CLAIMS:

1. A system, comprising:

a gas turbine system, comprising:

a turbine combustor;

a turbine driven by combustion products from the turbine combustor; and

an exhaust gas compressor driven by the turbine, wherein the exhaust gas compressor is configured to compress and supply an exhaust gas to the turbine combustor; and

an exhaust gas recirculation (EGR) system, wherein the EGR system is configured to recirculate the exhaust gas along an exhaust recirculation path from the turbine to the exhaust gas compressor;

a main oxidant compression system configured to supply compressed oxidant to the gas turbine system, and the main oxidant compression system comprises:

a first oxidant compressor; and

a first gearbox configured to enable the first oxidant compressor to operate at a first speed different from a first operating speed of the gas turbine system.

2. The system of claim 1, wherein the first gearbox comprises a parallel shaft gearbox having input and output shafts that are generally parallel with one another, the input shaft is in line with a shaft line of the gas turbine system, and the output shaft is drivingly coupled to the first oxidant compressor.

3. The system of claim 1, wherein the first gearbox comprises an epicyclic gearbox having input and output shafts in line with one another and a shaft line of the gas turbine system, and the output shaft is drivingly coupled to the first oxidant compressor.

4. The system of claim 1, wherein the main oxidant compression system is driven at least partially by the gas turbine system, and the main oxidant compression system comprises a plurality of compression stages including the first oxidant compressor and a second oxidant compressor.

5. The system of claim 4, wherein the first oxidant compressor is driven by the gas turbine system through the first gearbox.

6. The system of claim 5, comprising:

an electrical generator coupled to a shaft of the gas turbine system, wherein the first oxidant compressor is coupled to the electrical generator via the first gearbox;

a drive coupled to the second oxidant compressor, wherein the drive comprises a steam turbine or an electric motor; and

a second gearbox coupling the second oxidant compressor and the drive, wherein the second gearbox is configured to enable the second oxidant compressor to operate at a second speed different from a second operating speed of the drive.

7. The system of claim 4, wherein the second oxidant compressor is directly driven by the gas turbine system.

8. The system of claim 7, wherein the second oxidant compressor is disposed along a shaft line of the gas turbine system and coupled to an input shaft of an electrical generator, and the first oxidant compressor is coupled to an output shaft of the electrical generator via the first gearbox.

9. The system of claim 7, comprising an electrical generator disposed along a shaft line of the gas turbine system, wherein the second oxidant compressor is coupled to the electrical generator and to an input shaft of the first gearbox, and the first oxidant compressor is coupled to the second oxidant compressor via the first gearbox.

10. The system of claim 7, comprising an interstage cooling system disposed along an oxidant flow path between the first and second oxidant compressors.

11. The system of claim 10, wherein the interstage cooling system comprises a spray system configured to output a spray along the oxidant flow path.

12. The system of claim 10, wherein the interstage cooling system comprises a heat exchanger disposed along the oxidant flow path, and the heat exchanger comprises a coolant path configured to circulate a coolant to absorb heat along the oxidant flow path.

13. The system of claim 10, wherein the interstage cooling system comprises a steam generator, a feed water heater, or a combination thereof, configured to cool compressed oxidant along the oxidant flow path by transferring heat to a feed water supply, wherein the steam generator is configured to generate steam for a steam turbine generator having a steam turbine coupled to an electrical generator, and the feed water heater is configured to preheat the feed water supply for eventual supply to a heat recovery steam generator (HRSG).

14. The system of claim 7, comprising a drive coupled to the first oxidant compressor, wherein the drive comprises a steam turbine or an electric motor coupled to an input shaft of the first gearbox.

15. The system of claim 7, wherein at least one of the first or second oxidant compressors comprises a plurality of compression stages.

16. The system of claim 7, wherein at least one of the first or second oxidant compressors comprises one or more axial flow compressors, one or more centrifugal compressors, or a combination thereof.

17. The system of claim 1, wherein the main oxidant compression system comprises a second oxidant compressor, the first and second oxidant compressors are fluidly coupled in parallel to the gas turbine system, and the second oxidant compressor is coupled to the first gearbox via the first oxidant compressor.

18. The system of claim 1, comprising:

an electrical generator coupled to a shaft of the gas turbine system; and

a drive coupled to the first oxidant compressor, wherein the drive comprises a steam turbine or an electric motor, and the drive is coupled to an input shaft of the first gearbox; and

wherein the main oxidant compression system comprises a second oxidant compressor coupled to the electrical generator via a second gearbox, and the first and second oxidant compressors are fluidly coupled in parallel to the gas turbine system.

