What Is Claimed Is:

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

~~at least one vessel;~~

~~shot comprising reactants, the reactants comprising:~~

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

~~b) at least one source of H_2O or H_2O;~~

~~c) at least one source of atomic hydrogen or atomic hydrogen; and~~

~~d) at least one of~~) producing a ~~conductor and a conductive matrix;~~

~~at least one shot injection system;~~

~~at least one shot ignition system to cause the shot to form at least one of light-emitting plasma and thermal-emitting plasma;~~

~~a system to recover reaction products of the reactants;~~

~~at least one regeneration system to regenerate additional reactants from the reaction products and form additional shot,~~

~~wherein the additional reactants comprise:~~

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

~~b) at least one source of H_2O or H_2O;~~

~~c) at least one source of atomic hydrogen or atomic hydrogen; and~~

~~d) at least one of a conductor and a conductive matrix;~~

~~wherein the regeneration system comprises a pelletizer comprising a smelter to form molten reactants, a system to add H_2 and H_2O to the molten reactants, a melt dripper, and a coolant to form shot; and~~

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

~~2. The power system of Claim 1 wherein the vessel is capable of a pressure of below atmospheric.~~

~~3. The power system of Claim 1 wherein the shot ignition system comprises:~~

~~a) at least one~~ voltage differential between a set of electrodes ~~to confine the shot; and~~

~~b) a source of electrical power to deliver a short burst of high current electrical energy.~~

~~4. The power system of Claim 3 wherein the short burst of high current electrical energy is sufficient to cause the shot reactants to react to form plasma.~~

~~5. The power system of Claim 3 wherein the source of electrical power receives electrical power from the power converter.~~

~~The power system of Claim 3 wherein the shot ignition system comprises at least one set of electrodes that are~~ separated to form an open circuit~~, wherein the open circuit is closed by the injection of the shot to cause the high current to flow to~~ ;

~~achieve ignition.~~

~~The power system of Claim 3~~ b) injecting a conductive material and H_2O between said electrodes to close said open circuit and form a current and voltage across said conductive material;

~~6.~~ wherein said conductive material comprises metal and a metal oxide, and 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;~~

~~wherein the~~ and 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 is in the range of at least one of 0.1 V to 500 kV, 0.1 V to 100 kV, and 1 V to 50 kV, and~~

~~the AC frequency is in range of at least one of 0.1 Hz to 10 GHz, 1 Hz to 1 MHz, 10 Hz to 100 kHz, and 100 Hz to 10 kHz.~~

~~7. The power system of Claim 1 wherein the ignition system comprises a source of electrical power, bus bars, slip rings, shafts, shaft bearings, electrodes, bearing structural supports, a base support, roller drive pulleys, motor drive pulleys, belts, belt tensioners, motor shafts, roller pulley bearings, motor bearings, and at least one motor.~~

~~8. The power system of Claim 8 wherein the electrodes comprise a pair of rollers that are mounted on the shafts suspended by bearings attached to structural supports being mounted on a base support, wherein the shafts and attached electrodes are turned by roller drive pulleys that are driven by belts each having a belt tensioner, motor shafts and motor pulleys suspended on bearings, and motors.~~

~~9. The power system of Claim 9 wherein the motor is a computer controlled servomotors.~~

~~10. The power system of Claim 1 wherein the shot comprises at least one of silver, copper, and a hydrate.~~

~~11. The power system of Claim 11 wherein the hydrate comprises at least one of an alkali hydrate, an alkaline earth hydrate, and a transition metal hydrate.~~

~~12. The power system of Claim 12 wherein the hydrate comprises at least one of $MgCl_2 \cdot 6H_2O$, $BaI_2 \cdot 2H_2O$, and $ZnCl_2 \cdot 4H_2O$.~~

~~13. The power system of Claim 1 wherein the shot comprises at least one of silver,~~

~~copper, absorbed hydrogen, and water.~~

~~14. The power system of Claim 1 wherein the injection system comprises at least one of an augmented railgun and a pneumatic injector, wherein the pneumatic injector comprises a source of high pressure flowing gas to propel the shot.~~

