CLAIMS

1. A heat to electric energy converter for operation with a working fluid being in gas and liquid phases, the electric energy converter comprising:

a first electrode, the first electrode being hygroscopic at a first working fluid absorption potential;

a second electrode, the second electrode being hygroscopic at a working fluid absorption potential that is different from the absorption potential of the first electrode whereby a voltage potential exist between the two electrodes;

an electrochemical barrier, the barrier being coupled between the first electrode and second electrode and conducting at least one ion species of the working fluid between the first electrode and the second electrode, and

the first and second electrode being exposed to and coupled to each other by a gas, the gas comprising at least one constituent of the working fluid.

2. The heat to electric converter as disclosed in claim 1 wherein the electrochemical barrier comprises a metal, the metal being permeable to hydrogen and a proton conductive material that has a different absorption affinity for water in the gas phase relative to its absorption potential for water in the liquid phase.

3. The heat to electric converter as disclosed in claim 1 wherein the electrochemical barrier comprises a working fluid permeable membrane and a proton conductive material that has a

different absorption affinity for water in the gas phase relative to its absorption potential for water in the liquid phase.

4. The heat to electric converter as disclosed in claim 3 wherein the working fluid permeable membrane is permeable substantially exclusively to the working fluid.

5. The heat to electric converter as disclosed in claim 1 wherein the converter further includes a housing structure.

6. The heat to electric converter as disclosed in claim 2 wherein multiple membrane electrode assembly cell are stacked in series within the housing so as to produce a higher overall output voltage.

7. A heat to electric energy converter operational with a working fluid comprising:

a membrane electrode assembly, the membrane electrode assembly comprising a condensing electrode, an evaporating electrode, and an electrochemical barrier sandwiched between the first electrode and the second electrode,

the barrier being coupled between the first electrode and second electrode and conducting a single ions species of the working fluid between the first electrode and the second electrode,

the first and second electrode being exposed to and coupled to each other by a gas, the gas comprising at least one constituent of the working fluid, the electrodes maintaining working fluid gas phase absorption equilibrium relative to each other,

the converter producing DC electrical current with connection of a load circuit between the two electrodes through pseudo flow of working fluid via oxidation reduction reactions from the condensing electrode to the evaporating electrode as working fluid ions are conducted through the electrochemical barrier as working fluid gas passes from the evaporating electrode to the condensing electrode.

8. The ambient heat converter of claim 1 wherein said ion conductive membrane electrode has a first electrode, a second electrode, an ion conductive member positioned between the first electrode and the second electrode, wherein the ion conductive member is a proton conductive member.

9. The ambient heat converter of claim 1 wherein the ion conductive member is a proton conductive member having high barrier properties to molecular water diffusion.

10. The ambient energy converter of claim 2 wherein the electrochemical barrier comprises an ion conductive material coated hydrogen permeable metal.

11. The heat to electric converter as disclosed in claim 7 wherein the electrochemical barrier comprises a working fluid permeable membrane and a proton conductive material that has a different absorption affinity for water in the gas phase relative to its absorption potential for water in the liquid phase, the working fluid permeable membrane is permeable substantially exclusively to the working fluid.

12. The heat to electric converter as disclosed in claim 7 wherein the condensing electrode is hygroscopic at a first liquid working fluid absorption potential and the evaporating electrode is hygroscopic at a different liquid working fluid absorption potential relative to the first electrode.

13. The heat to electric converter as disclosed in claim 7 wherein the condensing hygroscopic electrode comprises a porous electronic conductive layer and an ion conductive substantially nonporous layer.

14. The heat to electric converter as disclosed in claim 1 wherein the condensing hygroscopic electrode comprises a porous electronic conductive layer and an ion conductive substantially nonporous layer.

15. A heat to electric energy converter operational with a working fluid being in gas and liquid phases, the electric energy converter comprising:

a housing;

a first electrode, the first electrode being hygroscopic at a first working fluid absorption potential;

a second electrode, the second electrode being hygroscopic at a working fluid absorption potential that is different from the absorption potential of the first electrode whereby a voltage potential exist between the two electrodes, and

an electrochemical barrier, the barrier being coupled between the first electrode and second

electrode and conducting at least one ion species of the working fluid between the first electrode and the second electrode,

the housing containing the first electrode, second electrode and electrochemical barrier so that the working fluid in gas and vaporized form may freely flow between the first electrode and the second electrode,

the first electrode and the second electrode being coupled to each other through the electrochemical barrier for passage of a gas constituent of the working fluid from the first electrode to the second electrode.

16. The heat to electric converter as disclosed in claim 15 wherein the electrochemical barrier comprises a metal, the metal being permeable to hydrogen and a proton conductive material that has a different absorption affinity for water in the gas phase relative to its absorption potential for water in the liquid phase.

17. The heat to electric converter as disclosed in claim 15 wherein the electrochemical barrier comprises a working fluid permeable membrane and a proton conductive material that has a different absorption affinity for water in the gas phase relative to its absorption potential for water in the liquid phase.