other than bulk H_2O , a compound or compounds that undergo at least one of react to form H_2O and release bound H_2O .

13. A power system of Claim 12 wherein the bound H_2O comprises a compound that interacts with H_2O wherein the H_2O is in a state of at least one of absorbed H_2O , bound H_2O , physisorbed H_2O , and waters of hydration.

14. A power system of Claim 9 wherein the reactants comprise a conductor and one or more compounds or materials that undergo at least one of release of bulk H_2O , absorbed H_2O , bound H_2O , physisorbed H_2O , and waters of hydration, and have H_2O as a

reaction product.

15. The power system of Claim 9 wherein at least one of the source of nascent H_2O catalyst and the source of atomic hydrogen comprises at least one of:

- a) at least one source of H_2O ;
- b) at least one source of oxygen, and
- c) at least one source of hydrogen.

16. The power system of Claim 9 wherein the reactants to form at least one of the source of catalyst, the catalyst, the source of atomic hydrogen, and the atomic hydrogen comprise at least one of

H_2O and the source of H_2O ;

O_2 , H_2O , HOOH , $\text{OOH}^\cdot$, peroxide ion, superoxide ion, hydride, H_2 , a halide, an oxide, an oxyhydroxide, a hydroxide, a compound that comprises oxygen, a hydrated compound, a hydrated compound selected from the group of at least one of a halide, an oxide, an oxyhydroxide, a hydroxide, a compound that comprises oxygen, and

a conductive matrix.

17. A power system of Claim 16 wherein the oxyhydroxide comprises at least one from the group of TiOOH , GdOOH , CoOOH , InOOH , FeOOH , GaOOH , NiOOH , AlOOH , CrOOH , MoOOH , CuOOH , MnOOH , ZnOOH , and SmOOH ;

the oxide comprises at least one from the group of CuO , Cu_2O , CoO , Co_2O_3 , Co_3O_4 , FeO , Fe_2O_3 , NiO , and Ni_2O_3 ;

the hydroxide comprises at least one from the group of $\text{Cu}(\text{OH})_2$, $\text{Co}(\text{OH})_2$, $\text{Co}(\text{OH})_3$, $\text{Fe}(\text{OH})_2$, $\text{Fe}(\text{OH})_3$, and $\text{Ni}(\text{OH})_2$;

the compound that comprises oxygen comprises at least one from the group of a sulfate, phosphate, nitrate, carbonate, hydrogen carbonate, chromate, pyrophosphate, persulfate, perchlorate, perbromate, and periodate, MXO_3 , MXO_4 (M = metal such as alkali metal such as Li , Na , K , Rb , Cs ; X = F , Br , Cl , I), cobalt magnesium oxide, nickel magnesium oxide, copper magnesium oxide, Li_2O , alkali metal oxide, alkaline earth metal oxide, CuO , CrO_4 , ZnO , MgO , CaO , MoO_2 , TiO_2 , ZrO_2 , SiO_2 , Al_2O_3 , NiO , FeO , Fe_2O_3 , TaO_2 , Ta_2O_5 , VO , VO_2 , V_2O_3 , V_2O_5 , P_2O_3 , P_2O_5 , B_2O_3 , NbO , NbO_2 , Nb_2O_5 , SeO_2 , SeO_3 , TeO_2 , TeO_3 , WO_2 , WO_3 , Cr_3O_4 , Cr_2O_3 , CrO_2 , CrO_3 , CoO , Co_2O_3 , Co_3O_4 , FeO , Fe_2O_3 , NiO , Ni_2O_3 , rare earth oxide, CeO_2 , La_2O_3 , an oxyhydroxide, TiOOH , GdOOH , CoOOH , InOOH , FeOOH , GaOOH , NiOOH , AlOOH , CrOOH , MoOOH , CuOOH , MnOOH , ZnOOH , and SmOOH , and

the conductive matrix comprises at least one from the group of a metal powder, carbon, carbide, boride, nitride, carbonitrile such as TiCN , or nitrile.

18. The power system of Claim 9 wherein the reactants comprise a mixture of a metal, its metal oxide, and H_2O wherein the reaction of the metal with H_2O is not thermodynamically favorable.
19. The power system of Claim 9 wherein the reactants comprise a mixture of a metal, a metal halide, and H_2O wherein the reaction of the metal with H_2O is not thermodynamically favorable.
20. The power system of Claim 9 wherein the reactants comprise a mixture of a transition metal, an alkaline earth metal halide, and H_2O wherein the reaction of the metal with H_2O is not thermodynamically favorable.
21. A power system of Claim 9 wherein the reactants comprise a mixture of a conductor, a hygroscopic material, and H_2O .
22. The power system of Claim 9 or 21 wherein the conductor comprises a metal powder or carbon powder wherein the reaction of the metal or carbon with H_2O is not thermodynamically favorable.
23. The power system of Claim 21 wherein the hygroscopic material comprises at least one of the group of lithium bromide, calcium chloride, magnesium chloride, zinc chloride, potassium carbonate, potassium phosphate, carnallite such as $\text{KMgCl}_3 \cdot 6(\text{H}_2\text{O})$, ferric ammonium citrate, potassium hydroxide and sodium hydroxide and concentrated sulfuric and phosphoric acids, cellulose fibers, sugar, caramel, honey, glycerol, ethanol, methanol, diesel fuel, methamphetamine, a fertilizer chemical, a salt, a desiccant, silica, activated charcoal, calcium sulfate, calcium chloride, a molecular sieves, a zeolite, a deliquescent material, zinc chloride, calcium chloride, potassium hydroxide, sodium hydroxide and a deliquescent salt.
24. The power system of Claim 23 comprising a mixture of a conductor, hygroscopic materials, and H_2O wherein the ranges of relative molar amounts of (metal), (hygroscopic material), (H_2O) are at least one of about (0.000001 to 100000), (0.000001 to 100000), (0.000001 to 100000); (0.00001 to 10000), (0.00001 to 10000), (0.00001 to 10000); (0.0001 to 1000), (0.0001 to 1000), (0.0001 to 1000); (0.001 to 100), (0.001 to 100), (0.001 to 100); (0.01 to 100), (0.01 to 100), (0.01 to 100); (0.1 to 10), (0.1 to 10), (0.1 to 10); and (0.5 to 1), (0.5 to 1), (0.5 to 1).
25. The power system of Claims 18, 19, 20, or 22 wherein the metal having a thermodynamically unfavorable reaction with H_2O is at least one of the group of Cu, Ni, Pb, Sb, Bi, Co, Cd, Ge, Au, Ir, Fe, Hg, Mo, Os, Pd, Re, Rh, Ru, Se, Ag, Tc, Te, Tl, Sn, W, Al, V, Zr, Ti, Mn, Zn, Cr, and In.
26. The power system of Claim 25 wherein reactants are regenerated by addition of H_2O .

27. The power system of Claim 9 wherein the reactants comprise a mixture of a metal, its metal oxide, and H_2O wherein the metal oxide is capable of H_2 reduction at a temperature less than 1000°C .

28. The power system of Claim 9 wherein the reactants comprise a mixture of an oxide that is not easily reduced with H_2 and mild heat;
a metal having an oxide capable of being reduced to the metal with H_2 at a temperature less than 1000°C , and
 H_2O .

29. The power system of Claims 27 or 28 wherein the metal having an oxide capable of being reduced to the metal with H_2 at a temperature less than 1000°C is at least one of the group of Cu, Ni, Pb, Sb, Bi, Co, Cd, Ge, Au, Ir, Fe, Hg, Mo, Os, Pd, Re, Rh, Ru, Se, Ag, Tc, Te, Tl, Sn, W, Al, V, Zr, Ti, Mn, Zn, Cr, and In.

30. The power system of Claim 28 wherein the metal oxide that is not easily reduced with H_2 , and mild heat comprises at least one of alumina, an alkaline earth oxide, and a rare earth oxide.

31. The power system of Claim 9 wherein the solid fuel comprises carbon or activated carbon and H_2O wherein the mixture is regenerated by rehydration comprising addition of H_2O .

32. The power system of Claim 9 wherein the reactants comprise at least one of a slurry, solution, emulsion, composite, and a compound.

33. The power system of Claim 9 wherein the H_2O mole % content may be in the range of at least one of about 0.000001% to 100%, 0.00001% to 100%, 0.0001% to 100%, 0.001% to 100%, 0.01% to 100%, 0.1% to 100%, 1% to 100%, 10% to 100%, 0.1% to 50%, 1% to 25%, and 1% to 10%.

34. The power system of Claim 9 wherein the current of the source of electrical power to deliver a short burst of high-current electrical energy is sufficient enough to cause the hydrino reactants to undergo the reaction to form hydrinos at a very high rate.

35. The power system of Claim 9 wherein the source of electrical power to deliver a short burst of high-current electrical energy comprises at least one of the following:

a voltage selected to cause a high AC, DC, or an AC-DC mixture of current that is in the range of at least one of 100 A to 1,000,000 A, 1 kA to 100,000 A, 10 kA to 50 kA;

a DC or peak AC current density in the range of at least one of 100 A/cm^2 to 1,000,000 A/cm^2 , 1000 A/cm^2 to 100,000 A/cm^2 , and 2000 A/cm^2 to 50,000 A/cm^2 ;

the voltage is determined by the conductivity of the solid fuel or energetic material wherein the voltage is given by the desired current times the resistance of the solid fuel or energetic material sample;

the DC or peak AC voltage may be in at least one range chosen from about 0.1 V to 500 kV, 0.1 V to 100 kV, and 1 V to 50 kV, and

the AC frequency may be in the range of about 0.1 Hz to 10 GHz, 1 Hz to 1 MHz, 10 Hz to 100 kHz, and 100 Hz to 10 kHz.

36. The power system of Claim 9 wherein the resistance of the solid fuel or energetic material sample is in at least one range chosen from about 0.001 milliohm to 100 Mohm, 0.1 ohm to 1 Mohm, and 10 ohm to 1 kohm, and

the conductivity of a suitable load per electrode area active to form hydridos is in at least one range chosen from about 10^{-10} ohm⁻¹ cm⁻² to 10^6 ohm⁻¹ cm⁻², 10^{-5} ohm⁻¹ cm⁻² to 10^6 ohm⁻¹ cm⁻², 10^{-4} ohm⁻¹ cm⁻² to 10^5 ohm⁻¹ cm⁻², 10^{-3} ohm⁻¹ cm⁻² to 10^4 ohm⁻¹ cm⁻², 10^{-2} ohm⁻¹ cm⁻² to 10^3 ohm⁻¹ cm⁻², 10^{-1} ohm⁻¹ cm⁻² to 10^2 ohm⁻¹ cm⁻², and 1 ohm⁻¹ cm⁻² to 10 ohm⁻¹ cm⁻².

37. The power system of Claim 9 wherein the regeneration system comprises at least one of a hydration, thermal, chemical, and electrochemical system.

38. The power system of Claim 9 wherein the at least one direct plasma to electricity converter comprises at least one of the group of plasmadynamic power converter, $\vec{E} \times \vec{B}$ direct converter, magnetohydrodynamic power converter, magnetic mirror magnetohydrodynamic power converter, charge drift converter, Post or Venetian Blind power converter, gyrotron, photon bunching microwave power converter, and photoelectric converter, and

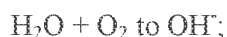
the at least one thermal to electricity converter comprises at least one of the group of a heat engine, a steam engine, a steam turbine and generator, a gas turbine and generator, a Rankine-cycle engine, a Brayton-cycle engine, a Stirling engine, a thermionic power converter, and a thermoelectric power converter.