~~The power system of Claim 15 wherein the augmented railgun comprises separated electrified rails and magnets that produce a magnetic field perpendicular to the plane of the rails, and the circuit between the rails is open until~~in said closed ~~by the contact of the shot with the rails.~~circuit and conductive material is capable of initiating a plasma forming reaction when H_2O is present as nascent molecules;

~~15. The power system of Claim 16 wherein the contact of the shot with the rails causes a current to flow through the shot, and the resulting current interacts with the magnetic field to produce a Lorentz force that causes the shot to be propelled along the rails.~~

~~16. The power system of Claim 16 wherein the injection system further comprises at least one transporter to feed shot into the at least one of the augmented railgun and the pneumatic injector.~~

~~17. The power system of Claim 18 wherein transporter comprises at least one auger.~~

~~18. The power system of Claim 17 wherein the applied magnetic field of the augmented railgun injector comprises a component parallel to the direction of pellet motion and transverse to the current through the shot.~~

~~19. The power system of Claim 20 wherein the current interacts with the magnetic field to produce a Lorentz force that causes the shot to be forced down on the rails to make and maintain good electrical contact between the shot and the rails.~~

~~20. The power system of Claims 16 and 20 wherein the magnetic field perpendicular to the plane of the rails and the motion-parallel magnetic field is provided by at least one of permanent magnets and electromagnets.~~

~~21. The power system of Claim 1 wherein the system to recover the products of the reactants comprises at least one of gravity and a system to produce a Lorentz force on the plasma and direct the recovered products to a collection region.~~

~~22. The power system of Claim 23 wherein the system to produce a Lorentz force on the plasma and direct the recovered products to a collection region comprises an augmented plasma railgun recovery system.~~

~~23. The power system of Claim 24 wherein the augmented plasma railgun recovery system comprises at least one magnet providing a magnetic field and a vector-crossed current component.~~

~~24. The power system of Claim 25 wherein the at least one magnet comprises at least one of Helmholtz coils and permanent magnets.~~

~~25. The power system of Claim 26 wherein the augmented plasma railgun recovery system further comprises at least one additional set of electrodes peripheral to the ignition electrodes wherein the current source comprises at least one of the current flow between the ignition electrodes and current between the at least one additional set of electrodes.~~

~~26. The power system of Claim 1 wherein the system to recover the products of the reactants comprises at least one of a light transparent baffle and a light transparent window, wherein the light transparent window may comprise a coating on the power converter.~~

~~27. The power system of Claim 28 wherein the light transparent baffle and the window are transparent to ultraviolet light.~~

~~28. The power system of Claim 29 wherein the light transparent baffle and the window comprise at least one of the group chosen from sapphire, LiF, MgF_2, and CaF_2, other alkaline earth halides, alkaline earth fluorides, BaF_2, CdF_2, quartz, fused quartz, UV glass, borosilicate, and Infrasil (ThorLabs).~~

~~29. The power system of Claim 28 wherein at least one of the light transparent baffle and the window comprises a lens to focus the light emitted by the ignition of the shot onto the power converter.~~

~~30. The power system of Claim 28 further comprising a removal system to remove ignition product from the surface of the light transparent baffle and a light transparent window, wherein the light transparent window may comprise a coating on the power converter comprising an ion-sputtering beam or a knife or razor blade mechanical scraper.~~

~~31. The power system of Claim 1 wherein the coolant to form shot comprises a water reservoir and/or bath.~~

~~32. The power system of Claim 1 further comprising a system that maintains a vacuum.~~

~~33. The power system of Claim 34 wherein the system that maintains a vacuum comprises at least one of a vacuum pump and a chiller of the water reservoir and/or bath.~~

~~34. The power system of Claim 1 wherein the smelter comprises an insulated vessel~~

and a heater.

35. The power system of Claim 36 wherein the heater comprises at least one of a resistive heater, an arc heater, an inductively coupled heater, a heat exchanger to transfer thermal power sourced from the reaction of the reactants, and at least one optical element to transfer optical power sourced from the reaction of the reactants.