19. The system of claim 1, comprising a stoichiometric combustion system having the turbine combustor configured to combust a fuel/oxidant mixture in a combustion equivalence ratio of between approximately 0.95 and 1.05 fuel to oxygen in the oxidant.

20. The system of claim 1, comprising a heat recovery steam generator (HRSG) coupled to the gas turbine system, wherein the HRSG is configured to generate steam by transferring heat from the exhaust gas to a feed water.

21. The system of claim 20, wherein the HRSG is fluidly coupled to a steam turbine generator having a steam turbine coupled to an electrical generator, the steam turbine is configured to drive the first oxidant compressor via the first gearbox, to drive a second oxidant compressor of the main oxidant compression system, or any combination thereof.

22. The system of claim 20, wherein the EGR system is configured to route the exhaust gas from the turbine, through the HRSG, and back to the exhaust gas compressor, wherein the EGR system comprises:

a blower configured to motivate the exhaust gas toward the exhaust gas compressor;

a cooler configured to cool the exhaust gas; and

a moisture removal unit configured to remove moisture from the exhaust gas.

23. The system of claim 22, wherein the HRSG comprises a catalyst configured to reduce a concentration of oxygen in the exhaust gas.

24. The system of claim 1, comprising an exhaust extraction system coupled to the gas turbine system, wherein the exhaust extraction system is configured to remove a portion of the exhaust gas from the gas turbine system.

25. The system of claim 23, comprising a hydrocarbon production system fluidly coupled to the exhaust extraction system, wherein the exhaust extraction system is configured to utilize the portion of the exhaust gas as a pressurized fluid for enhanced oil recovery.

26. The system of claim 23, wherein the exhaust extraction system comprises a catalyst configured to reduce a concentration of oxygen in the portion of the exhaust gas.

27. The system of claim 1, wherein the main oxidant compression system is configured to supply the compressed oxidant as atmospheric air, oxygen enriched air having between approximately 21% and 80% by volume oxygen, oxygen depleted air having between approximately 1% and 21% by volume oxygen, or substantially pure oxygen comprising greater than 80% by volume oxygen.

28. A system, comprising:

a gas turbine system, comprising:

a turbine combustor;

a turbine driven by combustion products from the turbine combustor; and

an exhaust gas compressor driven by the turbine, wherein the exhaust gas compressor is configured to compress and supply an exhaust gas to the turbine combustor; and

an exhaust gas recirculation (EGR) system, wherein the EGR system is configured to recirculate the exhaust gas along an exhaust recirculation path from the turbine to the exhaust gas compressor;

a main oxidant compression system configured to supply compressed oxidant to the gas turbine system, and the main oxidant compression system comprises:

a first oxidant compressor; and

a second oxidant compressor, wherein the first and second oxidant compressors are driven by the gas turbine system.

29. The system of claim 28, wherein an oxidant outlet of the second oxidant compressor is fluidly coupled to an oxidant inlet of the first oxidant compressor.

30. The system of claim 29, wherein the first and second oxidant compressors are driven by the gas turbine system via an electrical generator drivingly coupled to a shaft of the gas turbine system, wherein the second oxidant compressor is drivingly coupled to an output shaft of the electrical generator.

31. The system of claim 29, wherein the first oxidant compressor comprises a centrifugal compressor and the second oxidant compressor comprises an axial flow compressor.

32. The system of claim 29, comprising a first gearbox coupling the first and second oxidant compressors, wherein the second oxidant compressor is drivingly coupled to an input shaft of the first gearbox and the first oxidant compressor is drivingly coupled to an output shaft of the first gearbox.

33. The system of claim 29, wherein the first oxidant compressor is driven by the gas turbine system via an electrical generator, wherein the second oxidant compressor is drivingly coupled to an input shaft of the electrical generator and the first oxidant compressor is drivingly coupled to an output shaft of the electrical generator.

34. The system of claim 29, comprising an interstage cooling system disposed along an oxidant flow path between the first and second oxidant compressors.

35. The system of claim 34, wherein the interstage cooling system comprises a spray system configured to output a spray along the oxidant flow path.

36. The system of claim 34, wherein the interstage cooling system comprises a heat exchanger disposed along the oxidant flow path, and the heat exchanger comprises a coolant path configured to circulate a coolant to absorb heat along the oxidant flow path.

37. The system of claim 34, wherein the interstage cooling system comprises a steam generator, a feed water heater, or a combination thereof, configured to cool compressed oxidant along the oxidant flow path by transferring heat to a feed water supply, wherein the steam generator is configured to generate steam for a steam turbine generator having a steam turbine coupled to an electrical generator, and the feed water heater is configured to preheat the feed water supply for eventual supply to a heat recovery steam generator (HRSG).