39. An electrochemical power system comprising a vessel, the vessel comprising
at least one cathode;
at least one anode;
at least one electrolyte;
at least two reactants chosen from:
a) at least one source of catalyst or a catalyst comprising nascent H_2O ;
b) at least one source of atomic hydrogen or atomic hydrogen;
c) at least one of a source of a conductor, a source of a conductive matrix, a conductor, and a conductive matrix, and
at least one current source to produce a current comprising at least one of a high ion and electron current chosen from an internal current source and an external current source;
wherein the electrochemical power system generates at least one of electricity and thermal energy.
40. The electrochemical power system of Claim 39 wherein at least one of the source of nascent H_2O catalyst and the source of atomic hydrogen comprises:
a) at least one source of H_2O ;
b) at least one source of oxygen, and
c) at least one source of hydrogen.
41. The electrochemical power system of Claim 40 further comprising one or more solid fuel reactants to form at least one of the conductor, source of catalyst, the catalyst, the source of atomic hydrogen, and the atomic hydrogen.
42. The electrochemical power system of Claim 41 wherein the reactants undergo reaction during cell operation with separate electron flow in an external circuit and electron flow and ion mass transport within the reactants.
43. The electrochemical power system of Claim 39 wherein the reaction of the catalyst with atomic H causes a decrease in the cell voltage as the cell current increases.
44. The electrochemical power system of Claim 41 wherein at least one of an excess voltage, current, and electrical power to those applied or generated internally is produced by the formation of at least one of HOH catalyst and H by the flow of a high current.
45. The electrochemical power system of Claim 41 wherein a voltage and electrical power is produced by the formation of at least one of HOH catalyst, H, and a conductor capable of carrying high current by at least one electrochemical reaction.
46. The electrochemical power system of Claim 42, 44, or 45 wherein a high current enhances the rate of reaction of the catalyst with atomic H.

47. The electrochemical power system of Claim 41 wherein the electrochemical reaction involves an electron transfer with at least one electrode of the cell.
48. The electrochemical power system of Claim 39 further comprising at least one bipolar plate.
49. The electrochemical power system of Claim 39 further comprising at least one of an electrolysis system and an anode regeneration system.
50. The electrochemical power system of Claim 39 comprising at least one of
- a) a porous electrode,
 - b) a gas diffusion electrode,
 - c) a hydrogen permeable anode, wherein at least one of oxygen and H_2O is supplied to the cathode and H_2 is supplied to the anode,
 - d) a cathode comprising at least one of an oxyhydroxide, an oxide, nickel oxide, lithiated nickel oxide, nickel, and
 - e) an anode comprising Ni, Mo, or a Mo alloy such as MoCu, MoNi, or MoCo, and a hydride.
51. The electrochemical power system of Claim 50 further comprising at least one gas supply system comprising a manifold, a gas line, and at least one gas channel connected to the electrode.
52. The electrochemical power system of Claim 50 wherein the hydride is $LaNi_5H_x$ and the cathode is at least one of $TiOOH$, $GdOOH$, $CoOOH$, $InOOH$, $FeOOH$, $GaOOH$, $NiOOH$, $AlOOH$, $CrOOH$, $MoOOH$, $CuOOH$, $MnOOH$, $ZnOOH$, $SmOOH$, and MnO_2 .
53. The electrochemical power system of Claim 41 wherein the current comprising at least one of ion and electron current is carried by the electrolyte.
54. The electrochemical power system of Claim 41 wherein the current is carried by electrochemical reactions between at least one of the electrolyte, reactants, and the electrodes.
55. The electrochemical power system of Claim 54, wherein at least one species of the electrolyte may optionally comprise at least one reactant.
56. The electrochemical power system of Claim 41 wherein the electron current flows through a conductor of the electrolyte.
57. The electrochemical power system of Claim 41 wherein the conductor is formed by a reduction reaction during electron current flow at an electrode.
58. The electrochemical power system of Claim 41 wherein the electrolyte comprises metal ions.
59. The electrochemical power system of Claim 58 wherein the metal ions are

reduced during current flow to form a conductive metal.

60. The electrochemical power system of Claim 41 wherein the current carrying reduction electrochemical reaction is at least one of metal ion to a metal;



a metal oxide + H_2O to at least one of the metal oxyhydroxide and metal hydroxide and OH^- , and



wherein the ion current carrier is OH^- .

61. The electrochemical power system of Claim 60 wherein the anode comprises H.

62. The electrochemical power system of Claim 61 wherein the H_2O is formed by oxidation of the OH^- and reaction with H at the anode.

63. The electrochemical power system of Claim 61 wherein source of H at the anode comprises at least one of a metal hydride, LaNi_5H_x , H_2 formed by electrolysis on the anode, H_2 supplied as a gas, and H_2 supplied through a hydrogen permeable membrane.

64. The electrochemical power system of Claim 39 wherein the ion current is carried by at least one of ions comprising oxygen, of ions comprising oxygen and hydrogen, OH^- , OOH^- , O^{2-} , and O_2^{2-} .

65. The electrochemical power system of Claim 39 wherein the electrolyte comprises at least one of the source of oxygen, the source of hydrogen, H_2O , the source of HOH catalyst, and the source of H.

66. The electrochemical power system of Claim 39 wherein the electrolyte comprises at least one electrolyte chosen from:

at least one aqueous alkali metal hydroxide;

saturated aqueous KOH;

at least one molten hydroxide;

at least one eutectic salt mixture;

at least one mixture of a molten hydroxide and at least one other compound;

at least one mixture of a molten hydroxide and a salt;

at least one mixture of a molten hydroxide and halide salt;

at least one mixture of an alkaline hydroxide and an alkaline halide;

at least one of the group of molten LiOH-LiBr , LiOH-NaOH , LiOH-LiBr-NaOH , LiOH-LiX-NaOH , LiOH-LiX , NaOH-NaBr , NaOH-NaI , NaOH-NaX , and KOH-KX , wherein X represents a halide);

at least one acid, and

at least one of HCl , H_3PO_4 , and H_2SO_4 .

67. The electrochemical power system of Claim 41 wherein solid fuel reactants comprise a source of H_2O and a conductive matrix to form at least one of the source of catalyst, the catalyst, the source of atomic hydrogen, and the atomic hydrogen.

68. A electrochemical power system of Claim 41 wherein the solid fuel reactants comprising a source of H_2O comprise at least one of bulk H_2O , a state other than bulk H_2O , a compound or compounds that undergo at least one of react to form H_2O and release bound H_2O .

69. A electrochemical power system of Claim 68 wherein the bound H_2O comprises a compound that interacts with H_2O wherein the H_2O is in a state of at least one of absorbed H_2O , bound H_2O , physisorbed H_2O , and waters of hydration.

70. A electrochemical power system of Claim 41 wherein the solid fuel reactants comprise a conductor and one or more compounds or materials that undergo at least one of release of bulk H_2O , absorbed H_2O , bound H_2O , physisorbed H_2O , and waters of hydration, and have H_2O as a reaction product.

71. The electrochemical power system of Claim 41 wherein the reactants to form at least one of the source of catalyst, the catalyst, the source of atomic hydrogen, and the atomic hydrogen comprise at least one of

H_2O and the source of H_2O ;

O_2 , H_2O , HOOH , $\text{OOH}^\cdot$, peroxide ion, superoxide ion, hydride, H_2 , a halide, an oxide, an oxyhydroxide, a hydroxide, a compound that comprises oxygen, a hydrated compound, a hydrated compound selected from the group of at least one of a halide, an oxide, an oxyhydroxide, a hydroxide, a compound that comprises oxygen, and

a conductive matrix.

72. A electrochemical power system of Claim 71 wherein the oxyhydroxide comprises at least one from the group of TiOOH , GdOOH , CoOOH , InOOH , FeOOH , GaOOH , NiOOH , AlOOH , CrOOH , MoOOH , CuOOH , MnOOH , ZnOOH , and SmOOH ;

the oxide comprises at least one from the group of CuO , Cu_2O , CoO , Co_2O_3 , Co_3O_4 , FeO , Fe_2O_3 , NiO , and Ni_2O_3 ;

the hydroxide comprises at least one from the group of $\text{Cu}(\text{OH})_2$, $\text{Co}(\text{OH})_2$, $\text{Co}(\text{OH})_3$, $\text{Fe}(\text{OH})_2$, $\text{Fe}(\text{OH})_3$, and $\text{Ni}(\text{OH})_2$;

the compound that comprises oxygen comprises at least one from the group of a sulfate, phosphate, nitrate, carbonate, hydrogen carbonate, chromate, pyrophosphate, persulfate, perchlorate, perbromate, and periodate, MXO_3 , MXO_4 ($\text{M} \neq$ metal such as alkali metal such as Li , Na , K , Rb , Cs ; $\text{X} = \text{F}$, Br , Cl , I), cobalt magnesium oxide, nickel magnesium oxide, copper magnesium oxide, Li_2O , alkali

metal oxide, alkaline earth metal oxide, CuO, CrO₄, ZnO, MgO, CaO, MoO₂, TiO₂, ZrO₂, SiO₂, Al₂O₃, NiO, FeO, Fe₂O₃, TaO₂, Ta₂O₅, VO, VO₂, V₂O₃, V₂O₅, P₂O₃, P₂O₅, B₂O₃, NbO, NbO₂, Nb₂O₅, SeO₂, SeO₃, TeO₂, TeO₃, WO₂, WO₃, Cr₃O₄, Cr₂O₃, CrO₂, CrO₃, CoO, Co₂O₃, Co₃O₄, FeO, Fe₂O₃, NiO, Ni₂O₃, rare earth oxide, CeO₂, La₂O₃, an oxyhydroxide, TiOOH, GdOOH, CoOOH, InOOH, FeOOH, GaOOH, NiOOH, AlOOH, CrOOH, MoOOH, CuOOH, MnOOH, ZnOOH, and SmOOH, and

the conductive matrix comprises at least one from the group of a metal powder, carbon, carbide, boride, nitride, carbonitrile such as TiCN, or nitrile.

73. The electrochemical power system of Claim 41 wherein the reactants constitute hydrino reactants comprising a mixture of a metal, a metal halide, and H₂O.

74. The electrochemical power system of Claim 41 wherein the reactants constitute hydrino reactants comprising a mixture of a transition metal, an alkaline earth metal halide, and H₂O.

75. The electrochemical power system of Claim 41 wherein the reactants constitute hydrino reactants comprising a mixture of a conductor, hygroscopic materials, and H₂O.

76. The electrochemical power system of Claim 75 wherein the conductor comprises a metal powder or carbon powder.

77. The electrochemical power system of Claim 75 wherein the hygroscopic material comprises at least one of the group of lithium bromide, calcium chloride, magnesium chloride, zinc chloride, potassium carbonate, potassium phosphate, carnallite such as KMgCl₃·6(H₂O), ferric ammonium citrate, potassium hydroxide and sodium hydroxide and concentrated sulfuric and phosphoric acids, cellulose fibers, sugar, caramel, honey, glycerol, ethanol, methanol, diesel fuel, methamphetamine, a fertilizer chemical, a salt, a desiccant, silica, activated charcoal, calcium sulfate, calcium chloride, a molecular sieves, a zeolite, a deliquescent material, zinc chloride, calcium chloride, potassium hydroxide, sodium hydroxide and a deliquescent salt.

