Proposed Claim Amendments

1. A storage vessel for storing compressed gas, comprising:
   a wellbore provided in a subsurface;
   a casing placed within the wellbore and cemented to surrounding rock formations, the cased wellbore defining a volumetric space for storing the compressed gas generated from a renewable energy source; and
   at least one gas flow regulator sealed at a top end of the casing for selectively injecting the compressed gas into the space or discharging the compressed gas from the volumetric space for generating electrical energy,
   wherein the storage vessel is configured to store at least a portion of heat for heating the compressed gas in an expansion process for generation of the electrical energy, the portion of heat being generated during a compression process of the compressed gas.

2. The storage vessel of claim 1, wherein an effective volume capacity of the well is 1-8 m^3/100 meter of well length.

3. The storage vessel of claim 2, wherein a total volume of the well is 50-100 m^3.

4. The storage vessel of claim 1, wherein the stored compressed gas has a pressure of 5 MPa to 100 MPa, and a temperature of 50 ^oC to 250 ^oC.

5. The storage vessel of claim 1, wherein the casing further comprises multitude sections comprising progressively smaller diameter casing as the wellbore length is extended.

6. The storage vessel of claim 1, wherein the compressed gas is compressed air.

7. The storage vessel of claim 1, wherein the compressed gas has a pressure of 50 MPa.

8. The storage vessel of claim 1, wherein the cased wellbore has a volumetric capacity of $7m^3/100m$ of length, a depth of 1000 meters, and a total volume of $70m^3$.

9. A system for storing energy in a form of compressed gas for generation of electrical energy, comprising:
one or more energy storage vessels for storing compressed gas, said energy storage vessels each comprising:
a wellbore provided in a subsurface;
a casing placed within the wellbore and cemented to surrounding rock formations, the casing defining a volumetric space for storing the compressed gas; and
at least one gas flow regulator sealed at a top end of the casing for selectively injecting the compressed gas into the space or discharging the compressed gas from the volumetric space,
at least one surface gas compressor in sealed, fluid communication with the one or more energy storage vessels for compressing the gas and for injecting the compressed gas therein; and
at least one surface gas expander system in sealed, fluid communication with the one or more energy storage vessels for generating electricity from the compressed gas discharged from one or more energy storage vessels; and
a heat recovery system configured to perform at least one of:
removing surplus heat generated during a gas compression process at the at least one surface gas compressor;
storing the surplus heat in the one or more energy storage vessels;
storing the surplus heat in a thermal storage medium; and
providing at least a portion of the surplus heat to the compressed gas during an expansion process at the at least one surface gas expander system,
wherein the compressed gas is generated from a renewable energy source.

10. The system of claim 9, wherein the one or more energy storage vessels comprise a plurality of energy storage vessels and any adjacent energy storage vessels are in fluid communication with each other.

11. The system of claim 9, wherein the compressed gas is air.

12. The system of claim 9, wherein an effective volume capacity of the storage vessel is 1-8 m^3/100 meter of cased wellbore length.

13. The system of claim 12, wherein a total volume of the well is 50-100 m^3.

14. The system of claim 9, wherein the system is configured to provide a maximum pressure in the one or more energy storage vessels of about 100 MPa per energy storage vessel.

15. The system of claim 10, where the plurality of energy storage vessels form an array that is in fluid connection to collectively provide a cumulative storage capacity for energy storage.

16. The system of claim 9, wherein said thermal storage medium includes the surrounding rock formations for heat storage.

17. A method for energy storage for generation of electrical energy, comprising:
forming at least one storage vessel by cementing a casing in a wellbore in the subsurface;
compressing gas on the surface using a renewable energy source;
injecting compressed gas into the at least one storage vessel;
discharging compressed gas from at least one storage vessel; and
expanding the compressed gas in an expander system for generating electricity; and
heating at least in part the compressed gas in the expander system using surplus heat generated at the step of compressing the gas.

18. The storage vessel of claim 1, wherein the storage vessel stores the compressed air that stores on an order of 5 MWh or more of energy for electricity generation.

19. The system of claim 14, wherein overall round-trip efficiencies of the system is greater than 50%.

20. The storage vessel of claim 1, wherein the storage vessel is used in an adiabatic system for storing energy in the compressed gas for generation of electrical energy.