CLAIMS

1. An integrated system comprising:
a gas turbine system comprising a combustion chamber configured to combust one or more oxidants and one or more fuels in the presence of a compressed recycle stream, wherein the combustion chamber directs a first discharge stream to an expander to generate a gaseous exhaust stream and at least partially drive a main compressor, wherein the one or more oxidants and the one or more fuels are separately provided to the combustion chamber so as to be in a stoichiometric ratio of between 0.9:1 and 1.1:1 in the combustion chamber; and
an exhaust gas recirculation system, wherein the main compressor compresses the gaseous exhaust stream and thereby generates the compressed recycle stream;
wherein the exhaust gas recirculation system comprises (i) at least one cooling unit configured to receive and cool the gaseous exhaust stream, (ii) at least one blower configured to receive and increase the pressure of the gaseous exhaust stream before directing a cooled recycle gas to the main compressor, (iii) a second cooling unit configured to receive the gaseous exhaust stream from the at least one blower and to adjust a temperature and lower a dew point of the gaseous exhaust stream to the main compressor thereby generating the cooled recycle gas, and (iv) a feed/effluent cross exchanger in series with the second cooling unit configured to adjust the temperature of the cooled recycle gas to achieve a dew point margin of
at least about 20° F.

2. The system of claim 1, wherein the at least one cooling unit is a heat recovery steam generator (HRSG) configured to receive and cool the gaseous exhaust stream before introduction to the at least one blower.

3. The system of claim 2, wherein the second cooling unit comprises a direct contact cooler (DCC) section.

4. The system of claim 2, wherein the second cooling unit comprises a HRSG.

5. The system of claim 2, wherein the HRSG further comprises cooling water coils and wherein the exhaust gas recirculation system further comprises a separator configured to receive the gaseous exhaust stream from the cooling water coils of the HRSG and remove water droplets from the gaseous exhaust stream before introduction to the blower.

6. The system of claim 5 wherein the separator comprises a vane pack.

7. The system of claim 3, wherein the HRSG further comprises cooling water coils and wherein the exhaust gas recirculation system further comprises a separator configured to receive the gaseous exhaust stream from the cooling water coils of the HRSG and remove water droplets from the gaseous exhaust stream before introduction to the blower.

8. The system of claim 7 wherein the separator comprises a vane pack.

9. The system of claim 2, wherein
the second cooling unit comprises a second HRSG and each of the first and second cooling units further comprise cooling water coils; and
the exhaust gas recirculation system further comprises a first separator configured to receive the gaseous exhaust stream from the cooling water coils of the first cooling unit and remove water droplets from the gaseous exhaust stream before introduction to the blower and a second separator configured to receive the cooled recycle gas from the cooling water coils of the second cooling unit and remove water droplets from the cooled recycle gas before introduction to the main compressor.

10. The system of claim 9 wherein the first separator, the second separator, or both of the first and second separators comprise a vane pack.

11. The system of claim 3, wherein the exhaust gas recirculation system employs psychrometric cooling of the gaseous exhaust stream.

12. The system of claim 11, wherein
water is added to the gaseous exhaust stream to saturate or nearly saturate the gaseous exhaust stream before introduction to the blower;
the exhaust gas recirculation system further comprises a separator configured to receive the saturated or nearly saturated gaseous exhaust stream and remove water droplets from the saturated or nearly saturated gaseous exhaust stream before introduction to the blower; and
the second cooling unit is further configured to remove water from the gaseous exhaust stream and recycle at least part of the water removed.

13. The system of claim 12, wherein a first portion of the water removed in the second cooling unit is recycled and added to the gaseous exhaust stream upstream of the separator and a second portion of the water removed in the second cooling unit is recycled to the second cooling unit.

14. The system of claim 1, wherein the second cooling unit is configured to cause the cooled recycle gas to have a dew point margin of at least about 30° F.

15. The system of claim 3, wherein
the second cooling unit further comprises a glycol absorption section configured to receive the cooled recycle gas from the DCC section and at least partially dehydrate the cooled recycle gas before introduction to the main compressor; and
the exhaust gas recirculation system further comprises a glycol regeneration system configured to receive rich glycol from the glycol absorption section of the second cooling unit, thermally regenerate the rich glycol in a glycol regeneration column to form regenerated lean glycol, and return the regenerated lean glycol to the glycol absorption section.

16. The system of claim 15, wherein the glycol regeneration system is operated under vacuum conditions.

17. The system of claim 15, wherein the second cooling unit comprises the glycol regeneration column and the glycol regeneration column is configured to receive the gaseous exhaust stream from the blower before introduction to the DCC section.

18. The system of claim 17, wherein the second cooling unit further comprises a desuperheating section positioned between the glycol regeneration column and the DCC section.

19. The system of claim 1, wherein the combustion chamber is configured to combust one or more oxidants and one or more fuels in the presence of the compressed recycle stream and a high pressure steam coolant stream.

20. The system of claim 1, wherein the compressed recycle stream includes a steam coolant, which supplements the gaseous exhaust stream.