78. The electrochemical power system of Claim 75 comprising a mixture of a conductor, a hygroscopic material, and H₂O wherein the ranges of relative molar amounts of (metal), (hygroscopic material), (H₂O) are at least one of about (0.000001 to 100000 metal), (0.000001 to 100000 hygroscopic material), (0.000001 to 100000 H₂O); about (0.00001 to 10000 metal), (0.00001 to 10000 hygroscopic material), (0.00001 to 10000 H₂O); about (0.0001 to 1000 metal), (0.0001 to 1000 hygroscopic material), (0.0001 to 1000 H₂O); about (0.001 to 100 metal), (0.001 to 100 hygroscopic material), (0.001 to 100 H₂O); about (0.01 to 100 metal), (0.01 to 100 hygroscopic material), (0.01 to 100 H₂O); about (0.1 to 10 metal), (0.1 to 10 hygroscopic material), (0.1 to 10 H₂O); and about (0.5 to 1 metal), (0.5 to 1

hydroscopic material), (0.5 to 1 H₂O).

79. The electrochemical power system of Claim 39 wherein the reactants constitute hydrino reactants comprising at least one of a slurry, solution, emulsion, composite, and a compound.

80. The power system of Claim 41 wherein the H₂O mole % content is in the range of at least one of about 0.000001% to 100%, 0.00001% to 100%, 0.0001% to 100%, 0.001% to 100%, 0.01% to 100%, 0.1% to 100%, 1% to 100%, 10% to 100%, 0.1% to 50%, 1% to 25%, and 1% to 10%.

81. The power system of Claim 39 wherein the current of the internal and external current source is sufficiently high to cause the hydrino reactants to undergo the reaction to form hydrinos at a very high rate.

82. The electrochemical power system of Claim 39 wherein the current source chosen from an internal current source and an external current source comprises:

a voltage selected to cause a DC, AC, or an AC-DC mixture of current that is in the range of at least one of 1 A to 50 kA, 10 A to 10 kA, and 10 A to 1 kA;

a DC or peak AC current density in the range of at least one of 1 A/cm² to 50 kA/cm², 10 A/cm² to 10 kA/cm², and 10 A/cm² to 1 kA/cm²;

the voltage is determined by the conductivity of the electrolyte wherein the voltage is given by the desired current times the resistance of the electrolyte comprising a conductor;

the DC or peak AC voltage may be in at least one range chosen from about 0.1 V to 100 V, 0.1 V to 10 V, and 1 V to 5 V, and

the AC frequency may be in the range of about 0.1 Hz to 1 GHz, 1 Hz to 1 MHz, 10 Hz to 100 kHz, and 100 Hz to 10 kHz.

83. The electrochemical power system of Claim 39 wherein at least one electrical discharge arc forms between the electrodes.

84. The electrochemical power system of Claim 39 wherein the resistance of the electrolyte is in at least one range chosen from about 0.001milliohm to 10 ohm and 0.01 ohm to 1 ohm, and the resistance of the electrolyte per electrode area active to form hydrinos is in at least one range chosen from about 0.001milliohm/cm² to 10 ohm/cm² and 0.01 ohm/cm² to 1 ohm/cm².

85. The electrochemical power system of Claim 39 further comprising a heat exchanger on an exterior cell surface; the heat exchanger further comprising a coolant input and a coolant outlet.

86. The electrochemical power system of Claim 39 further comprising at least one thermal to electricity converter comprising at least one of the group chosen from a heat

engine, a steam engine, a steam turbine and generator, a gas turbine and generator, a Rankine- cycle engine, a Brayton-cycle engine, a Stirling engine, a thermionic power converter, and a thermoelectric power converter.

87. The electrochemical power system of Claim 39 wherein the combination of the cathode, anode, reactants, and external current source permit the catalysis of atomic hydrogen to form hydrinos to propagate that maintains a contribution to the current between each cathode and corresponding anode.

88. A water arc plasma power system comprising:
at least one closed reaction vessel;
reactants comprising at least one of source of H_2O and H_2O ;
at least one set of electrodes;
a source of electrical power to deliver an initial high breakdown voltage of the H_2O and provide a subsequent high current, and
a heat exchanger system,
wherein the power system generates arc plasma, light, and thermal energy.
89. The water arc plasma power system of Claim 88 wherein the H_2O serves a reactant comprising:
- a source of catalyst or a catalyst comprising nascent H_2O ;
 - a source of atomic hydrogen or atomic hydrogen, and
 - a plasma medium.
90. The water arc plasma power system of Claim 88 further comprising a plasma medium comprising at least one of H_2O and trace ions.
91. The water arc plasma power system of Claim 88 wherein arc plasma is generated and causes the reactants to undergo a reaction to form hydrinos at a very high rate.
92. The water arc plasma power system of Claim 88 wherein H_2O is the source of HOH catalyst and H that are formed by arc plasma.
93. The water arc plasma power system of Claim 88 wherein H_2O is present as at least one of liquid and gaseous states at the standard conditions of a liquid and gaseous mixture according to the H_2O phase diagram for the operating temperatures and pressures in the range of about 1°C to 2000°C and 0.01 atm to 200 atm, respectively.
94. The water arc plasma power system of Claim 88 wherein the plasma medium comprises a source of ions comprising at least one of a dissolved ionic and a salt compound that causes the medium to be more conductive to achieve arc breakdown at a lower voltage.
95. The water arc plasma power system of Claim 88 wherein the high breakdown voltage is in the range of at least one of about 50 V to 100 kV, 1 kV to 50 kV, and 1 kV to 30 kV.
96. The water arc plasma power system of Claim 88 wherein the high current has a limit in the range of at least one of about 1 kA to 100 kA, 2 kA to 50 kA, and 10 kA to 30 kA.
97. The water arc plasma power system of Claim 88 wherein the source of electrical power provides a high discharge current density in the range of at least one of 0.1 A/cm^2 to $1,000,000 \text{ A/cm}^2$, 1 A/cm^2 to $1,000,000 \text{ A/cm}^2$, 10 A/cm^2 to $1,000,000 \text{ A/cm}^2$, 100

A/cm² to 1,000,000 A/cm², and 1 kA/cm² to 1,000,000 A/cm².

98. The water arc plasma power system of Claim 88 wherein the high voltage and current may be at least one of DC, AC, and mixtures thereof.

99. The water arc plasma power system of Claim 88 wherein the source of electrical power to form arc plasma comprises a plurality of capacitors comprising a bank of capacitors capable of supplying high voltage in the range of about 1 kV to 50 kV and a high current that increases as the resistance and voltage decreases.

100. The water arc plasma power system of Claim 88 further comprising a secondary power source.

101. The water arc plasma power system of Claim 88 comprising at least one of additional power circuit elements and a secondary high current power source.

102. The water arc plasma power system of Claim 101 wherein the source of electrical power comprises a plurality of banks of capacitors that sequentially supply power to the arc wherein each discharged bank of capacitors is recharged by the secondary power source as a given charged bank of capacitors is discharged.

103. The water arc plasma power system of Claim 88 wherein the closed vessel further comprises a boiler comprising a steam outlet, a return, and a recirculation pump wherein at least one H₂O phase comprising at least one of heated water, super-heated water, steam, and super-heated steam flow out the steam outlet and supply a thermal or mechanical load,

at least one the processes of cooling of the outlet flow and condensation of steam occurs with thermal power transfer to the load,

the cooled steam or water is pumped by the recirculation pump, and

the cooled steam or water is returned to the cell through the return.

104. The water arc plasma power system of Claim 103 further comprising at least one thermal-to-electric converter to receive thermal power from at least one of the boiler and the heat exchanger.

105. The water arc plasma power system of Claim 104 wherein the at least one thermal-to-electric converter comprises at least one of the group chosen from a heat engine, a steam engine, a steam turbine and generator, a gas turbine and generator, a Rankine-cycle engine, a Brayton-cycle engine, a Stirling engine, a thermionic power converter, and a thermoelectric power converter.

106. A mechanical power system comprising:
at least one piston cylinder of an internal combustion-type engine;
a fuel comprising:
a) at least one source of catalyst or a catalyst comprising nascent H_2O ;
b) at least one source of atomic hydrogen or atomic hydrogen;
c) at least one of a conductor and a conductive matrix;
at least one fuel inlet with at least one valve;
at least one exhaust outlet with at least one valve;
at least one piston;
at least one crankshaft;
a high current source, and
at least two electrodes that confine and conduct a high current through the
fuel.
107. The mechanical power system of Claim 106 further comprising at least one
gas or a source of gas.
108. The mechanical power system of Claim 107 wherein the gas or source of gas
is heated.
109. The mechanical power system of Claim 106 wherein the piston cylinder is
capable of a pressure of at least one of atmospheric, above atmospheric, and below
atmospheric during different phases of a reciprocating cycle.
110. The mechanical power system of Claim 106 wherein at least one of the piston
or piston cylinder may serve as a counter electrode for another electrode.
111. The mechanical power system of Claim 110 further comprising at least one
brush to provide electrical contact between the at least one piston and the high current source.
112. The mechanical power system of Claim 106 further comprising a generator
that is powered by the mechanical power of the engine.
113. The mechanical power system of Claim 112 wherein the generator provides
power to the high current source.
114. The mechanical power system of Claim 106 further comprising a fuel
regenerator.
115. The mechanical power system of Claim 106 wherein the piston of the system
undergoes a reciprocating motion.
116. The mechanical power system of Claim 106 wherein the system comprises a
two-stroke cycle comprising the steps of induction and compression, and ignition and
exhaust.
117. The mechanical power system of Claim 106 wherein the system comprises a

four-stroke cycle comprising the steps of power, exhaust, intake, and compression.

118. The mechanical power system of Claim 106 wherein the system comprises a rotary engine.

119. The mechanical power system of Claim 106 wherein the fuel flows into the piston chamber with the piston displaced.

120. The mechanical power system of Claim 106 wherein during the power stroke of a reciprocating cycle:

the compressed fuel is ignited;

the products and any additional added gas or source of gas is caused to be heated, and

the heated gases in the cylinder cause the piston to move in the cylinder and turn the crankshaft.

121. The mechanical power system of Claim 106 wherein fuel flows into the cylinder when the piston is displaced, becomes compressed by the returning piston before ignition, and products are exhausted after the power step by the returning displaced piston.

122. The mechanical power system of Claim 106 wherein exhaust gases are vented while the fuel flows into the cylinder, and the piston compresses the fuel before another ignition.

123. The mechanical power system of Claim 114 wherein the exhausted product may flow to the regeneration system.

124. The mechanical power system of Claim 107 wherein any additional gas or source of gas to assist in performance of conversion of the heat from the ignition of the fuel is recovered, regenerated, and recycled.

125. The mechanical power system of Claim 106 wherein the fuel comprises a source of H_2O and a conductive matrix to form at least one of the source of catalyst, the catalyst, the source of atomic hydrogen, and the atomic hydrogen.

126. A mechanical power system of Claim 106 wherein the fuel comprises a source of H_2O comprise at least one of bulk H_2O , a state other than bulk H_2O , a compound or compounds that undergo at least one of react to form H_2O and release bound H_2O .

