CLAIMS

What is claimed is:

1. A method of monetizing energy, comprising:

transporting a high energy density material to an energy market from a stranded natural gas reduction process location, wherein the high energy density material is obtained from reduction of a material oxide to the high energy density material using a stranded natural gas reduction process.

2. The method of claim 1, further comprising:

distributing the high energy density material in the energy market; and marketing the high energy density material within the energy market.

3. The method of claim 2, further comprising producing energy by reacting the high energy density material in a reaction process, wherein the reaction process produces at least the material oxide.

4. The method of any one of claims 1-3, further comprising:

collecting the material oxide; and

transporting the material oxide to the stranded natural gas reduction process location.

5. The method of claim 4, further comprising:

providing a stranded natural gas resource;

providing the material oxide;

transferring energy in a stranded natural gas resource to the high energy density material by reducing the material oxide to the high energy density material using the stranded natural gas reduction process at the stranded natural gas reduction process location; and

transporting the high energy density material to the energy market.

6. The method of claim 5, further comprising repeating the steps of claims 1-5 in a cycle.

7. The method of any one of claims 1-6, wherein the high energy density material has an energy density greater than 1.0 mega-joules squared per liter per kilogram divided by 1,000 ($MJ^2/kg/L/1000$).

8. The method of any one of claims 1-6, wherein the high energy density material is one of magnesium (Mg), boron (B), silicon (Si), carbon (C), zinc (Zn), polyethylene plastic, and aluminum (Al).

9. The method of claim 3, wherein the reaction process is conducted at one of a fuel cell, gas turbine, industrial power plant, commercial power plant, and internal combustion engine.

10. The method of claim 6, wherein the stranded natural gas reduction process is selected from the group consisting of: the Bayer process using the stranded natural gas to provide heat to the process, a boria reduction process using the stranded natural gas to provide heat, a boria reduction process using the stranded natural gas to provide disassociated hydrogen for use in the process as a fuel or a reactant.

11. A method of monetizing energy, comprising:

transporting a stranded natural gas resource to a reduction site;

transporting a material oxide to the reduction site;

reducing the material oxide to a high energy density material using the stranded natural gas resource in a stranded natural gas reduction process at the reduction site; and

transporting the high energy density material to an energy market.

12. The method of claim 11, further comprising:

marketing a high energy density material to an energy market; and

distributing the high energy density material within the energy market.

13. The method of any one of claims 11-12, further comprising:

producing energy by reacting the material in a reaction process, wherein the reaction process produces at least the material oxide; and

transporting the material oxide to the reduction site.

14. The method of claim 13, wherein the steps of claim 13 are repeated in cycle.

15. The method of claim 11-14, wherein the high energy density material has an energy density greater than or equal to about 40 mega-joules per liter (MJ/l).

16. The method of claim 13, wherein the reaction process is a combustion process.

17. The method claim 11, wherein the natural gas reduction process comprises:

producing hydrogen (H_2) from the natural gas; and

using the produced hydrogen as a catalytic reduction promoter to reduce the material oxide to the high energy density material.

18. The method of claim 17, wherein the hydrogen is produced by a process selected from the group of processes consisting of: a methane decomposition process, a steam natural gas reforming process, and a catalytic dissociation of natural gas process.

19. The method of claim 11, wherein the material oxide reduction process is one of the processes selected from the group consisting of: a Moissan process combined with an upgrading process, thermal decomposition of the material oxide, reducing the material oxide using hydrogen (H_2) as a catalytic reduction promoter, a Bayer process combined with an electrolysis process, and any combination thereof.

20. A system for monetizing high energy density materials, comprising:

a first transportation infrastructure comprising transportation carriers configured to carry a high energy density material to an energy market from a stranded natural gas reduction process location, wherein the high energy density material is obtained from reduction of a material oxide to the high energy density material using a stranded natural gas reduction process.

21. The system of claim 20, further comprising: a distribution infrastructure configured to receive the high energy density material from the first transportation infrastructure and distribute at least a portion of the high energy density material within an energy market to be reacted for energy generation.