36. The power system of Claim 37 wherein the pelletizer comprises a first insulated vessel heated by the inductively coupled heater, a second insulated vessel to receive the melt for the first insulated vessel, a dripper, and a water reservoir to form shot.

37. The power system of Claim 38 wherein the second vessel comprises melted ignition products, hydrogen and steam lines that enter the inside of the second vessel, hydrogen and steam bubblers of the melt connected to the hydrogen and steam lines, at least one gas exit line that connects to a pump to recirculate the hydrogen and steam.

38. The power system of Claim 39 wherein the hydrogen and steam lines that enter the inside of the second vessel carry the hydrogen and steam that bubbles through the melt to be incorporated into the melt with excess gas existing through the at least one exit line to be recirculated through the second vessel by at least one pump, and the gas-treated melt flows to the dripper to drip into the water reservoir to form shot.

39. The power system of Claim 40 wherein the pelletizer comprises a heat recuperator.

40. The power system of Claim 41 wherein the heat recuperator recovers or reclaims at least some heat from the cooling shot and transfers it to incoming ignition product to preheat it as it enters the smelter or first vessel.

41. The power system of Claim 39 wherein the hydrogen is supplied from a tank refilled by the electrolysis of water, and the water is supplied from a water tank, wherein the water in both cases is periodically refilled as water is consumed.

42. The power system of Claim 33 wherein the water reservoir comprises an agitator to feed shot into the injection system.

43. The power system of Claim 15 wherein the injection system further comprises at least one agitator to feed shot into the augmented railgun injector.

44. The power system of Claims 44 and 45 wherein the agitator comprises at least one of an auger and a water jet.

45. The power system of Claim 46 wherein the water reservoir comprises a transporter to feed shot into the injection system.

~~46. The power system of Claim 47 wherein the transporter comprises a first auger that transports the shot from the water bath to a shot hopper, wherein a second auger, a shot auger, feeds shot into the injection system.~~

~~47. The power system of Claim 48 wherein the injection system comprises at least one of an augmented railgun and a pneumatic injector.~~

~~48. The power system of Claim 40 comprising a roller electrode regeneration system comprising: (1) at least one of recovered ignition products and at least one of a hydrogen and H_2O deficient shot, (2) the injection system, (3) the ignition system, and (4) a milling system to regenerate the electrodes to their original form.~~

~~49. The power system of Claim 50 wherein the hydrogen and H_2O deficient shot comprises shot formed from the ignition product melt by the pelletizer without treatment of the melt with hydrogen or steam;~~

~~wherein at least one of the H_2O deficient shot and recovered ignition products is injected into the roller electrodes by the injection system;~~

~~wherein the flow of high current of the ignition system causes the hydrogen deficient shot or powder to weld or bond to the roller electrode surfaces, and the milling system removes excess bonded material to regenerate the electrodes to their original form.~~

~~50. The power system of Claim 51 wherein the milling system comprises at least one of a dressing wheel, a grinder, a lathe, a mill, and an electrical discharge machining tool.~~

~~51. The power system of Claim 1 wherein the at least one power converter of the reaction power output comprises at least one of the group of a photovoltaic converter, a photoelectronic converter, a plasmadynamic converter, a thermionic converter, a thermoelectric converter, a Sterling engine, a Brayton cycle engine, a Rankine cycle engine, and a heat engine, and a heater.~~

~~52. The power system of Claim 1 wherein the vessel comprises walls reflective of at least one of the ultraviolet, visible, and near infrared light emitted by the plasma.~~

~~53. The power system of Claim 53 wherein the photovoltaic converter comprises a light transparent window.~~

~~54. The power system of Claim 53 wherein photovoltaic cells are coated with a light transparent window.~~

~~55. The power system of Claim 56 wherein the light emitted by the cell is predominantly ultraviolet light.~~

~~56. The power system of Claims 55 and 56 wherein the window comprises a phosphor to shift the spectrum of the cell emitted light to one to which the~~

photovoltaic cells of the photovoltaic converter are selectively responsive.

57. The power system of Claim 58 wherein the photovoltaic cells comprises visible and infrared concentrator photovoltaic cells.

58. The power system of Claim 57 wherein the power converter comprises a photovoltaic converter, and the photovoltaic cells comprises ultraviolet concentrator photovoltaic cells.