127. A mechanical power system of Claim 126 wherein the bound H_2O comprises a compound that interacts with H_2O wherein the H_2O is in a state of at least one of absorbed H_2O , bound H_2O , physisorbed H_2O , and waters of hydration.

128. A mechanical power system of Claim 106 wherein the fuel comprises a conductor and one or more compounds or materials that undergo at least one of release of bulk H_2O , absorbed H_2O , bound H_2O , physisorbed H_2O , and waters of hydration, and have H_2O as a reaction product.

129. The mechanical power system of Claim 106 wherein at least one of the source of nascent H₂O catalyst and the source of atomic hydrogen comprises at least one of:

- a) at least one source of H₂O;
- b) at least one source of oxygen, and
- c) at least one source of hydrogen.

130. The mechanical power system of Claim 106 wherein the fuel form at least one of the source of catalyst, the catalyst, the source of atomic hydrogen, and the atomic hydrogen comprise at least one of

- a) H₂O and the source of H₂O;
- b) O₂, H₂O, HOOH, OOH⁻, peroxide ion, superoxide ion, hydride, H₂, a halide, an oxide, an oxyhydroxide, a hydroxide, a compound that comprises oxygen, a hydrated compound, a hydrated compound selected from the group of at least one of a halide, an oxide, an oxyhydroxide, a hydroxide, a compound that comprises oxygen, and
- c) a conductive matrix.

131. A mechanical power system of Claim 130 wherein at least one of the following is present:

the oxyhydroxide comprises at least one group chosen from TiOOH, GdOOH, CoOOH, InOOH, FeOOH, GaOOH, NiOOH, AlOOH, CrOOH, MoOOH, CuOOH, MnOOH, ZnOOH, and SmOOH;

the oxide comprises at least one group chosen from CuO, Cu₂O, CoO, Co₂O₃, Co₃O₄, FeO, Fe₂O₃, NiO, and Ni₂O₃;

the hydroxide comprises at least one group chosen from Cu(OH)₂, Co(OH)₂, Co(OH)₃, Fe(OH)₂, Fe(OH)₃, and Ni(OH)₂;

the compound that comprises oxygen comprises at least one group chosen from a sulfate, phosphate, nitrate, carbonate, hydrogen carbonate, chromate, pyrophosphate, persulfate, perchlorate, perbromate, and periodate, MXO₃, MXO₄ (M = metal such as alkali metal such as Li, Na, K, Rb, Cs; X = F, Br, Cl, I), cobalt magnesium oxide, nickel magnesium oxide, copper magnesium oxide, Li₂O, alkali metal oxide, alkaline earth metal oxide, CuO, CrO₄, ZnO, MgO, CaO, MoO₂, TiO₂, ZrO₂, SiO₂, Al₂O₃, NiO, FeO, Fe₂O₃, TaO₂, Ta₂O₅, VO, VO₂, V₂O₃, V₂O₅, P₂O₃, P₂O₅, B₂O₃, NbO, NbO₂, Nb₂O₅, SeO₂, SeO₃, TeO₂, TeO₃, WO₂, WO₃, Cr₃O₄, Cr₂O₃, CrO₂, CrO₃, CoO, Co₂O₃, Co₃O₄, FeO, Fe₂O₃, NiO, Ni₂O₃, rare earth oxide, CeO₂, La₂O₃, an oxyhydroxide, TiOOH, GdOOH, CoOOH, InOOH, FeOOH, GaOOH, NiOOH, AlOOH, CrOOH, MoOOH, CuOOH, MnOOH, ZnOOH, and SmOOH, and

the conductive matrix comprises at least one from the group of a metal

powder, carbon, carbide, boride, nitride, carbonitrile such as TiCN, or nitrile.

132. The mechanical power system of Claim 106 wherein the fuel comprise a mixture of a metal, its metal oxide, and H_2O wherein the reaction of the metal with H_2O is not thermodynamically favorable.

133. The mechanical power system of Claim 106 wherein the fuel comprise a mixture of a metal, a metal halide, and H_2O wherein the reaction of the metal with H_2O is not thermodynamically favorable.

134. The mechanical power system of Claim 106 wherein the fuel comprise a mixture of a transition metal, an alkaline earth metal halide, and H_2O wherein the reaction of the metal with H_2O is not thermodynamically favorable.

135. A mechanical power system of Claim 106 wherein the fuel comprise a mixture of a conductor, a hygroscopic material, and H_2O .

136. The mechanical power system of Claim 135 wherein the conductor comprises a metal powder or carbon powder wherein the reaction of the metal or carbon with H_2O is not thermodynamically favorable.

137. The mechanical power system of Claim 135 wherein the hygroscopic material comprises at least one of the group of lithium bromide, calcium chloride, magnesium chloride, zinc chloride, potassium carbonate, potassium phosphate, carnallite such as $KMgCl_3 \cdot 6(H_2O)$, ferric ammonium citrate, potassium hydroxide and sodium hydroxide and concentrated sulfuric and phosphoric acids, cellulose fibers, sugar, caramel, honey, glycerol, ethanol, methanol, diesel fuel, methamphetamine, a fertilizer chemical, a salt, a desiccant, silica, activated charcoal, calcium sulfate, calcium chloride, a molecular sieves, a zeolite, a deliquescent material, zinc chloride, calcium chloride, potassium hydroxide, sodium hydroxide and a deliquescent salt.

138. The mechanical power system of Claim 135 comprising a mixture of a conductor, hygroscopic materials, and H_2O wherein the ranges of relative molar amounts of (metal), (hygroscopic material), (H_2O) are at least one of about (0.000001 to 100000 metal), (0.000001 to 100000 hygroscopic material), (0.000001 to 100000 H_2O); (0.00001 to 10000 metal), (0.00001 to 10000 hygroscopic material), (0.00001 to 10000 H_2O); (0.0001 to 1000 metal), (0.0001 to 1000 hygroscopic material), (0.0001 to 1000 H_2O); (0.001 to 100 metal), (0.001 to 100 hygroscopic material), (0.001 to 100 H_2O); (0.01 to 100 metal), (0.01 to 100 hygroscopic material), (0.01 to 100 H_2O); (0.1 to 10 metal), (0.1 to 10 hygroscopic material), (0.1 to 10 H_2O); and (0.5 to 1 metal), (0.5 to 1 hygroscopic material), (0.5 to 1 H_2O).

139. The mechanical power system of Claims 132, 133, 134, or 136 wherein the metal having a thermodynamically unfavorable reaction with H_2O is chosen from at least one of of Cu, Ni, Pb, Sb, Bi, Co, Cd, Ge, Au, Ir, Fe, Hg, Mo, Os, Pd, Re, Rh, Ru, Se, Ag, Tc, Te,

Tl, Sn, W, Al, V, Zr, Ti, Mn, Zn, Cr, and In.

140. The mechanical power system of Claim 139 wherein the fuel is regenerated by addition of H_2O .

141. The mechanical power system of Claim 106 wherein the fuel comprises a mixture of a metal, its metal oxide, and H_2O wherein the metal oxide is capable of H_2 reduction at a temperature less than 1000 °C.

142. The mechanical power system of Claim 106 wherein the fuel comprises a mixture of

- a) an oxide that is not easily reduced with H_2 and mild heat;
- b) a metal having an oxide capable of being reduced to the metal with H_2 at a temperature less than 1000 °C, and
- c) H_2O .

143. The mechanical power system of Claims 141 or 142 wherein the metal having an oxide capable of being reduced to the metal with H_2 at a temperature less than 1000 °C is chosen from at least one of Cu, Ni, Pb, Sb, Bi, Co, Cd, Ge, Au, Ir, Fe, Hg, Mo, Os, Pd, Re, Rh, Ru, Se, Ag, Tc, Te, Tl, Sn, W, Al, V, Zr, Ti, Mn, Zn, Cr, and In.

144. The mechanical power system of Claims 141 or 142 wherein the metal oxide that is not easily reduced with H_2 , and mild heat comprises at least one of alumina, an alkaline earth oxide, and a rare earth oxide.

145. The mechanical power system of Claim 114 wherein the fuel comprises carbon or activated carbon and H_2O wherein the mixture is regenerated by rehydration comprising addition of H_2O .

146. The mechanical power system of Claim 106 wherein the fuel comprises at least one of a slurry, solution, emulsion, composite, and a compound.

147. The mechanical power system of Claim 106 wherein the H_2O mole % content is in the range of at least one of about 0.000001% to 100%, 0.00001% to 100%, 0.0001% to 100%, 0.001% to 100%, 0.01% to 100%, 0.1% to 100%, 1% to 100%, 10% to 100%, 0.1% to 50%, 1% to 25%, and 1% to 10%.

148. The mechanical power system of Claim 106 wherein the current of the source of electrical power to deliver a short burst of high-current electrical energy is sufficient enough to cause the fuel to undergo the reaction to form hydrinos at a very high rate.

149. The mechanical power system of Claim 106 wherein the source of electrical power to deliver a short burst of high-current electrical energy is capable of a high voltage to achieve an H_2O arc plasma.

150. The mechanical power system of Claim 106 wherein the source of electrical power to deliver a short burst of high-current electrical energy comprises:

a voltage selected to cause a high AC, DC, or an AC-DC mixture of current that is in the range of at least one of 100 A to 1,000,000 A, 1 kA to 100,000 A, 10 kA to 50 kA; a DC or peak AC current density in the range of at least one of 100 A/cm² to 1,000,000 A/cm², 1000 A/cm² to 100,000 A/cm², and 2000 A/cm² to 50,000 A/cm², wherein

the voltage is determined by the conductivity of the fuel,

the voltage is given by the desired current times the resistance of the fuel;

the DC or peak AC voltage is in at least one range chosen from about 0.1 V to 500 kV, 0.1 V to 100 kV, and 1 V to 50 kV, and

the AC frequency is in the range of about 0.1 Hz to 10 GHz, 1 Hz to 1 MHz, 10 Hz to 100 kHz, and 100 Hz to 10 kHz.

151. The mechanical power system of Claim 106 wherein

the resistance of the fuel is in at least one range chosen from about 0.001 milliohm to 100 Mohm, 0.1 ohm to 1 Mohm, and 10 ohm to 1 kohm, and

the conductivity of a suitable load per electrode area active to form hydrinos is in at least one range chosen from about 10⁻¹⁰ ohm⁻¹ cm⁻² to 10⁶ ohm⁻¹ cm⁻², 10⁻⁵ ohm⁻¹ cm⁻² to 10⁶ ohm⁻¹ cm⁻², 10⁻⁴ ohm⁻¹ cm⁻² to 10⁵ ohm⁻¹ cm⁻², 10⁻³ ohm⁻¹ cm⁻² to 10⁴ ohm⁻¹ cm⁻², 10⁻² ohm⁻¹ cm⁻² to 10³ ohm⁻¹ cm⁻², 10⁻¹ ohm⁻¹ cm⁻² to 10² ohm⁻¹ cm⁻², and 1 ohm⁻¹ cm⁻² to 10 ohm⁻¹ cm⁻².

152. The mechanical power system of Claim 114 wherein the regeneration system comprises at least one of a hydration, thermal, chemical, and electrochemical system.