21. A method of generating power, comprising:
separately providing at least one oxidant and at least one fuel to a combustion chamber so that the at least one oxidant and the at least one fuel have a stoichiometric ratio of between 0.9:1 and 1.1:1 in the combustion chamber;
combusting the at least one oxidant and the at least one fuel in the presence of a compressed recycle exhaust gas, thereby generating a discharge stream;
expanding the discharge stream in an expander to at least partially drive a main compressor and generate a gaseous exhaust stream; and
directing the gaseous exhaust stream to an exhaust gas recirculation system, wherein the main compressor compresses the gaseous exhaust stream and thereby generates the compressed recycle stream;
wherein the exhaust gas recirculation system comprises (i) at least one cooling unit configured to receive and cool the gaseous exhaust stream, (ii) at least one blower configured to receive and increase the pressure of the gaseous exhaust stream before directing a cooled recycle gas to the main compressor, (iii) a second cooling unit configured to receive the gaseous exhaust stream from the at least one blower and to adjust a temperature and lower a dew point of the gaseous exhaust

stream to the main compressor, wherein the second cooling unit is configured to cause the cooled recycle gas to have a dew point margin of at least about 20° F., and (iv) a feed/effluent cross exchanger in series with the second cooling unit configured to adjust the temperature of the cooled recycle gas to achieve the dew point marginsuch that the gaseous exhaust stream is cooled in the at least one cooling unit and the pressure of the gaseous exhaust stream is increased in the at least one blower, thereby generating the cooled recycle gas directed to the main compressor.

22. The method of claim 21, wherein the at least one cooling unit is a heat recovery steam generator (HRSG) that cools the gaseous exhaust stream before the gaseous exhaust stream is introduced to the at least one blower.

23. The method of claim 22, wherein the second cooling unit comprises a direct contact cooler (DCC) section.

24. The method of claim 22, wherein the second cooling unit comprises a second HRSG.

25. The method of claim 22, wherein the HRSG further comprises cooling water coils and wherein the exhaust gas recirculation system further comprises a separator that receives the gaseous exhaust stream from the cooling water coils of the HRSG and removes water droplets from the gaseous exhaust stream before the gaseous exhaust stream is introduced to the blower.

26. The method of claim 25 wherein the separator comprises a vane pack.

27. The method of claim 26, wherein the HRSG further comprises cooling water coils and wherein the exhaust gas recirculation system further comprises a separator that receives the gaseous exhaust stream from the cooling water coils of the HRSG and removes water droplets from the gaseous exhaust stream before the gaseous exhaust stream is introduced to the blower.

28. The method of claim 27 wherein the separator comprises a vane pack.

29. The method of claim 22, wherein
the second cooling unit comprises a second HRSG and each of the first and second cooling units further comprise cooling water coils; and
the exhaust gas recirculation system further comprises:
a first separator that receives the gaseous exhaust stream from the cooling water coils of the first cooling unit and removes water droplets from the gaseous exhaust stream before the gaseous exhaust stream is introduced to the blower; and
a second separator that receives the cooled recycle gas from the cooling water coils of the second cooling unit and removes water droplets from the cooled recycle gas before the cooled recycle gas is introduced to the main compressor.

30. The method of claim 29 wherein the first separator, the second separator, or both of the first and second separators comprise a vane pack.

31. The method of claim 22, wherein the exhaust gas recirculation system employs psychrometric cooling to further cool the gaseous exhaust stream.

32. The method of claim 31, wherein
the gaseous exhaust stream is saturated or nearly saturated with water before the gaseous exhaust stream is introduced to the blower;
the exhaust gas recirculation system further comprises a separator that receives the saturated or nearly saturated gaseous exhaust stream and removes water droplets from the saturated or nearly saturated gaseous exhaust stream before the gaseous exhaust stream is introduced to the blower; and
the second cooling unit removes water from the gaseous exhaust stream and at least part of the water removed by the second cooling unit is recycled.

33. The method of claim 32, wherein a first portion of the water removed by the second cooling unit is recycled and added to the gaseous exhaust stream upstream of the separator and a second portion of the water removed in the second cooling unit is recycled to the second cooling unit.

34. The method of claim 22, wherein the second cooling unit is configured to cause dew point margin of the cooled recycle gas to have a dew point margin of at least about 30° F.

35. The method of claim 23, wherein
the second cooling unit further comprises a glycol absorption section that receives the cooled recycle gas from the DCC section and at least partially dehydrates the cooled recycle gas before the cooled recycle gas is introduced to the main compressor; and
the exhaust gas recirculation system further comprises a glycol regeneration system that receives rich glycol from the glycol absorption section of the second cooling unit, thermally regenerates the rich glycol in a glycol regeneration column to form regenerated lean glycol, and returns the regenerated lean glycol to the glycol absorption section.

36. The method of claim 35, wherein the glycol regeneration system is operated under vacuum conditions.

37. The method of claim 36, wherein the second cooling unit comprises the glycol regeneration column and the glycol regeneration column receives the gaseous exhaust stream from the blower before the gaseous exhaust stream is introduced to the DCC section.

38. The method of claim 37, wherein the second cooling unit further comprises a desuperheating section receives the gaseous exhaust stream from the glycol regeneration column and cools the gaseous exhaust stream to a temperature sufficient to at least partially condense glycol from the gaseous exhaust stream before the gaseous exhaust stream is introduced to the DCC section.

39. The method of claim 21, wherein the at least one oxidant and the at least one fuel are combusted in the combustion chamber in the presence of the compressed recycle exhaust gas and high pressure steam.

40. The system of claim 20, further comprising a water recycle loop to provide the steam coolant.

41. The method of claim 21, further comprising adding a steam coolant to the compressed recycle stream to supplement the gaseous exhaust stream.

42. The method of claim 41, further comprising a water recycle loop to provide the steam coolant.