CLAIMS

What is claimed is:

1. A gas turbine system, comprising:

a first compressor configured to receive and compress a recycled exhaust gas into a compressed recycle exhaust gas;

a second compressor configured to receive and compress enriched air to generate a compressed oxidant;

a combustion chamber configured to receive the compressed recycle exhaust gas and the compressed oxidant and stoichiometrically combust a fuel stream, wherein the compressed recycle exhaust gas serves as a diluent to moderate combustion temperatures; and

an expander coupled to the first compressor and configured to receive a discharge from the combustion chamber to generate the recycled exhaust gas and at least partially drive the first compressor.

2. The system of claim 1, wherein the enriched air has an oxygen concentration between about 30wt% and about 50wt%.

3. The system of claim 2, wherein the enriched air is mixed with atmospheric air to obtain the oxygen concentration between about 30wt% and about 50wt%.

4. The system of claim 1, wherein the enriched air is derived from membrane separation, pressure swing adsorption, temperature swing adsorption, and any combination thereof.

5. The system of claim 1, wherein the enriched air is derived from a reject stream of an air separation unit.

6. The system of claim 5, wherein the reject stream has an oxygen concentration between about 50wt% and about 70wt%.

7. The system of claim 1, wherein the recycle exhaust gas has a CO_2 concentration of between about 10wt% and about 20wt%.

8. The system of claim 1, wherein the fuel stream is selected from the group consisting of: natural gas, methane, naphtha, butane, propane, syngas, diesel, kerosene, aviation fuel, coal derived fuel, bio-fuel, oxygenated hydrocarbon feedstock, and any combination thereof.

9. The system of claim 1, further comprising a purge stream taken from the compressed recycle exhaust gas and treated in a CO_2 separator to generate a CO_2 stream and a residual stream substantially comprising nitrogen gas.

10. A method of generating power, comprising:

compressing a recycled exhaust gas in a main compressor to generate a compressed recycle exhaust gas;

compressing enriched air in an inlet compressor to generate a compressed oxidant;

stoichiometrically combusting the compressed oxidant and a fuel in a combustion chamber and in the presence of the compressed recycle exhaust gas, thereby generating a discharge stream, wherein the compressed recycle exhaust gas acts as a diluent configured to moderate the temperature of the discharge stream; and

expanding the discharge stream in an expander to at least partially drive the main compressor and generate the recycled exhaust gas and at least partially drive the main compressor.

11. The method of claim 10, wherein the enriched air has an oxygen concentration between about 30wt% and about 50wt%.

12. The method of claim 11, further comprising mixing the enriched air with atmospheric air to obtain the oxygen concentration between about 30wt% and about 50wt%.

13. The method of claim 10, wherein the recycle exhaust gas has a CO_2 concentration of between about 10wt% and about 20wt%.

14. The method of claim 10, wherein the enriched air is derived from a reject stream of an air separation unit, the reject stream having an oxygen concentration between about 50wt% and about 70wt%.

15. An integrated system, comprising:

a gas turbine system, comprising:

a first compressor configured to receive and compress a recycled exhaust gas into a compressed recycle exhaust gas;

a second compressor configured to receive and compress enriched air to generate a compressed oxidant, the enriched air having an oxygen concentration between about 30wt% and about 50wt%;

a combustion chamber configured to receive the compressed recycle exhaust gas and the compressed oxidant and stoichiometrically combust a fuel stream, wherein the compressed recycle exhaust gas serves as a diluent to moderate combustion temperatures; and

an expander coupled to the first compressor and configured to receive a discharge from the combustion chamber to generate the recycled exhaust stream and at least partially drive the first compressor; and

an exhaust gas recirculation system, comprising:

a heat recovery steam generator communicably coupled to a steam gas turbine, the heat recovery steam generator being configured to receive the recycled exhaust gas

from the expander to create steam that generates electrical power in the steam generator;

one or more cooling units configured to cool the recycled exhaust gas received from the heat recovery steam generator and remove condensed water from the recycled exhaust gas; and

a boost compressor configured to increase the pressure of the recycled exhaust gas before injection into the first compressor to provide the compressed recycle exhaust gas.

16. The system of claim 15, wherein the boost compressor increases the pressure of the recycled exhaust gas stream to a pressure between about 17 psia and about 21 psia.

17. The system of claim 15, wherein the recycle exhaust gas has a CO_2 concentration of between about 15wt% and about 20wt%.

18. The system of claim 15, wherein the enriched air is mixed with atmospheric air to obtain the oxygen concentration between about 30wt% and about 50wt%.

19. The system of claim 15, wherein the enriched air is derived from membrane separation, pressure swing adsorption, temperature swing adsorption, an air separation unit, and any combination thereof.

20. The system of claim 19, wherein the air separation unit has a reject stream having an oxygen concentration between about 50wt% and about 70wt%, the reject stream substantially providing the enriched air.

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1. An integrated system, comprising:

a gas turbine system, comprising:

a first compressor configured to receive and compress a recycled exhaust gas into a compressed recycle exhaust gas;

a second compressor configured to receive and compress enriched air to generate a compressed oxidant, the enriched air having an oxygen concentration between about 30wt% and about 50wt%;

a combustion chamber configured to receive the compressed recycle exhaust gas and the compressed oxidant and stoichiometrically combust a fuel stream, wherein the compressed recycle exhaust gas serves as a diluent to moderate combustion temperatures; and

an expander coupled to the first compressor and configured to receive a discharge from the combustion chamber to generate the recycled exhaust stream and at least partially drive the first compressor; and

an exhaust gas recirculation system, comprising:

a heat recovery steam generator communicably coupled to a steam gas turbine, the heat recovery steam generator being configured to receive the recycled exhaust gas from the expander to create steam that generates electrical power in the steam generator;

one or more cooling units configured to cool the recycled exhaust gas received from the heat recovery steam generator and remove condensed water from the recycled exhaust gas; and

a boost compressor configured to increase the pressure of the recycled exhaust gas before injection into the first compressor to provide the compressed recycle exhaust gas, wherein the enriched air is mixed with atmospheric air to obtain the oxygen concentration between about 30wt% and about 50wt%.