38. The system of claim 28, wherein the main oxidant compression system comprises a first gearbox configured to enable the first oxidant compressor to operate at a first speed different from a first operating speed of the gas turbine system, the first and second oxidant compressors are fluidly coupled in parallel to the gas turbine system, and the second oxidant compressor is coupled to the first gearbox via the first oxidant compressor.

39. The system of claim 28, comprising a stoichiometric combustion system having the turbine combustor configured to combust a fuel/oxidant mixture in a combustion equivalence ratio of between approximately 0.95 and 1.05 fuel to oxygen in the oxidant.

40. The system of claim 28, comprising a heat recovery steam generator (HRSG) coupled to the gas turbine system, wherein the HRSG is configured to generate steam by transferring heat from the exhaust gas to a feed water.

41. The system of claim 40, wherein the HRSG is fluidly coupled to a steam turbine generator having a steam turbine coupled to an electrical generator, the steam turbine is configured to drive the first oxidant compressor via the first gearbox, to drive the second oxidant compressor of the main oxidant compression system, or any combination thereof.

42. The system of claim 40, wherein the EGR system is configured to route the exhaust gas from the turbine, through the HRSG, and back to the exhaust gas compressor, wherein the EGR system comprises:

a blower configured to motivate the exhaust gas toward the exhaust gas compressor;

a cooler configured to cool the exhaust gas; and

a moisture removal unit configured to remove moisture from the exhaust gas.

43. The system of claim 42, wherein the HRSG comprises a catalyst configured to reduce a concentration of oxygen in the exhaust gas.

44. The system of claim 28, comprising an exhaust extraction system coupled to the gas turbine system, wherein the exhaust extraction system is configured to remove a portion of the exhaust gas from the gas turbine system.

45. The system of claim 44, comprising a hydrocarbon production system fluidly coupled to the exhaust extraction system, wherein the exhaust extraction system is configured to utilize the portion of the exhaust gas as a pressurized fluid for enhanced oil recovery.

46. The system of claim 44, wherein the exhaust extraction system comprises a catalyst configured to reduce a concentration of oxygen in the portion of the exhaust gas.

47. The system of claim 28, wherein the main oxidant compression system is configured to supply the compressed oxidant as atmospheric air, oxygen enriched air having between approximately 21% and 80% by volume oxygen, oxygen depleted air having between approximately 1% and 21% by volume oxygen, or substantially pure oxygen comprising greater than 80% by volume oxygen.

48. A system, comprising:

a gas turbine system, comprising:

a turbine combustor;

a turbine driven by combustion products from the turbine combustor; and

an exhaust gas compressor driven by the turbine, wherein the exhaust gas compressor is configured to compress and supply an exhaust gas to the turbine combustor; and

an exhaust gas recirculation (EGR) system, wherein the EGR system is configured to recirculate the exhaust gas along an exhaust recirculation path from the turbine to the exhaust gas compressor;

a main oxidant compression system configured to supply compressed oxidant to the gas turbine system, and the main oxidant compression system comprises one or more oxidant compressors;

a heat recovery steam generator (HRSG) coupled to the gas turbine system, wherein the HRSG is configured to generate steam by transferring heat from the exhaust gas to a feed water, and the exhaust recirculation path of the EGR system extends through the HRSG; and

a steam turbine disposed along a shaft line of the gas turbine system and at least partially driven by the steam from the HRSG, wherein the steam turbine is configured to return condensate as at least a portion of the feedwater to the HRSG.

49. The system of claim 48, wherein at least one oxidant compressor of the one or more oxidant compressors of the main oxidant compression system is disposed along the shaft line of the gas turbine system.

50. The system of claim 49, wherein the steam turbine is disposed along the shaft line between the main oxidant compression system and the gas turbine system.

51. The system of claim 50, comprising an electrical generator disposed between the steam turbine and the at least one oxidant compressor of the main oxidant compression system.

52. The system of claim 50, comprising an electrical generator disposed between the steam turbine and the gas turbine system, wherein the gas turbine system is mechanically coupled to an input shaft of the electrical generator and the steam turbine is mechanically coupled to an output shaft of the electrical generator.

53. The system of claim 49, wherein the main oxidant compression system is driven by the gas turbine system, and the main oxidant compression system is positioned along the shaft line between the steam turbine and the gas turbine system.

54. The system of claim 53, comprising a clutch disposed between the at least one compressor of the main oxidant compression system and the steam turbine, wherein the clutch enables the steam turbine to operate at the same speed as the gas turbine system when engaged, and to operate separate from the gas turbine system when not engaged.

55. The system of claim 48, wherein the main oxidant compression system comprises a plurality of compressors in a series arrangement of compression.

56. The system of claim 48, wherein the main oxidant compression system comprises a plurality of compressors in a parallel arrangement of compression.

