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 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.

3. The fuel cell module assembly of claim 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.

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.

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.