CLAIMS

What is claimed is:

1. A fuel cell module assembly comprising:

a fuel cell stack assembly comprising:

a fuel cell stack configured to receive and output a first process gas, and

a plurality of manifolds including a first manifold and a second manifold,

wherein the first manifold is configured to provide the first process gas to the fuel cell stack and the second manifold is configured to receive the first process gas output from the fuel cell stack,

a heat exchanger configured to receive the first process gas from an external source and output the first process gas to the first manifold, and configured to receive the first process gas from the second manifold and output, away from the fuel cell module assembly, the first process gas, and

a housing enclosing the fuel cell stack assembly and the heat exchanger~~.~~,

wherein the fuel cell stack is further configured to receive and output a second process gas, and

wherein the plurality of manifolds includes a third manifold and a fourth manifold, wherein the third manifold is configured to provide the second process gas to the fuel cell stack and the fourth manifold is configured to receive the second process gas output from the fuel cell stack, and

wherein the heat exchanger is further configured to receive the second process gas from a second external source and output the second process gas to the third manifold, and configured to receive the second process gas from the fourth manifold and output the second process gas.

~~2. The fuel cell module assembly of claim 1, wherein the fuel cell stack is further configured to receive and output a second process gas, and wherein the plurality of manifolds includes a third manifold and a fourth manifold, wherein the third manifold is configured to provide the second process gas to the fuel cell stack and the fourth manifold is configured to receive the second process gas output from the fuel cell stack, and wherein the heat exchanger is further configured to receive the second process gas from a second external~~

~~source and output the second process gas to the third manifold, and configured to receive the second process gas from the fourth manifold and output the second process gas.~~

~~3.~~2. The fuel cell module assembly of claim ~~2~~ 1, wherein the housing comprises a plurality of ports located at a first end of the housing,

wherein the plurality of ports are fluidly connected to the heat exchanger and includes a first port, a second port, a third port, and a fourth port, and

wherein the first port is configured to receive the first process gas from the external source, the second port is configured to output first process gas from the housing, the third port is configured to receive the second process gas from the second external source, and the fourth port is configured to output the second process gas from the housing.

~~4.~~3. The fuel cell module assembly of claim ~~2~~ 1, wherein the heat exchanger is further configured to receive the first process gas from the external source at a first temperature and output the first process gas to the fuel cell stack assembly at a second temperature,

wherein the first temperature is from about 85% to about 95% cooler than the second temperature.~~, and wherein the heat exchanger is further configured to receive the first process gas from the fuel cell stack assembly at a third temperature and output the first process gas at a fourth temperature, wherein the fourth temperature is from about 70% to about 80% cooler than the third temperature.~~

4. The fuel cell module assembly of claim 3, wherein the heat exchanger is further configured to receive the first process gas from the fuel cell stack assembly at a third temperature and output the first process gas at a fourth temperature,

wherein the fourth temperature is from about 70% to about 80% cooler than the third temperature.

5. The fuel cell module assembly of claim 4, wherein the heat exchanger is further configured to receive the second process gas from the second external source at a fifth temperature and output the second process gas to the fuel cell stack assembly at a sixth temperature,

wherein the fifth temperature is from about 75% to about 85% cooler than the sixth temperature.~~, and wherein the heat exchanger is further configured to receive the second process gas from the fuel cell stack assembly at a seventh temperature and output the second process gas at an eighth temperature, wherein the eighth temperature is from about 70% to about 80% cooler than the seventh temperature.~~

6. The fuel cell module assembly of claim 5, wherein the heat exchanger is further configured to receive the second process gas from the fuel cell stack assembly at a seventh temperature and output the second process gas at an eighth temperature,

wherein the eighth temperature is from about 70% to about 80% cooler than the seventh temperature.

~~6. A fuel cell power plant system comprising: a module assembly having a first end and comprising a fuel cell stack, a racking structure configured to, during an installed mode, hold the module assembly, balance of plant equipment, and ducting configured to, during the installed mode, provide fluid communication between the balance of plant equipment and the first end of the module assembly, wherein the module assembly and the racking structure are configured such that, during a removal mode, the module assembly is removable from the racking structure in a direction away from the first end of the module assembly.~~

~~7. The fuel cell power plant system of claim 6, wherein the racking structure has a first end and a second end opposite the first end, wherein at least a portion of the ducting is proximate the first end of the racking structure, and wherein, during the installed mode, the first end of the module assembly is proximate the first end of the racking structure.~~

~~8. The fuel cell power plant system of claim 7, wherein the module assembly and the racking structure are configured such that, during the removal mode, the module assembly is removable from the second end of the racking structure.~~

~~9. The fuel cell power plant system of claim 6, wherein the fuel cell stack is configured to receive and output a process gas, and wherein the module assembly further~~

~~comprises: a plurality of manifolds including a first manifold and a second manifold, wherein the first manifold is configured to provide the process gas to the fuel cell stack, and the second manifold is configured to receive the process gas output from the fuel cell stack, and a heat exchanger configured to receive the process gas at a first temperature from an external source and to output the process gas at a second temperature to the first manifold, and configured to receive the process gas at a third temperature from the second manifold and to output the process gas a fourth temperature.~~

~~10. The fuel cell power plant system of claim 6, further comprising a plurality of module assemblies, and wherein the racking structure is configured to hold the plurality of module assemblies in a stacked arrangement, and wherein the racking structure and each of the plurality of module assemblies are configured such that, during the removal mode, the module assemblies are removable from the racking structure in a same direction.~~

~~11. The fuel cell power plant system of claim 8, further comprising: a plurality of module assemblies including the module assembly; wherein the racking structure is configured to hold the plurality of module assemblies in a stacked arrangement, and wherein the racking structure is configured to hold the balance of plant equipment in a stacked arrangement relative to the plurality of module assemblies.~~

~~12. The fuel cell power plant system of claim 11, wherein the ducting comprises a trunk proximate the first end of the racking structure and configured to extend away from the balance of plant equipment toward the plurality of module assemblies, and a plurality of branches extending away from the trunk including a first branch configured to communicate with the module assembly.~~

~~13. The fuel cell power plant system of claim 12, wherein the plurality of module assemblies, the racking structure, the balance of plant equipment, and the ducting form a module cluster, wherein the fuel cell power plant further comprises a plurality of module clusters including the module cluster, and wherein, during the removal mode, the module cluster is configured to be electrically and/or fluidly isolated from other module clusters among the plurality of module clusters.~~

~~14. The fuel cell power plant system of claim 13, wherein the plurality of module clusters are arranged side by side to form a cluster group, wherein the cluster group has a first end, and wherein the first end of each racking structure among the plurality of module clusters is at the first end of the cluster group.~~

~~15. The fuel cell power plant system of claim 14, further comprising a plurality of cluster groups including the cluster group.~~