59. The power system of Claim 60 wherein the photovoltaic cells comprise at least one compound chosen from a Group III nitride, GaAlN, GaN, and InGaN.

60. The power system of Claim 61 wherein the photovoltaic cells are multi junction cells comprising a plurality of junctions, that may be layered in series, or the junctions are independent or electrically parallel, wherein the independent junctions may be mechanically stacked or wafer bonded; a substrate, grid connections, and a cooling system.

61. The power system of Claim 62 wherein the multi junction photovoltaic cells comprise at least one of two junctions, three junctions, and greater than three junctions, each comprising n p doped semiconductors from the group of InGaN, GaN, and AlGaN, wherein the n dopant of GaN may comprise oxygen, and the p dopant may comprise Mg;

the multi junction photovoltaic cells may comprise InGaN//GaN//AlGaN wherein // refers to an isolating transparent wafer bond layer or mechanical stacking;

the substrate of the multifunction cell may comprise at least one of sapphire, Si, SiC, and GaN wherein the latter two may provide the best lattice matching for concentrator photovoltaic applications;

the layers may be deposited using metalorganic vapor phase epitaxy (MOVPE) methods;

the coolant system may comprise by cold plates, and heat exchanger, and a chiller, and

the grid contacts may comprise fine wires be mounted on the front and back surfaces of the cells.

62. The power system of Claim 53 wherein the photovoltaic converter comprises a light distribution system comprising a stacked series of semi transparent and semi reflective mirrors which direct a portion of the incident light on each mirror of the stack to a corresponding photovoltaic cell while the balance of light is transmitted to the next mirror in the stack.

63. The power system of Claim 64 wherein each of the semi transparent and semi

reflective mirrors comprises a window that is transparent to the incident light, and the window is partially mirrored to reflect a portion of the incident light.

64. The power system of Claim 65 wherein each of the semi-transparent and semi-reflective mirrors comprises dichroic mirrors or beam splitters.

65. The power system of Claim 66 wherein each of the semi-transparent and semi-reflective mirrors comprises a window that is transparent to the incident light, and the window is partially mirrored with a dichroic film to selectively reflect a portion of the incident light onto a photovoltaic cell that is selectively responsive to the reflected wavelengths.

66. The power system of Claim 67 wherein each of dichroic mirrors and corresponding photovoltaic cells are arranged to increase the power conversion efficiency while distributing the light over the photovoltaic converter surface area.

67. The power system of Claim 68 wherein the semi-transparent and semi-reflective mirrors comprise UV-transparent and UV-reflective materials.

68. The power system of Claims 55, 56, and 69 wherein at least one of the UV-transparent window, the UV-transparent window coating of the photovoltaic cells, and the UV-transparent mirror material comprises at least one compound of the group of sapphire, LiF, MgF_2, and CaF_2, other alkaline earth halides, alkaline earth fluorides, BaF_2, CdF_2, quartz, fused quartz, UV-glass, borosilicate, and Infrasil (ThorLabs),

69. The power system of Claims 54 and 69 wherein at least one of the UV-reflective wall coating and the UV-reflective mirror materials comprises one of group of Ag, Al, a thin coat of Ag on Al, a material capable of high reflectivity at UV wavelengths, thin fluoride films, MgF_2-coated Al, MgF_2-films on Al, LiF films on Al, and SiC films on Al.

70. The power system of Claim 53 wherein the photovoltaic converter further comprises a heat exchanger and a chiller.

71. The power system of Claim 53 wherein the photoelectric converter comprises a plurality of photoelectric cells, where each photoelectric cell comprises a photocathode having a work function greater than 1.8 eV, an anode, a vacuum space between the electrodes, and a window.

72. The power system of Claim 73 wherein the photoelectric cell comprises at least one of the group of the transmission or semitransparent type, or the opaque or reflective type photoelectronic cell.

73. The power system of Claim 74 wherein the transmission or semitransparent type photoelectric cell comprises a photocathode, an anode, and a separating gap

between the electrodes.

