CLAIMS

What is claimed is:

1. A gas-reservoir electrochemical pressure generator comprising:

an electrical power source;

an electrochemical pressure generator selectably connected to the electrical power source,

wherein the electrical power source is configured to power the electrochemical pressure generator in a first operation mode to convert a solid state of hydrogen or oxygen within the electrochemical pressure generator into a gas with a first pressure when connected thereto;

one or more gas reservoirs in fluid communication with the electrochemical pressure generator and each comprising a first chamber and a second chamber arranged in series,

wherein the first chamber of each of the one or more gas reservoirs is in fluid communication with the electrochemical pressure generator and includes a first surface of a non-rigid dividing element having a first area, and

wherein the second chamber of each of the one or more gas reservoirs includes a second surface of the non-rigid dividing element having a second area, the second surface mechanically connected to the first surface by the non-rigid dividing element to generate a second pressure; and

a hydraulic means coupled to the second chamber for transmitting the second pressure to a load.

2. The gas-reservoir electrochemical pressure generator in accordance with Claim 1 further comprising an energy storage device coupled to the electrochemical pressure generator, wherein the electrochemical pressure generator is configured to charge the energy storage device when converting the gas into the solid state.

3. The gas-reservoir electrochemical pressure generator in accordance with Claim 2 wherein the power source comprises the energy storage device.

4. The gas-reservoir electrochemical pressure generator in accordance with any of the preceding claims wherein the first chamber of each of the one or more gas reservoirs comprises a first expandable chamber.

5. The gas-reservoir electrochemical pressure generator in accordance with Claim 4 wherein the first expandable chamber of each of the one or more gas reservoirs comprises bellows.

6. The gas-reservoir electrochemical pressure generator in accordance with Claim 4 wherein the first expandable chamber of each of the one or more gas reservoirs comprises pistons.

7. The gas-reservoir electrochemical pressure generator in accordance with any of the preceding claims wherein the second chamber of each of the one or more gas reservoirs comprises a second expandable chamber.

8. The gas-reservoir electrochemical pressure generator in accordance with Claim 7 wherein the second expandable chamber of each of the one or more gas reservoirs comprises bellows.

9. The gas-reservoir electrochemical pressure generator in accordance with Claim 7 wherein the first expandable chamber of each of the one or more gas reservoirs comprises pistons.

10. The gas-reservoir electrochemical pressure generator in accordance with any of the preceding claims wherein the second chamber of each of the one or more gas reservoirs is filled with a non-compressible fluid.

11. The gas-reservoir electrochemical pressure generator in accordance with Claim 10 wherein the non-compressible fluid comprises a fluid selected from silicone oil, mineral oil and water.

12. The gas-reservoir electrochemical pressure generator in accordance with any of the preceding claims wherein the one or more gas reservoirs comprise a single gas reservoir in fluid communication with the electrochemical pressure generator to receive the gas, and wherein the first area of the first surface is larger than the second area of the second surface in order to generate the second pressure at a value greater than the first pressure, and wherein the difference between the first area of the first surface and the second area of the second surface is determined in response to requirements of a desired application to provide the value of the second pressure to the load.

13. The gas-reservoir electrochemical pressure generator in accordance with any of Claims 1 to 11, wherein the electrochemical pressure generator is further configured to operate in a second operation mode to convert the high-pressure gas back into the solid state, and

wherein the one or more gas reservoirs comprise a first gas reservoir and a second gas reservoir, both the first and second gas reservoirs in fluid communication with the electrochemical pressure generator, and

wherein the first area of the first surface of the first chamber of the first gas reservoir is larger than the second area of the second surface of the second chamber of the first gas reservoir and the second pressure within the second chamber of the first gas reservoir is greater than the first pressure within the first chamber of the first gas reservoir, and

wherein the first area of the first surface of the first chamber of the second gas reservoir is smaller than the second area of the second surface of the second chamber of the second gas reservoir and the second pressure within the second chamber of the second gas reservoir is smaller than the first pressure within the first chamber of the first gas reservoir,

the gas-reservoir electrochemical pressure generator further comprising a plurality of valves configured to control pressure transmitted to the load by the hydraulic means, wherein a first portion of the plurality of valves is located between the electrochemical pressure generator and each of the first gas reservoir and the second gas reservoir and a second portion of the plurality of valves is located between each of the first gas reservoir and the second gas reservoir and the hydraulic means; and

the gas-reservoir electrochemical pressure generator further comprising a control means coupled to each of the plurality of valves and configured to alternate gas flow between the first gas reservoir and the second gas reservoir and to the hydraulic means

as operation of the electrochemical pressure generator alternates between the first operation mode and the second operation mode.

14. A dual-gas-reservoir electrochemical pressure generator comprising:

an electrical power source;

an electrochemical pressure generator selectably connected to the electrical power source,

wherein the electrical power source is configured to power the electrochemical pressure generator to produce a gas with first pressure P1 from a solid state of hydrogen or oxygen within the electrochemical pressure generator, and

wherein the electrochemical pressure generator is configured to convert the gas into a solid state of the hydrogen and the oxygen, resulting in a second pressure P2;

a first gas reservoir in fluid communication with the electrochemical pressure generator and comprising a first and second chamber arranged in series,

wherein the first chamber is in fluid communication with the gas having the first pressure and includes a first surface on a first non-rigid dividing element separating the first chamber from the second chamber, the first surface having an area S1, and

wherein the second chamber is filled with a non-compressible fluid and includes a second surface of the first non-rigid dividing element having an area S1' to generate a pressure P1', and

wherein S1 > S1' and P1 < P1';

a second gas reservoir in fluid communication with the electrochemical pressure generator and comprising a third and fourth chamber arranged in series,

wherein the third chamber is in fluid communication with gas having the second pressure P2 and includes a third surface of a second non-rigid dividing element

separating the third chamber from the fourth chamber, the third surface having an area S2, and

wherein the fourth chamber is filled with a non-compressible fluid and includes a fourth surface having an area S2' in contact with the third surface to output a pressure P2', and

wherein S2 < S1' and P2 > P2';

a hydraulic means selectably coupled to the second chamber and the fourth chamber for transmitting the pressure P1' and the pressure P2' to a load;

a plurality of valves for controlling flow of gas from the electrochemical pressure generator to the first and third chambers and for controlling the flow of pressure from the second and fourth chambers to the hydraulic means; and

a control means coupled to the plurality of valves and configured for controlling transmission of the pressure P1' and the pressure P2' to the load.

15. The dual-gas-reservoir electrochemical pressure generator in accordance with Claim 14 further comprising an energy storage device, wherein the electrochemical pressure generator is configured to charge the energy storage device when converting the gas into a solid state.