153. The mechanical power system of Claim 106 further comprising a heat exchanger on an exterior cylinder surface to remove heat produced by the cell and deliver it to a load;

the heat exchanger comprising a coolant input to receive cool coolant from a load and a coolant outlet to supply or return hot coolant to the load, wherein

the heat is used directly or converted to mechanical or electrical power using a corresponding converter, and

the at least one thermal to electricity converter comprises at least one of the group of a heat engine, a steam engine, a steam turbine and generator, a gas turbine and generator, a Rankine-cycle engine, a Brayton-cycle engine, a Stirling engine, a thermionic power converter, and a thermoelectric power converter.

154. A power generation system comprising:
an electrical power source of at least about 2,000 A/cm²;
a plurality of electrodes electrically coupled to the electrical power source;
a fuel loading region configured to receive a solid fuel, wherein the plurality of electrodes is configured to deliver electrical power to the solid fuel to produce a plasma; and
a plasma power converter positioned to receive at least a portion of the plasma.
155. The power generation system of claim 154 further comprising a catalyst-induced hydrino transition cell, wherein two of the plurality of electrodes are included in the catalyst induced hydrino transition cell.
156. The power generation system of claim 155 wherein the power generation system comprises a plurality of catalyst induced hydrino transition cells.
157. The power generation system of claim 154 wherein a first electrode of the plurality of electrodes is movable.
158. The power generation system of claim 157 wherein a second of the plurality of electrodes is movable, and wherein the first electrode and the second electrode change the size of the fuel loading region as they move.
159. The power generation system of claim 154 wherein at least a first of the plurality of electrodes includes a compression mechanism.
160. The power generation system of claim 159 wherein the compression mechanism is moveable.
161. The power generation system of claim 160 wherein at least a second of the plurality of electrodes includes a compression mechanism, and the compression mechanism of the first electrode and the compression mechanism of the second electrode interact with each other as they move.
162. The power generation system of claim 158 wherein the compression mechanisms include rotatable gears.
163. The power generation system of claim 158 wherein the compression mechanisms include rotatable rollers.
164. The power generation system of claim 154 further comprising a delivery mechanism for moving a fuel into the fuel loading region.
165. The power generation system of claim 164 wherein the delivery mechanism includes a carousel.
166. The power generation system of claim 164 wherein the delivery mechanism

includes a conveyor belt.

167. The power generation system of claim 164 wherein the delivery mechanism includes a hopper.

168. The power generation system of claim 164 wherein the delivery mechanism also moves the fuel out of the fuel loading region.

169. The power generation system of claim 154 wherein the plasma power converter includes at least one of a plasmadynamic power converter, a magnetohydrodynamic power converter, a magnetic mirror magnetohydrodynamic power converter, a charge drift converter, a Post or Venetian Blind power converter, a gyrotron, a photon-bunching microwave power converter, and a photoelectric converter.

170. The power generation system of claim 154 further comprising a removal system for removing a byproduct of the fuel from the fuel loading region, wherein the byproduct is produced when the plurality of electrodes delivers power to the fuel loading region.

171. The power generation system of claim 170 further comprising a delivery mechanism configured to move the fuel out of the fuel loading region.

172. The power generation system of claim 171 further comprising a regeneration system for processing the byproduct of the fuel.

173. The power generation system of claim 171 further comprising a condenser for condensing the byproduct of the fuel.

174. The power generation system of claim 154 further comprising an output power conditioner for altering a quality of the power converted by the plasma power converter.

175. The power generation system of claim 154 further comprising a temperature control system including a heat exchanger and a cooling line.

176. The power generation system of claim 154 further comprising a sensor configured to measure at least one parameter associated with the power generation system.

177. The power generation system of claim 154 further comprising a controller configured to monitor a parameter associated with the power generation system.

178. The power generation system of claim 177 wherein the controller is configured to control at least a process associated with the power generation system.

179. The power generation system of claim 178 further comprising one or more sensors configured to measure at least one parameter associated with the power generation system, wherein the controller is configured to control at least a process associated with the power generation system based on the at least one measured parameter.

180. The power generation system of claim 154 wherein the power source is an electrical power source of at least about 5,000 A/cm², at least about 12,000 A/cm², at least

about 14,000 A/cm², at least about 18,000 A/cm², or at least about 25,000 A/cm².

181. The power generation system of claim 154 wherein the power source is an electrical power source ranging from about 5,000 A/cm² to about 100,000 A/cm² or about 10,000 A/cm² to about 50,000 A/cm².

182. A power generation system, comprising:

a plurality of electrodes;

a fuel loading region located between the plurality of electrodes and configured to receive a conductive fuel, wherein the plurality of electrodes are configured to apply a current to the conductive fuel sufficient to ignite the conductive fuel and generate at least one of plasma and thermal power;

a delivery mechanism for moving the conductive fuel into the fuel loading region; and

a plasma-to-electric power converter configured to convert the plasma into a non-plasma form of power or a thermal to electric or mechanical converter to convert the thermal power into a nonthermal form of power comprising electricity or mechanical power.

183. The power generation system of claim 182 further comprising an output power conditioner for altering a quality of the power converted by the plasma-to-electric power converter.

184. The power generation system of claim 183 further comprising one or more output power terminals for outputting the power conditioned by the output power conditioner.

185. The power generation system of claim 182 wherein the non-plasma form of power includes at least one of mechanical, nuclear, chemical, thermal, electrical, and electromagnetic energy.

186. The power generation system of claim 182 further comprising a removal system for removing a byproduct of the ignited fuel and a regeneration system for recycling the byproduct of the ignited fuel.

187. The power generation system of claim 182 further comprising a controller and a sensor configured to measure at least one parameter associated with the power generation system, wherein the controller is configured to control at least a portion of the power generation system based on the at least one measured parameter.

188. A method of generating power, comprising:

delivering an amount of fuel to a fuel loading region, wherein the fuel loading region is located among a plurality of electrodes;

igniting the fuel by flowing a current of at least about 2,000 A/cm² through the fuel by applying the current to the plurality of electrodes to produce at least one of

plasma, light, and heat;

receiving at least a portion of the plasma in a plasma-to-electric converter;
converting the plasma to a different form of power using the plasma-to-

electric converter; and

outputting the different form of power.

189. The method of claim 188 further comprising removing an amount of fuel byproduct from the fuel loading region and regenerating at least a portion of the fuel byproduct.

190. The method of claim 188 further comprising removing at least a portion of the heat produced by the ignition process.

191. The method of claim 188 wherein outputting the different form of power includes delivering the power to an external load.

192. The method of claim 188 wherein outputting the different form of power includes delivering the power to a storage device.

193. The method of claim 188 wherein outputting the different form of power includes delivering a portion of the power to the plurality of electrodes.

194. A power generation system, comprising:

an electrical power source of at least about 5,000 kW;

a plurality of spaced apart electrodes, wherein the plurality of electrodes at least partially surround a fuel, are electrically connected to the electrical power source, are configured to receive a current to ignite the fuel, and at least one of the plurality of electrodes is moveable;

a delivery mechanism for moving the fuel; and

a plasma-to-electric power converter configured to convert plasma generated from the ignition of the fuel into a non-plasma form of power.

195. A power generation system, comprising:

an electrical power source of at least about 2,000 A/cm²;

a plurality of spaced apart electrodes, wherein the plurality of electrodes at least partially surround a fuel, are electrically connected to the electrical power source, are configured to receive a current to ignite the fuel, and at least one of the plurality of electrodes is moveable;

a delivery mechanism for moving the fuel; and

a plasma-to-electric power converter configured to convert plasma generated from the ignition of the fuel into a non-plasma form of power.

196. The power generation system of claims 194 or 195 further comprising:

an output power conditioner for altering a quality of the power converted by

the plasma-to-electric power converter; and
one or more output power terminals for outputting the power conditioned by the output power conditioner.

197. The power generation system of claims 194 or 195 wherein the power generation system includes two electrodes and both of the electrodes are moveable relative to each other to allow the delivery mechanism to move the fuel.

198. The power generation system of claims 194 or 195 wherein the plurality of electrodes is part of a catalyst induced hydrino transition cell.

199. The power generation system of claim 198 wherein the power generation system includes a plurality of catalyst induced hydrino transition cells, and each catalyst induced hydrino transition cell includes a pair of electrodes that surrounds a fuel loading region, wherein for at least one of the pairs of electrodes, the electrodes are moveable relative to each other to allow the delivery mechanism to deliver a fuel to the fuel loading region.

200. A power generation system, comprising:
an electrical power source of at least about 5,000 kW;
a plurality of spaced apart electrodes, wherein at least one of the plurality of electrodes includes a compression mechanism;
a fuel loading region configured to receive a fuel, wherein the fuel loading region is surrounded by the plurality of electrodes so that the compression mechanism of the at least one electrode is oriented towards the fuel loading region, and wherein the plurality of electrodes are electrically connected to the electrical power source and configured to supply power to the fuel received in the fuel loading region to ignite the fuel;
a delivery mechanism for moving the fuel into the fuel loading region; and
a plasma power converter configured to convert plasma generated from the ignition of the fuel into a non-plasma form of power.

201. A power generation system, comprising:
an electrical power source of at least about 2,000 A/cm²;
a plurality of spaced apart electrodes, wherein at least one of the plurality of electrodes includes a compression mechanism;
a fuel loading region configured to receive a fuel, wherein the fuel loading region is surrounded by the plurality of electrodes so that the compression mechanism of the at least one electrode is oriented towards the fuel loading region, and wherein the plurality of electrodes are electrically connected to the electrical power source and configured to supply power to the fuel received in the fuel loading region to ignite the fuel;

- a delivery mechanism for moving the fuel into the fuel loading region; and
a plasma power converter configured to convert plasma generated from the ignition of the fuel into a non-plasma form of power.
202. The power generation system of claim 48 further comprising:
an output power conditioner for altering a quality of the power converted by the plasma power converter; and
one or more output power terminals for outputting the power conditioned by the output power conditioner.
203. The power generation system of claims 200 or 201 wherein the compression mechanism is moveable.
204. The power generation system of claims 200 or 201 wherein each of the electrodes includes a compression mechanism and the compression mechanisms interact to promote electrical contact and ignition of the fuel.
205. The power generation system of claims 200 or 201 wherein the compression mechanism is rotatable.
206. The power generation system of claim 205 wherein the compression mechanism includes at least one of a gear and a roller.
207. A power generation system, comprising:
a plurality of electrodes;
a fuel loading region surrounded by the plurality of electrodes and configured to receive a fuel, wherein the plurality of electrodes is configured to ignite the fuel located in the fuel loading region,
a delivery mechanism for moving the fuel into the fuel loading region;
a plasma power converter configured to convert plasma generated from the ignition of the fuel into a non-plasma form of power;
a removal system for removing a byproduct of the ignited fuel; and
a regeneration system operably coupled to the removal system for recycling the removed byproduct of the ignited fuel into recycled fuel.
208. The power generation system of claim 207 further comprising a re-loading system operably coupled to the regeneration system for re-introducing the recycled fuel to the delivery mechanism for moving the recycled fuel into the fuel loading region.
209. The power generation system of claim 207 further comprising a condenser for condensing the byproduct of the fuel.
210. The power generation system of claim 207 further comprising a temperature control system including a heat exchanger and a cooling line, wherein the cooling line diverts a portion of heat generated by the ignition of the fuel in the fuel loading area to the

regeneration system.