74. The power system of Claim 74 wherein the opaque or reflective photoelectronic cell comprises one of the group a cells having a photocathode material formed on an opaque metal electrode base, where the light enters and the electrons exit from the same side, and a double reflection type wherein a metal base is mirror-like, causing light that passed through the photocathode without causing emission to be bounced back for a second pass at absorption and photoemission.

75. The power system of Claim 76 wherein the opaque or reflective photoelectronic cell comprises a transparent casing, a photocathode, a transparent anode, a separating space or an evacuated inter-electrode space, and external electrical connections between the cathode and anode through a load wherein radiation enters the cell and is directly incident on the photocathode; radiation enters the cathode at the gap interface, and electrons are emitted from the same interface.

76. The power system of Claims 75 and 77 wherein the gap between the electrodes is in the range of at least one of 0.1 um to 1000 um, 1 um to 100 um, 1 um to 10 um, and 1 to 5 um.

77. The power system of Claim 77 wherein the opaque or reflective photoelectronic cell comprises a transparent window wherein the light enters the cell through the transparent window having a grid anode on the interior side of the window.

78. The power system of Claims 75 and 77 wherein the window comprises at least one of sapphire, LiF, MgF_2, and CaF_2, other alkaline earth halides, other alkaline earth fluorides, BaF_2, CdF_2, quartz, fused quartz, UV glass, borosilicate, and Infrasil (ThorLabs).

79. The power system of Claim 73 wherein the photocathode work function may be at least one of the group of greater than 1.8 eV for radiation of shorter wavelength than 690 nm, greater than 3.5 eV for radiation of shorter wavelength than 350 nm, and within the range of at least one of 0.1 V to 100 V, 0.5 V to 10 V, 1 V to 6 V, and 1.85 eV to 6 V.

80. The power system of Claim 81 wherein the photocathode of the photoelectric cell comprises one of the group of GaN, GaN alloys, $Al_xGa_{1-x}N$, $In_xGa_{1-x}N$, alkali halides, KI, KBr, CsI, multi-alkali, S20 Hamamatsu comprising Na-K-Sb-Cs, GaAs, CsTe, diamond, Sb-Cs, Au, Ag-O-Cs, bi-alkali, Sb-Rb-Cs, Sb-K-Cs, Na-K-Sb, InGaAs, an opaque photocathode comprising at least one of GaN, CsI, and SbCs, a semitransparent photocathode comprising CsTe, type III-V material UV photocathode having suitable large bandgaps in the range of 3.5 eV for GaN and 6.2 eV for AlN, a photocathode having an energy or wavelength responsive

region fine tuned by changing the material composition of the photocathode, a photocathode having an energy or wavelength responsive region fine tuned by changing the ratio of GaN to AlN in $Al_xGa_{1-x}N$, thin films of p-doped material activated into negative electron affinity by proper surface treatments, thin films of p-doped material activated into negative electron affinity by proper surface treatments with cesium or Mg and oxygen, photocathodes comprising MgO thin-film on Ag, MgF_2, MgO, CuI_2, metal photocathodes, metal photocathodes comprising at least one of Cu, Mg, Pb, Y, and Nb, coated metal photocathodes, coated metal photocathodes comprising at least one of Cu-CsBr, Cu-MgF_2, Cu-Cs, and Cu-CsI, metal alloy photocathodes, coated metal alloy photocathodes, metal alloy photocathodes comprising CsAu, photocathodes comprising alloys of pure metals Al, Mg, and Cu, photocathodes comprising alloys of pure metals of Al, Mg, and Cu with small amounts of Li, Ba, and BaO, respectively, semiconductor photocathodes, semiconductor photocathodes comprising CsTe, RbTe, alkali antimonides, Cs_3Sb, K_2CsSb, Na_2KSb, NaK_2Sb, CsK_2Sb, Cs_2Te, superalkalies, positive election affinity (PEA) type photocathodes; Cs:GaAs, Cs:GaN, Cs:InGaN, Cs:GaAsP, graded doping photocathodes, tertiary structure photocathode, and a photocathode comprising a negative electron affinity (NEA) type.