22. The system of claim 21, further comprising: a collection infrastructure configured to collect the reacted high energy density materials as a material oxide, wherein the material oxide is to be delivered to an exportation infrastructure.

23. The system of claim 22, further comprising: a second transportation infrastructure operatively connected to the collection infrastructure comprising transportation carriers configured to carry the material oxide to a natural gas reduction site.

24. The system of any one of claims 20-23, wherein the high energy density material has an energy density greater than or equal to 1.0 mega-joules squared per liter per kilogram divided by 1,000 ($MJ^2/kg/L/1000$).

25. The system of any one of claims 20-23, wherein the high energy density material is one of magnesium (Mg), boron (B), silicon (Si), carbon (C), zinc (Zn), polyethylene plastic, and aluminum (Al).

26. The system of any one of claims 20-23, wherein the material oxide is transported by one of a marine or overland bulk carrier.

27. A method of producing energy, comprising:

providing a remote hydrocarbon and a material oxide;

decomposing the remote hydrocarbon into hydrogen (H_2) and carbon (C);

utilizing the carbon for one of fuel and sales;

reducing the material oxide to a high energy density material using the hydrogen; and

utilizing the high energy density material for one of fuel and sales.

28. The method of claim 27, wherein the method of decomposing the remote hydrocarbon is a catalytic dissociation method.

29. The method of claim 28, wherein the hydrogen is used as a catalytic reduction promoter to reduce the material oxide to a high energy density material.

30. The method of claim 27, wherein the remote hydrocarbon is decomposed by a process selected from the group of processes consisting of: a methane decomposition process, a steam natural gas reforming process, and a catalytic dissociation of natural gas process.

31. A system for producing energy, comprising:

a reduction site;

a first delivery infrastructure to supply a remote gas to the reduction site;

a second delivery infrastructure to supply a material oxide to the reduction site;

a remote gas decomposition plant for decomposing the remote gas into hydrogen (H_2) and carbon (C);

a material oxide reduction plant for reducing the material oxide to a high energy density material using the hydrogen from the remote gas decomposition plant; and

a transportation infrastructure to transport the carbon and the high energy density material to an energy market.

32. The system of claim 31, wherein the transportation infrastructure comprises a first transportation infrastructure for transporting the carbon to the energy market and a second transportation infrastructure for transporting the high energy density material to the energy market.

33. The system of claim 31, wherein the remote gas decomposition plant is configured to decompose the remote gas by at least one of the following processes: a methane decomposition process, a steam natural gas reforming process, and a catalytic dissociation of natural gas process.

CLAIMS

1. A method of monetizing energy, comprising:

transporting a high energy density material to an energy market from a stranded natural gas reduction process location, wherein the high energy density material is obtained from reduction of a material oxide to the high energy density material using a stranded natural gas reduction process.

2. The method of claim 1, further comprising:

distributing the high energy density material in the energy market; and marketing the high energy density material within the energy market.

3. The method of claim 2, further comprising:

producing energy by reacting the high energy density material in a reaction process, wherein the reaction process produces at least the material oxide.

4. The method of any one of claims 1-3, further comprising:

collecting the material oxide; and

transporting the material oxide to the stranded natural gas reduction process location.

5. The method of claim 4, further comprising:

providing a stranded natural gas resource;

providing the material oxide;

transferring energy in a stranded natural gas resource to the high energy density material by reducing the material oxide to the high energy density material using the stranded natural gas reduction process at the stranded natural gas reduction process location; and

transporting the high energy density material to the energy market.

6. The method of claim 5, further comprising repeating the steps of claims 1-5 in a cycle.

7. The method of any one of claims 1-6, wherein the high energy density material has an energy density greater than 1.0 mega-joules squared per liter per kilogram divided by 1,000 (MJ^2/kg/L/1000).

8. The method of any one of claims 1-6, wherein the high energy density material is one of magnesium (Mg), boron (B), silicon (Si), carbon (C), zinc (Zn), polyethylene plastic, and aluminum (Al).

9. The method of any one of claims 1-6, wherein the material oxide is transported by one of a marine or overland bulk carrier.