211. A power generation system, comprising:
 - an electrical power source configured to output a current of at least about 2,000 A/cm²;
 - a plurality of spaced apart electrodes electrically connected to the electrical power source;
 - a fuel loading region configured to receive a fuel, wherein the fuel loading region is surrounded by the plurality of electrodes, and wherein the plurality of electrodes is configured to supply power to the fuel to ignite the fuel when received in the fuel loading region;
 - a delivery mechanism for moving the fuel into the fuel loading region;
 - a plasma-to-electric power converter configured to convert plasma generated from the ignition of the fuel into electrical power;
 - one or more output power terminals operably coupled to the plasma-to-electric power converter; and
 - a power storage device.
212. The power generation system of claim 211 further comprising one or more output power conditioners operably connected to the plasma-to-electric power converter for altering a quality of the power converted by the plasma-to-electric power converter.
213. The power generation system of claim 211 wherein the power storage device is operably connected to the one or more output power terminals to receive at least a portion of the power from the one or more output power terminals.
214. The power generation system of claim 211 wherein the power storage device is operably connected to the electrical power source and supplies power to the power source.
215. The power generation system of claim 214 wherein the power storage device supplies power to the electrical power source intermittently.
216. The power generation system of claim 211 wherein the one or more output power terminals are configured to deliver power to an external load.
217. The power generation system of claim 216 wherein the one or more output power terminals are further configured to deliver power to the power storage device.
218. The power generation system of claim 211 wherein the power storage device includes a battery.
219. A power generation system, comprising:
 - an electrical power source of at least 5,000 kW;
 - a plurality of spaced apart electrodes electrically connected to the electrical power source;

a fuel loading region configured to receive a fuel, wherein the fuel loading region is surrounded by the plurality of electrodes, and wherein the plurality of electrodes is configured to supply power to the fuel to ignite the fuel when received in the fuel loading region;

a delivery mechanism for moving the fuel into the fuel loading region;

a plasma power converter configured to convert plasma generated from the ignition of the fuel into a non-plasma form of power;

a sensor configured to measure at least one parameter associated with the power generation system; and

a controller configured to control at least a process associated with the power generation system.

220. A power generation system, comprising:

an electrical power source of at least $2,000 \text{ A/cm}^2$;

a plurality of spaced apart electrodes electrically connected to the electrical power source;

a fuel loading region configured to receive a fuel, wherein the fuel loading region is surrounded by the plurality of electrodes, and wherein the plurality of electrodes is configured to supply power to the fuel to ignite the fuel when received in the fuel loading region;

a delivery mechanism for moving the fuel into the fuel loading region;

a plasma power converter configured to convert plasma generated from the ignition of the fuel into a non-plasma form of power;

a sensor configured to measure at least one parameter associated with the power generation system; and

a controller configured to control at least a process associated with the power generation system.

221. The power generation system of claims 219 or 220 further comprising an output power conditioner operably connected to the plasma power converter for altering a quality of the power converted by the plasma power converter.

222. The power generation system of claims 219 or 220 wherein the controller is configured to control the process associated with the power generation system based on the at least one measured parameter.

223. The power generation system of claims 219 or 220 wherein the controller is configured to adjust a speed of the fuel delivery or ignition mechanism to control power output.

224. The power generation system of claims 219 or 220 wherein the controller is

configured to control movement of at least one of the spaced apart electrodes to control power output.

225. The power generation system of claims 219 or 220 wherein the power generation system is autonomous.

226. The power generation system of claim 225, further comprising:
a removal system for removing a byproduct of the ignited fuel;
a regeneration system operably coupled to the removal system for recycling the removed byproduct of the ignited fuel into recycled fuel; and
a re-loading system operably coupled to the regeneration system for re-introducing the recycled fuel to the delivery mechanism for moving the recycled fuel into the fuel loading region.

227. A power generation system, comprising:
an electrical power source of at least about 5,000 kW;
a plurality of spaced apart electrodes electrically connected to the electrical power source;
a fuel loading region configured to receive a fuel, wherein the fuel loading region is surrounded by the plurality of electrodes, and wherein the plurality of electrodes is configured to supply power to the fuel to ignite the fuel when received in the fuel loading region, and wherein a pressure in the fuel loading region is a partial vacuum;
a delivery mechanism for moving the fuel into the fuel loading region; and
a plasma-to-electric power converter configured to convert plasma generated from the ignition of the fuel into a non-plasma form of power.

228. A power generation system, comprising:
an electrical power source of at least about 2,000 A/cm²;
a plurality of spaced apart electrodes electrically connected to the electrical power source;
a fuel loading region configured to receive a fuel, wherein the fuel loading region is surrounded by the plurality of electrodes, and wherein the plurality of electrodes is configured to supply power to the fuel to ignite the fuel when received in the fuel loading region, and wherein a pressure in the fuel loading region is a partial vacuum;
a delivery mechanism for moving the fuel into the fuel loading region; and
a plasma-to-electric power converter configured to convert plasma generated from the ignition of the fuel into a non-plasma form of power.

229. The power generation system of claims 227 or 228 wherein a pressure within

the plasma-to-electric power converter is a partial vacuum.

230. The power generation system of claims 227 or 228 wherein the fuel loading region is housed within a vacuum vessel.

231. The power generation system of claim 230, wherein at least two of the plurality of electrodes are housed within the vacuum vessel.

232. The power generation system of claims 227 or 228 further comprising a vacuum pump.

233. The power generation system of claims 227 or 228 further comprising a catalyst induced hydrino transition cell, wherein the vessel of the catalyst induced hydrino transition cell surrounds a pair of the plurality of electrodes, and wherein a pressure within the catalyst induced hydrino transition cell is a partial vacuum greater than about 10^{-10} Torr.

234. A power generation cell, comprising:

an outlet port coupled to a vacuum pump;

a plurality of electrodes electrically coupled to an electrical power source of at least 5,000 kW;

a fuel loading region configured to receive a water-based fuel comprising a majority H_2O , wherein the plurality of electrodes is configured to deliver power to the water-based fuel to produce at least one of an arc plasma and thermal power; and

a power converter configured to convert at least a portion of at least one of the arc plasma and the thermal power into electrical power.

235. The cell of claim 234 further including at least one of a plasma-to-electric power converter and a thermal to electric power converter positioned to receive at least a portion of at least one of the arc plasma and the thermal power of the arc plasma.

236. The cell of claim 234 further including the vacuum pump.

237. The cell of claim 234 further including the electrical power source.

238. The cell of claim 234 wherein the fuel comprises at least one a metal oxide, a metal halide, and a hydroscopic material; at least one metal that is substantially non-reactive in an aqueous environment; and H_2O .

239. A power generation system, comprising:

an electrical power source of at least 5,000 A/cm²;

a plurality of electrodes electrically coupled to the electrical power source;

a fuel loading region configured to receive a water-based fuel comprising a majority H_2O , wherein the plurality of electrodes is configured to deliver power to the water-based fuel to produce at least one of an arc plasma and thermal power; and

a power converter configured to convert at least a portion of at least one of the arc plasma and the thermal power into electrical power.

240. The power generation system of claim 239 wherein the electrical power source is a power source of at least 10,000 A/cm², at least about 12,000 A/cm², at least about 14,000 A/cm², at least about 18,000 A/cm², or at least 20,000 A/cm².

241. The power generation system of claim 239 wherein the plurality of electrodes is configured to apply at least 4 kV to the water-based fuel.

242. The power generation system of claim 239 wherein the power source includes a plurality of capacitors.

243. The power generation system of claim 239 wherein the fuel comprises at least one a metal oxide, a metal halide, and a hygroscopic material; at least one metal selected from Cu, Ni, Pb, Sb, Bi, Co, Cd, Ge, Au, Ir, Fe, Hg, Mo, Os, Pd, Re, Rh, Ru, Se, Ag, Tc, Te, Tl, Sn, W, Al, V, Zr, Ti, Mn, Zn, Cr, and In; and H₂O.

244. The power generation system of claim 243 further including a fuel regeneration system configured to at least partially recover the product and regenerate it.

245. The power generation system of claim 239 wherein the power converter is a thermal-to-electric power converter.

246. The power generation system of claim 239 wherein the power converter includes a heat exchanger.

247. A method of generating power, comprising:

loading a fuel into a fuel loading region, wherein the fuel loading region includes a plurality of electrodes;

applying a current of at least about 2,000 A/cm² to the plurality of electrodes to ignite the fuel to produce at least one of an arc plasma and thermal power;

performing at least one of passing the arc plasma through a plasma-to-electric converter to generate electrical power; and passing the thermal power through a thermal-to-electric converter to generate electrical power; and

outputting at least a portion of the generated electrical power.

248. The method of claim 247 further including generating a vacuum in the fuel loading region.

249. The method of claim 247 further including delivering an inert gas to the fuel loading region.

250. The method of claim 247 further including removing oxygen from the fuel loading region.

251. A power generation system, comprising:

an electrical power source of at least 5,000 kW;

a plurality of electrodes electrically coupled to the power source, wherein the plurality of electrodes is configured to deliver electrical power to a water-based fuel

comprising a majority H₂O to produce a thermal power; and
a heat exchanger configured to convert at least a portion of the thermal power into electrical power.

252. The power generation system of claim 251 wherein the heat exchanger includes one or more of a power plant, a steam plant with a boiler, a turbine, and a generator.

253. A power generation system, comprising:
an electrical power source of at least 5,000 kW;
a plurality of spaced apart electrodes, wherein at least one of the plurality of electrodes includes a compression mechanism;
a fuel loading region configured to receive a water-based fuel comprising a majority H₂O, wherein the fuel loading region is surrounded by the plurality of electrodes so that the compression mechanism of the at least one electrode is oriented towards the fuel loading region, and wherein the plurality of electrodes are electrically connected to the electrical power source and configured to supply power to the water-based fuel received in the fuel loading region to ignite the fuel;
a delivery mechanism for moving the water-based fuel into the fuel loading region; and
a plasma power converter configured to convert plasma generated from the ignition of the fuel into a non-plasma form of power.

254. The power generation system of claim 253 further comprising:
an output power conditioner for altering a quality of the power converted by the plasma power converter; and
one or more output power terminals for outputting the power conditioned by the output power conditioner.

255. The power generation system of claim 253 wherein the compression mechanism is moveable.

256. The power generation system of claim 253 wherein each of the electrodes includes a compression mechanism and the compression mechanisms interact to promote ignition of the fuel.

257. The power generation system of claim 253 wherein the compression mechanism is rotatable.

258. The power generation system of claim 253 wherein the compression mechanism includes at least one of a gear and a roller.

259. A system for producing mechanical power, comprising:
an electrical power source of at least about 5,000 A;
an ignition chamber configured to produce at least one of plasma and thermal power;
a fuel delivery device configured to deliver a solid fuel to the ignition chamber;
a pair of electrodes coupled to the electrical power source and configured to supply power to the solid fuel to produce the at least one of plasma and thermal power; and
a piston located within the ignition chamber and configured to move relative to the ignition chamber to output mechanical power.
260. A system for producing mechanical power, comprising:
an electrical power source of at least about 5,000 A;
an ignition chamber configured to produce at least one of plasma and thermal power, wherein the ignition chamber includes an outlet port;
a fuel delivery device configured to deliver a solid fuel to the ignition chamber to produce at least one of the plasma and the thermal power;
a pair of electrodes coupled to the electrical power source and configured to supply power to the ignition chamber; and
a turbine in fluid communication with the outlet port and configured to rotate to output mechanical power.
261. A system for producing mechanical power, comprising:
an electrical power source of at least about 5,000 A;
an impeller configured to rotate to output mechanical power, wherein the impeller includes a hollow region configured to produce at least one of plasma and thermal power and the hollow region includes an intake port configured to receive a working fluid;
a fuel delivery device configured to deliver a solid fuel to the hollow region; and
a pair of electrodes coupled to the electrical power source and configured to supply power to the hollow region to ignite the solid fuel and produce at least one of the plasma and the thermal power.
262. A system for producing mechanical power, comprising:
an electrical power source of at least about 5,000 A;
a moveable element configured to rotate to output mechanical power, wherein the moveable element at least partially defines an ignition chamber configured to

produce at least one of plasma and thermal power;
a fuel delivery device configured to deliver a solid fuel to the ignition chamber; and
a pair of electrodes coupled to the electrical power source and configured to supply power to the solid fuel to produce at least one of the plasma and the thermal power.