81. The power system of Claim 82 wherein semiconductor photocathodes may be maintained in high vacuum in the range of at least one of less than 10^{-9} Pa, 10^{-7} Pa, 10^{-5} Pa, 10^{-3} Pa, and 10^{-1} Pa.

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

at least one vessel;

slurry comprising reactants, the reactants comprising:

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

b) at least one source of H_2O or H_2O;

c) at least one source of atomic hydrogen or atomic hydrogen; and

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

at least one slurry injection system comprising rotating roller electrodes comprising a rotary slurry pump;

at least one slurry ignition system to cause the shot to form light-emitting plasma;

a system to recover reaction products of the reactants;

at least one regeneration system to regenerate additional reactants from the reaction products and form additional slurry,

wherein the additional reactants comprise:

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

b) at least one source of H_2O or H_2O;

c) at least one source of atomic hydrogen or atomic hydrogen; and

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

wherein the regeneration system comprises a pelletizer comprising a smelter to form molten reactants, a system to add H_2 and H_2O to the molten reactants, a melt dripper, and a coolant to form shot; and at least one power converter or output system of at least one of the light and thermal output to electrical power and/or thermal power.

83. The power system of Claim 84 wherein the ignition system to cause the shot to form light-emitting plasma comprises a source of electrical power to deliver a short burst of high-current electrical energy.

84. The power system of Claim 85 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 that is 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 that is in the range of at least one of 0.1 V to 500 kV, 0.1 V to 100 kV, and 1 V to 50 kV, and

the AC frequency that is in the range of at least one of 0.1 Hz to 10 GHz, 1 Hz to 1 MHz, 10 Hz to 100 kHz, and 100 Hz to 10 kHz.

85. The power system of Claim 84 wherein the ignition system comprises a source of electrical power, bus bars, slip rings, shafts, shaft bearings, electrodes, bearing structural supports, a base support, roller drive pulleys, motor drive pulleys, belts, belt tensioners, motor shafts, roller pulley bearings, motor bearings, and at least one motor.

86. The power system of Claim 87 wherein the electrodes comprise a pair of rollers that are mounted on the shafts suspended by bearings attached to structural supports being mounted on a base support, wherein the shafts and attached electrodes are turned by roller drive pulleys that are driven by belts each having a belt tensioner, motor shafts and motor pulleys suspended on bearings, and motors.

87. The power system of Claim 84 wherein the slurry comprises at least one of a metal and a hydrate.

88. The power system of Claim 89 wherein the hydrate comprises at least one of an alkali hydrate, an alkaline earth hydrate, and a transition metal hydrate.

89. The power system of Claim 90 wherein the hydrate comprises at least one of $MgCl_2 \cdot 6H_2O$, $BaI_2 \cdot 2H_2O$, and $ZnCl_2 \cdot 4H_2O$, and the metal comprises at least one of a transition metal, Ti, Cu, and Ag.

90. The power system of Claim 84 wherein the at least one power converter of the reaction power output comprises at least one or more of the group of a photovoltaic converter, a photoelectronic converter, a plasmadynamic converter, a thermionic converter, a thermoelectric converter, a Sterling engine, a Brayton cycle engine, a Rankine cycle engine, and a heat engine.

91. The power system of Claim 84 wherein the system to recover the products of the reactants comprises water jets and a slurry trough.

92. The power system of Claim 84 wherein the system to regenerate the initial reactants from the reaction products and form slurry comprises at least one sieve, mesh, or filter and at least one water suction pump in the walls of the slurry trough, and a rotary pump delivery auger.

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

at least one vessel capable of a pressure of below atmospheric;

shot comprising reactants, the reactants comprising:

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

f) at least one source of H_2O or H_2O;

g) at least one source of atomic hydrogen or atomic hydrogen; and

at least one of a conductor and ac) collecting the products of said plasma forming reaction;

d) regenerating said conductive matrix; material from said collected products; and

at least one shot injection system comprising at least one augmented railgun, wherein the augmented railgun comprises separated electrified rails and magnets that produce a magnetic field perpendicular to the plane of the rails, and the circuit between the rails is open until closed by the contact of the shot with the rails;

at least one ignition system to cause the shot to form at least one of light-emitting plasma and thermal-emitting plasma, at least one ignition system comprising:

a) at least one set of electrodes to confine the shot; and

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

wherein the at least one set of electrodes form an open circuit, wherein the open

circuit is closed by the injection of the shot to cause the high current to flow to achieve ignition, and 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 is in the range of at least one of 0.1 V to 500 kV, 0.1 V to 100 kV, and 1 V to 50 kV, and