10. The method of claim 3, wherein the reaction process is conducted at one of a fuel cell, gas turbine, industrial power plant, commercial power plant, and internal combustion engine.

11. The method of claim 6, wherein the stranded natural gas reduction process is selected from the group consisting of: the Bayer process using the stranded natural gas to provide heat to the process, a boria reduction process using the stranded natural gas to provide heat, a boria reduction process using the stranded natural gas to provide disassociated hydrogen for use in the process as a fuel or a reactant.

12. A method of monetizing energy, comprising:

transporting a stranded natural gas resource to a reduction site;

transporting a material oxide to the reduction site;

reducing the material oxide to a high energy density material using the stranded natural gas resource in a stranded natural gas reduction process at the reduction site; and

transporting the high energy density material to an energy market.

13. The method of claim 12, further comprising:

marketing a high energy density material to an energy market; and distributing the high energy density material within the energy market.

14. The method of any one of claims 12-13, further comprising:

producing energy by reacting the material in a reaction process, wherein the reaction process produces at least the material oxide; and

transporting the material oxide to the reduction site.

15. The method of any one of claims 12-14, wherein the high energy density material has an energy density greater than or equal to about 40 mega-joules per liter (MJ/L).

16. The method of claim 14, wherein the reaction process is a combustion process.

17. The method of claim 12, wherein the natural gas reduction process comprises:

producing hydrogen (H_2) from the natural gas; and

using the produced hydrogen as a catalytic reduction promoter to reduce the material oxide to the high energy density material.

18. The method of claim 17, wherein the hydrogen is produced by a process selected from the group of processes consisting of: a methane decomposition process, a steam natural gas reforming process, and a catalytic dissociation of natural gas process.

19. The method of claim 12, wherein the material oxide reduction process is one of the processes selected from the group consisting of: a Moissan process combined with an upgrading process, thermal decomposition of the material oxide, reducing the material oxide using hydrogen (H_2) as a catalytic reduction promoter, a Bayer process combined with an electrolysis process, and any combination thereof.

20. A system for monetizing high energy density materials, comprising:

a first transportation infrastructure comprising transportation carriers configured to carry a high energy density material to an energy market from a stranded natural gas reduction process location, wherein the high energy density material is obtained from reduction of a material oxide to the high energy density material using a stranded natural gas reduction process.

21. The system of claim 20, further comprising: a distribution infrastructure configured to receive the high energy density material from the first transportation infrastructure and distribute at least a portion of the high energy density material within an energy market to be reacted for energy generation.

22. The system of claim 21, further comprising: a collection infrastructure configured to collect the reacted high energy density materials as a material oxide, wherein the material oxide is to be delivered to an exportation infrastructure.

23. The system of claim 22, further comprising: a second transportation infrastructure operatively connected to the collection infrastructure comprising transportation carriers configured to carry the material oxide to a natural gas reduction site.

24. A method of producing energy, comprising:

providing a remote hydrocarbon and a material oxide;
decomposing the remote hydrocarbon into hydrogen (H_2) and carbon (C);
utilizing the carbon for one of fuel and sales;
reducing the material oxide to a high energy density material using the hydrogen; and
utilizing the high energy density material for one of fuel and sales.

25. The method of claim 24, wherein the method of decomposing the remote hydrocarbon is a catalytic dissociation method.

26. The method of claim 24, wherein the remote hydrocarbon is decomposed by a process selected from the group of processes consisting of: a methane decomposition process, a steam natural gas reforming process, and a catalytic dissociation of natural gas process.

27. A system for producing energy, comprising:

a reduction site;

a first delivery infrastructure to supply a remote gas to the reduction site;

a second delivery infrastructure to supply a material oxide to the reduction site;

a remote gas decomposition plant for decomposing the remote gas into hydrogen (H_2) and carbon (C);

a material oxide reduction plant for reducing the material oxide to a high energy density material using the hydrogen from the remote gas decomposition plant; and

a transportation infrastructure to transport the carbon and the high energy density material to an energy market.