263. The system of claims 259, 260, 261 or 262 wherein the electrical power source is at least about 10,000 A or at least about 14,000 A.

264. The system of claims 259, 260, 261 or 262 wherein the electrical power source is less than about 100 V, less than about 10 V, or less than about 8 V.

265. The system of claims 259, 260, 261 or 262 wherein the electrical power source is at least about 5,000 kW.

266. The system of claims 259, 260, 261 or 262 wherein the solid fuel comprises a portion of water, a portion of a water absorbing material, and a portion of a conducting element.

267. The system of claim 266, wherein the portion of water is at least about 30 mole% of the solid fuel.

268. The system of claim 266, wherein the portion of the water absorbing material is at least about 30 mole% of the solid fuel.

269. The system of claim 266, wherein the portion of the conducting element is at least about 30 mole% of the solid fuel.

270. The system of claims 259, 260, or 262 further including an intake port configured to deliver a working fluid to the ignition chamber.

271. The system of claim 270, wherein the working fluid includes at least one of air, H₂O, and an inert gas.

272. The system of claim 271, wherein the working fluid is delivered to the ignition chamber at a pressure of at least one of below atmospheric pressure, at atmospheric pressure, and above atmospheric pressure.

273. The system of of claims 259, 260, 261 or 262 wherein at least one of the pair of electrodes is electrically coupled to at least one of the piston and the ignition chamber.

274. The system of claims 259, 260, 261 or 262 wherein the fuel delivery device includes an injection device configured to inject at least a portion of the solid fuel into the ignition chamber.

275. The system of claim 274, wherein the injection device is configured to inject at least one of a gas, a liquid, and a solid particulate into the ignition chamber.

276. The system of claims 259, 260, 261 or 262 wherein the fuel delivery device

includes a carousel.

277. The system of claims 259, 260, 261 or 262 wherein at least one of the fuel delivery device and the pair of electrodes includes a receptacle configured to receive the solid fuel.

278. The system of of claims 259, 260, 261 or 262 further including at least one of a cooling system, a heating system, a vacuum system, and a plasma converter.

279. The system of claims 259, 260, 261 or 262 further including a regeneration system configured to at least one of capture, regenerate, and recycle one or more components produced by the ignition of the solid fuel.

280. The system of claim 260 wherein at least one of the pair of electrodes is electrically coupled to at least one of the turbine and the ignition chamber.

281. The system of claim 260 wherein the fuel delivery device includes an injection device configured to inject at least a portion of the solid fuel into the ignition chamber.

282. The system of claim 260 wherein the injection device is configured to inject at least one of a gas, a liquid, and a solid particulate into the ignition chamber.

283. The system of claim 261 wherein the impeller includes at least one blade configured to divert a flow of the working fluid.

284. The system of claim 283 wherein the working fluid includes at least one of air, H₂O, and an inert gas.

285. The system of claim 261 wherein the working fluid is delivered to the hollow region at a pressure of at least one of below atmospheric pressure, at atmospheric pressure, and above atmospheric pressure.

286. The system of claim 261 wherein at least one of the pair of electrodes is electrically coupled to at least one of the impeller and the hollow region.

287. The system of claim 261 wherein the fuel delivery device includes an injection device configured to inject at least a portion of the solid fuel into the hollow region.

288. The system of claim 262 wherein the injection device is configured to inject at least one of a gas, a liquid, and a solid particulate into the hollow region.

289. The system of claim 288 wherein the moveable element forms at least part of a first electrode of the pair of electrodes.

290. The system of claim 289 wherein a second moveable element forms at least part of a second electrode of the pair of electrodes.

291. The system of claim 262 wherein the moveable element includes a receptacle configured to receive the fuel.

292. The system of claim 262 wherein the moveable element includes a nozzle fluidly coupled to the ignition chamber and configured to direct a flow of at least one of

plasma and thermal power.

293. The system of claim 262 wherein the moveable element is configured to move in at least one of a linear, an arcuate, and a rotational direction.

294. The system of claim 262 wherein the moveable element includes at least one of a gear and a roller.

295. A system for producing mechanical power comprising:
an electrical power source of at least about 5,000 A;
a plurality of ignition chambers, wherein each of the plurality of ignition chambers is configured to produce at least one of plasma and thermal power;
a fuel delivery device configured to deliver a solid fuel to the plurality of ignition chambers; and
a plurality of electrodes coupled to the electrical power source, wherein at least one of the plurality of electrodes is associated with at least one of the plurality of ignition chambers and configured to supply electrical power to the solid fuel to produce at least one of the plasma and the thermal power.

296. The system of claim 295 wherein the fuel delivery device includes a carousel configured to rotate relative to at least one of the plurality of ignition chambers.

297. The system of claim 295 wherein at least one of the plurality of ignition chambers is fluidly coupled to at least one of a piston, a turbine, an impeller, a gear, and a roller.

298. The system of claim 295 wherein the plurality of ignition chambers are configured to rotate relative to the fuel delivery device.

299. The system of claim 295 further including a plurality of fuel delivery devices.

300. The system of claim 295 further including a plurality of electrical power sources, wherein at least one of the plurality of electrical power sources is electrically coupled to at least one of the plurality of electrodes.

301. The system of claim 295 further including a controller configured to control a supply of electrical power to the plurality of electrodes.

302. The system of claim 301 wherein the controller is configured to control a movement of the fuel delivery device.

303. The system of claim 301 wherein the controller is configured to control a movement of the plurality of ignition chambers.

304. A system for producing mechanical power comprising:
an electrical power source of at least about 5,000 A;
an ignition chamber configured to produce at least one of arc plasma and thermal power;

a fuel delivery device configured to deliver a water-based fuel to the ignition chamber;

a pair of electrodes coupled to the electrical power source and configured to supply power to the fuel to produce at least one of the arc plasma and the thermal power; and

a piston fluidly coupled to the ignition chamber and configured to move relative to the ignition chamber to output mechanical power.

305. A system for producing mechanical power, comprising:

an electrical power source of at least about 5,000 A;

an ignition chamber configured to produce at least one of arc plasma and thermal power, wherein the ignition chamber includes an outlet port;

a fuel delivery device configured to deliver a water-based fuel to the ignition chamber;

a pair of electrodes coupled to the electrical power source and configured to supply power to the fuel to produce at least one of the arc plasma and the thermal power; and

a turbine in fluid communication with the outlet port and configured to rotate to output mechanical power.

306. The system of claims 304 or 305 wherein the electrical power source is at least about 10,000 A or at least about 12,000 A.

307. The system of claims 304 or 305 wherein the electrical power source is at least about 1 kV, is at least about 2 kV, or at least about 4 kV.

308. The system of claims 304 or 305 wherein the electrical power source is at least about 5,000 kW.

309. The system of claims 304 or 305 wherein the water-based fuel includes at least 50 mole% water or at least 90 mole% water.

310. The system of claims 304 or 305 further including an intake port configured to deliver a working fluid to the ignition chamber.

311. The system of claim 310 wherein the working fluid includes at least one of a water-based fluid and an inert gas.

312. The system of claim 310 wherein the working fluid is delivered to the ignition chamber at a pressure of at least one of below atmospheric pressure, at atmospheric pressure, and above atmospheric pressure.

313. The system of claim 310 wherein the ignition chamber forms part of a closed-loop system configured to recirculate the working fluid.

314. The system of claims 304 or 305 wherein the fuel delivery device includes an

injection device configured to inject at least a portion of the water-based fuel into the ignition chamber.

315. The system of claim 314 wherein the injection device is configured to inject at least one of a gas, a liquid, and a solid particulate into the ignition chamber.

316. The system of claims 304 or 305 further including at least one of a cooling system and a heating system.

317. The system of claim 304 or 305 further including at least one of a vacuum system and a plasma converter.

318. The system of claim 304 or 305 further including a heat exchanger configured to convert a thermal energy associated the arc plasma into a different form of energy.

319. A system for producing mechanical power, comprising:

an electrical power source of at least about 5,000 A;

an impeller configured to rotate to output mechanical power, wherein the impeller includes a hollow region configured to produce at least one of arc plasma and thermal power and the hollow region includes an intake port configured to receive a working fluid;

a fuel delivery device configured to deliver a water-based fuel to the hollow region; and

a pair of electrodes coupled to the electrical power source and configured to supply electrical power to the hollow region to ignite the water-based fuel and produce at least one of the arc plasma and thermal power.

320. The system of claim 319 wherein the electrical power source is at least about 10,000 A or at least about 12,000 A.

321. The system of claim 319 wherein the electrical power source is at least about 1 kV, at least about 2 kV, or at least about 4 kV.

322. The system of claim 319 wherein the electrical power source is at least about 5,000 kW.

323. The system of claim 319 wherein the water-based fuel includes at least 50 mole% water or at least 90 mole% water.

324. The system of claim 319 wherein the impeller includes at least one blade configured to divert a flow of the working fluid.

325. The system of claim 319 wherein the working fluid includes at least one of a water-based fluid and an inert gas.

326. The system of claim 319 wherein the working fluid is delivered to the hollow region at a pressure of at least one of below atmospheric pressure, at atmospheric pressure, and above atmospheric pressure.

327. The system of claim 319 wherein the hollow region forms part of a closed-loop system configured to recirculate the working fluid.
328. The system of claim 319 wherein the fuel delivery device includes an injection device configured to inject at least a portion of the water-based fuel into the hollow region.
329. The system of claim 328 wherein the injection device is configured to inject at least one of a gas, a liquid, and a solid particulate into the hollow region.
330. The system of claim 319 further including at least one of a cooling system and a heating system.
331. The system of claim 319 further including at least one of a vacuum system and a plasma converter.
332. The system of claim 319 further including a heat exchanger configured to convert a thermal energy associated with the arc plasma into a different form of energy.
333. A system for producing mechanical power, comprising:
an electrical power source of at least about 5,000 A;
a plurality of ignition chambers, wherein each of the plurality of ignition chambers is configured to produce at least one of arc plasma and thermal power;
a fuel delivery device configured to deliver a water-based fuel to the plurality of ignition chambers; and
a plurality of electrodes coupled to the electrical power source, wherein at least one of the plurality of electrodes is associated with at least one of the plurality of ignition chambers and configured to supply electrical power to the water-based fuel to produce at least one of the arc plasma and the thermal power.
334. The system of claim 333 wherein the water-based fuel includes at least 50 mole% water or at least 90 mole% water.
335. The system of claim 333 further including at least one an intake port configured to deliver a working fluid to at least one of the plurality of ignition chambers.
336. The system of claim 335 wherein the working fluid includes at least one of a water-based fluid and an inert gas.
337. The system of claim 335 wherein the working fluid is delivered to the at least one of the plurality of ignition chambers at a pressure of at least one of below atmospheric pressure, at atmospheric pressure, and above atmospheric pressure.
338. The system of claim 335 wherein the at least one of the plurality of ignition chambers forms part of a closed-loop system configured to recirculate the working fluid.
339. The system of claim 335 wherein the fuel delivery device includes at least one injection device configured to inject at least a portion of the water-based fuel into at least one of the plurality of ignition chambers.