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

a system to recover reaction products of the reactants comprising at least one of gravity and an augmented plasma railgun recovery system comprising at least one magnet providing a magnetic field and a vector crossed current component of the ignition electrodes;

at least one regeneration system to regenerate additional reactants from the reaction products and form additional shot comprising a pelletizer comprising a smelter to form molten reactants, a system to add H_2 and H_2O to the molten reactants, a melt dripper, and a water reservoir to form shot,

wherein the additional reactants comprise:

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

f) at least one source of H_2O or H_2O;

g) at least one source of atomic hydrogen or atomic hydrogen; and

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

at least one power converter or output system of at least one of the light and thermal output to electrical power and/or thermal power comprising at least one or more of the group of a photovoltaic converter, a photoelectronic converter, a plasmadynamic converter, a thermionic converter, a thermoelectric converter, a Sterling engine, a Brayton cycle engine, a Rankine cycle engine, and a heat engine, and a heater.

96. A power system that generates at least one of electrical energy and thermal energy

~~comprising:~~

~~at least one vessel capable of a pressure of below atmospheric;~~

~~shot comprising reactants, the reactants comprising at least one of silver, copper, absorbed hydrogen, and water;~~

~~at least one shot injection system comprising at least one augmented railgun wherein the augmented railgun comprises separated electrified rails and magnets that produce a magnetic field perpendicular to the plane of the rails, and the circuit between the rails is open until closed by the contact of the shot with the rails;~~

~~at least one ignition system to cause the shot to form at least one of light-emitting plasma and thermal-emitting plasma, at least one ignition system comprising:~~

~~a) at least one set of electrodes to confine the shot; and~~

~~b) a source of electrical power to deliver a short burst of high-current—electrical energy;~~

~~wherein the at least one set of electrodes that are separated to form an open circuit, wherein the open circuit is closed by the injection of the shot to cause the high current to flow to achieve ignition, and he 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 is in the range of at least one of 0.1 V to 500 kV, 0.1 V to 100 kV, and 1 V to 50 kV, and~~

~~the AC frequency is in range of at least one of 0.1 Hz to 10 GHz, 1 Hz to 1 MHz, 10 Hz to 100 kHz, and 100 Hz to 10 kHz.~~

~~a system to recover reaction products of the reactants comprising at least one of gravity and a augmented plasma railgun recovery system comprising at least one magnet providing a magnetic field and a vector-crossed current component of the ignition electrodes;~~

~~at least one regeneration system to regenerate additional reactants from the reaction products and form additional shot comprising a pelletizer comprising a smelter to form molten reactants, a system to add H_2 and H_2O to the molten reactants, a melt dripper, and a water reservoir to form shot,~~

~~wherein the additional reactants comprise at least one of silver, copper, absorbed hydrogen, and water;~~

~~at least one power converter or output system comprising a concentrator ultraviolet photovoltaic converter wherein the photovoltaic cells comprise at least one compound chosen from a Group III nitride, GaAlN, GaN, and InGaN.~~e) loading said regenerated conductive material between said electrodes.

2. The method according to claim 1, wherein the metal is 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, or In.

3. A method comprising:

a) producing a voltage differential between a set of electrodes separated to form an open circuit;

b) injecting a conductive material and H_2O between said electrodes to close said open circuit and form a current and voltage across said conductive material;

wherein said conductive material comprises metal and a metal halide; and wherein the current and voltage in said closed circuit and conductive material is capable of initiating a plasma forming reaction when H_2O is present as nascent molecules;

c) collecting the products of said plasma forming reaction;

d) regenerating said conductive material from said collected products; and

e) loading said regenerated conductive material between said electrodes.

4. The method according to claim 3, wherein the metal is 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, or In.