340. The system of claim 339 wherein the at least one injection device is configured to inject at least one of a gas, a liquid, and a solid particulate into the at least one of the plurality of ignition chambers.

341. The system of claim 333 wherein at least one of the plurality of ignition chambers is fluidly coupled to at least one of a piston, a turbine, an impeller, a gear, and a roller.

342. The system of claim 333 wherein the plurality of ignition chambers are configured to rotate relative to the fuel delivery device.

343. The system of claim 333 further including a plurality of fuel delivery devices.

344. The system of claim 333 further including a plurality of electrical power sources, wherein at least one of the plurality of electrical power sources is electrically coupled to at least one of the plurality of electrodes.

345. The system of claim 333 further including a controller configured to control a supply of electrical power to the plurality of electrodes.

346. The system of claim 333 wherein the controller is configured to control a movement of the fuel delivery device.

347. The system of claim 333 wherein the controller is configured to control a movement of the plurality of ignition chambers.

348. An ignition chamber, comprising:

a shell defining a hollow chamber configured to create at least one of plasma, arc plasma, and thermal power;

a fuel receptacle in fluid communication with the hollow chamber, wherein the fuel receptacle is electrically coupled to a pair of electrodes; and

a moveable element in fluid communication with the hollow chamber.

349. An ignition chamber, comprising:

a shell defining a hollow chamber;

an injection device in fluid communication with the hollow chamber, wherein the injection device is configured to inject a fuel into the hollow chamber;

a pair of electrodes electrically coupled to the hollow chamber and configured to supply electrical power to the fuel sufficient to produce at least one of at least one of plasma, arc plasma, and thermal power in the hollow chamber; and

a moveable element in fluid communication with the hollow chamber.

350. The ignition chamber of claims 348 or 349 wherein the moveable element includes a piston located within the hollow chamber.

351. The ignition chamber of claims 348 or 349 wherein the moveable element includes a turbine located outside the hollow chamber.

352. The ignition chamber of claims 348 or 349 wherein the moveable element includes an impeller at least partially surrounding the hollow chamber.
353. The ignition chamber of claims 348 or 349 wherein the hollow chamber is configured to receive a working fluid.
354. The ignition chamber of claims 348 or 349 wherein the pair of electrodes are configured to supply a current of at least 5,000 A to the fuel receptacle.
355. The ignition chamber of claims 348 or 349 wherein the fuel receptacle is configured to receive a water-based fuel that includes at least 50 mole% water.
356. The ignition chamber of claims 348 or 349 wherein the fuel receptacle is configured to receive a solid fuel comprising a portion of water, a portion of a water absorbing material, and a portion of a conducting element.
357. The ignition chamber of claim 349 wherein the fuel is a solid fuel comprising a portion of water, a portion of a water absorbing material, and a portion of a conducting element.
358. The ignition chamber of claim 349 wherein the injection device is configured to inject at least one of a gas, a liquid, and a solid particulate into the hollow chamber.
359. A method for producing mechanical power, comprising:
delivering a solid fuel to an ignition chamber;
passing a current of at least about 5,000 A through the solid fuel and applying a voltage of less than about 10 V to the solid fuel to ignite the solid fuel and produce at least one of plasma and thermal power;
mixing at least one of the plasma and the thermal power with a working fluid;
and
directing the working fluid toward a moveable element to move the moveable element and output mechanical power.
360. The method of claim 359 wherein the current is at least about 14,000 A.
361. The method of claim 359 wherein the voltage is less than about 8 V.
362. The method of claim 359 wherein the solid fuel comprises a portion of water, a portion of a water absorbing material, and a portion of a conducting element.
363. The method of claim 359 further including at least one of capturing, regenerating, and recycling one or more components produced by the ignition of the solid fuel.
364. The method of claim 359 wherein the moveable element moves in at least one of a linear, an arcuate, and a rotational direction.
365. The method of claim 359 wherein the current is supplied to the solid fuel via at least one electrode coupled to the moveable element.

366. A method for producing mechanical power, comprising:
delivering a water-based fuel to an ignition chamber;
passing a current of at least about 5,000 A through the water-based fuel and
applying a voltage of at least about 2 kV to the water-based fuel to ignite the water-based fuel to produce at least one of arc plasma and thermal power;
mixing at least one of the arc plasma and the thermal power with a working fluid; and
directing the working fluid toward a moveable element to move the moveable element and output mechanical power.
367. The method of claim 366 wherein the current is at least about 12,000 A.
368. The method of claim 366 wherein the voltage is at least 4 kV.
369. The method of claim 366 wherein the water-based fuel includes at least 90 mole% water.
370. The method of claim 366 wherein the moveable element moves in at least one of a linear, an arcuate, and a rotational direction.
371. The method of claim 366 wherein the current is supplied to the water-based fuel via at least one electrode coupled to the ignition chamber.
372. A method for producing mechanical power, comprising:
supplying a solid fuel to an ignition chamber;
supplying at least about 5,000 A to an electrode electrically coupled to the solid fuel;
igniting the solid fuel to produce at least one of plasma and thermal power in the ignition chamber; and
converting at least some of at least one of the plasma and the thermal power into mechanical power.
373. The method of claim 372 further including supplying a working fluid to the ignition chamber.
374. The method of claim 373 wherein the working fluid includes at least one of air, H₂O, and an inert gas.
375. The method of claim 373 further including pressurizing the working fluid prior to injecting the working fluid into the ignition chamber.
376. The method of claim 373 wherein converting at least some of at least one of the plasma and the thermal power into mechanical power includes directing a flow of the working fluid toward a moveable element.
377. The method of claim 376 further including moving the moveable element in at least one of a linear, an arcuate, and a rotational direction.

378. The method of claim 372 further including supplying at least about 10,000 A to the solid fuel or at least about 14,000 A to the solid fuel.

379. The method of claim 372 further including supplying less than about 100 V to the solid fuel, less than about 10 V to the solid fuel, or less than about 8 V to the solid fuel.

380. The method of claim 372 further including supplying at least about 5,000 kW to the solid fuel.

381. The method of claim 372 further comprising creating a partial vacuum in the ignition chamber.

382. The method of claim 372 further comprising at least one of capturing, regenerating, and recycling at least one or more components produced by the ignition of the solid fuel.

383. A method for producing mechanical power, comprising:
supplying a water-based fuel to an ignition chamber;
supplying at least about 5,000 A to an electrode electrically coupled to the water-based fuel;
igniting the water-based fuel to form at least one of arc plasma and thermal power in the ignition chamber; and
converting at least some of at least one of the arc plasma and the thermal power into mechanical power.

384. The method of claim 383 further including supplying a working fluid to the ignition chamber.

385. The method of claim 384 wherein the working fluid includes at least one of a water-based fluid and an inert gas.

386. The method of claim 384 further including pressurizing the working fluid prior to injecting the working fluid into the ignition chamber.

387. The method of claim 384 wherein converting at least some of at least one of the arc plasma and the thermal power into mechanical power includes directing a flow of the working fluid toward a moveable element.

388. The method of claim 387, further including moving the moveable element in at least one of a linear, an arcuate, and a rotational direction.

389. The method of claim 383 further including supplying at least about 10,000 A to the water-based fuel or at least about 12,000 A to the water-based fuel.

390. The method of claim 383 further including supplying at least about 1 kV to the water-based fuel, at least about 2 kV to the water-based fuel, or at least about 4 kV to the water-based fuel.

391. The method of claim 383 further including supplying at least about 5,000 kW

to the water-based fuel.

392. The method of claim 383 further comprising creating a partial vacuum in the ignition chamber.

393. A machine configured for land-based transportation, comprising:
an electrical power source of at least about 5,000 A;
an ignition chamber configured to produce at least one of at least one of plasma, arc plasma, and thermal power;
a fuel delivery device configured to deliver a fuel to the ignition chamber;
a pair of electrodes coupled to the electrical power source and configured to supply power to the fuel to produce the at least one of the plasma the arc plasma, and the thermal power;
a moveable element fluidly coupled to the ignition chamber and configured to move relative to the ignition chamber; and
a drive-shaft mechanically coupled to the moveable element and configured to provide mechanical power to a transportation element.

394. The machine of claim 393 wherein the transportation element includes at least one of a wheel, a track, a gear assembly, and a hydraulic member.

395. The machine of claim 393 wherein the transportation element forms part of at least one of an automobile, a motorcycle, a snow-mobile, a truck, and a train.

396. A machine configured for aviation transport, comprising:
an electrical power source of at least about 5,000 A;
an ignition chamber configured to produce at least one of at least one of plasma, arc plasma, and thermal power;
a fuel delivery device configured to deliver a fuel to the ignition chamber;
a pair of electrodes coupled to the electrical power source and configured to supply power to the fuel to produce the at least one of the plasma, the arc plasma, and thermal power;
a moveable element fluidly coupled to the ignition chamber and configured to move relative to the ignition chamber; and
an aviation element mechanically coupled to the moveable element and configured to provide propulsion in an aviation environment.

397. The machine of claim 396 wherein the aviation element includes at least one of an aviation propeller and a compressor.

398. The machine of claim 396 wherein the aviation element forms part of at least one of a turbojet, a turbofan, a turboprop, a turboshaft, a propfan, a ramjet, and a scramjet.

399. A machine configured for marine transport, comprising:

an electrical power source of at least about 5,000 A;
an ignition chamber configured to produce at least one of at least one of
plasma, arc plasma, and thermal power;
a fuel delivery device configured to deliver a fuel to the ignition chamber;
a pair of electrodes coupled to the electrical power source and configured to
supply power to the fuel to produce the at least one of the plasma, the arc plasma, and
the thermal power;
a moveable element fluidly coupled to the ignition chamber and configured to
move relative to the ignition chamber; and
a marine element mechanically coupled to the moveable element and
configured to provide propulsion in a marine environment.

400. The machine of claim 399 wherein the marine element includes a marine
propeller.

401. The machine of claim 399 wherein the marine element forms part of at least
one of a pump-jet, a hydro-jet, and a water-jet.

402. A work machine, comprising:

an electrical power source of at least about 5,000 A;
an ignition chamber configured to produce at least one of at least one of
plasma, arc plasma, and thermal power;
a fuel delivery device configured to deliver a fuel to the ignition chamber;
a pair of electrodes coupled to the electrical power source and configured to
supply power to the fuel to produce the at least one of the plasma, the arc plasma, and
the thermal power;
a moveable element fluidly coupled to the ignition chamber and configured to
move relative to the ignition chamber; and
a work element mechanically coupled to the moveable element and configured
to provide mechanical power.

403. The machine of claim 402 wherein the work element includes at least one of a
rotating shaft, a reciprocating rod, a cog, an auger, and a blade.

404. The machine of claim 402 wherein the work element forms part of at least one
of a refrigerator, a washing machine, a dish washer, a lawn mower, a snow blower, and a
brush cutter.