57. The system of claim 48, wherein the main oxidant compression system comprises at least one oxidant compressor drivingly coupled to a speed-reducing or speed-increasing gearbox that enables the at least one oxidant compressor to operate at a speed that is different from an operating speed of the gas turbine system.

58. The system of claim 48, wherein the HRSG comprises a catalyst configured to reduce a concentration of oxygen in the exhaust gas.

59. The system of claim 48, comprising an exhaust extraction system coupled to the gas turbine system, wherein the exhaust extraction system is configured to remove a portion of the exhaust gas from the gas turbine system.

60. The system of claim 59, comprising a hydrocarbon production system fluidly coupled to the exhaust extraction system, wherein the exhaust extraction system is configured to utilize the portion of the exhaust gas as a pressurized fluid for enhanced oil recovery.

61. The system of claim 60, wherein the exhaust extraction system comprises a catalyst configured to reduce a concentration of oxygen in the portion of the exhaust gas.

62. The system of claim 48, wherein the main oxidant compression system is configured to supply the compressed oxidant as atmospheric air, oxygen enriched air having between approximately 21% and 80% by volume oxygen, oxygen depleted air having between approximately 1% and 21% by volume oxygen, or substantially pure oxygen comprising greater than 80% by volume oxygen.

63. A system, comprising:

a gas turbine system, comprising:

a turbine combustor;

a turbine driven by combustion products from the turbine combustor; and

an exhaust gas compressor driven by the turbine, wherein the exhaust gas compressor is configured to compress and supply an exhaust gas to the turbine combustor;

an exhaust gas recirculation (EGR) system, wherein the EGR system is configured to recirculate the exhaust gas along an exhaust recirculation path from the turbine to the exhaust gas compressor; and

a main oxidant compression system comprising one or more oxidant compressors, wherein the one or more oxidant compressors are separate from the exhaust gas compressor, and the one or more oxidant compressors are configured to supply all compressed oxidant utilized by the turbine combustor in generating the combustion products.

CLAIMS

1. A system, comprising:

a gas turbine system, comprising:

a turbine combustor;

a turbine driven by combustion products from the turbine combustor; and

an exhaust gas compressor driven by the turbine, wherein the exhaust gas compressor is configured to compress and supply an exhaust gas to the turbine combustor; and

an exhaust gas recirculation (EGR) system, wherein the EGR system is configured to recirculate the exhaust gas along an exhaust recirculation path from the turbine to the exhaust gas compressor;

a main oxidant compression system configured to supply compressed oxidant to the gas turbine system, and the main oxidant compression system comprises:

a first oxidant compressor separate from the exhaust gas compressor and configured to compress an oxidant separately from the exhaust gas; and

a first gearbox disposed between, and mechanically coupled in series with, the first oxidant compressor and the gas turbine system, wherein the first gearbox is configured to enable the first oxidant compressor to operate at a first speed independent of a first operating speed of the gas turbine system.

2. The system of claim 1, wherein the first gearbox comprises a parallel shaft gearbox having input and output shafts that are generally parallel with one another, the input shaft is in line with a shaft line of the gas turbine system, and the output shaft is drivingly coupled to the first oxidant compressor.

3. The system of claim 1, wherein the first gearbox comprises an epicyclic gearbox having input and output shafts in line with one another and a shaft line of the gas turbine system, and the output shaft is drivingly coupled to the first oxidant compressor.

4. The system of claim 1, wherein the main oxidant compression system is driven at least partially by the gas turbine system, and the main oxidant compression system comprises a plurality of compression stages including the first oxidant compressor and a second oxidant compressor.

5. The system of claim 4, wherein the first oxidant compressor is driven by the gas turbine system through the first gearbox.

6. The system of claim 5, comprising:

an electrical generator coupled to a shaft of the gas turbine system, wherein the first oxidant compressor is coupled to the electrical generator via the first gearbox;

a drive coupled to the second oxidant compressor, wherein the drive comprises a steam turbine or an electric motor; and

a second gearbox coupling the second oxidant compressor and the drive, wherein the second gearbox is configured to enable the second oxidant compressor to operate at a second speed different from a second operating speed of the drive.

7. The system of claim 4, wherein the second oxidant compressor is directly driven by the gas turbine system.

8. The system of claim 7, wherein the second oxidant compressor is disposed along a shaft line of the gas turbine system and coupled to an input shaft of an electrical generator, and the first oxidant compressor is coupled to an output shaft of the electrical generator via the first gearbox.

9. The system of claim 7, comprising an electrical generator disposed along a shaft line of the gas turbine system, wherein the second oxidant compressor is coupled to the electrical generator and to an input shaft of the first gearbox, and the first oxidant compressor is coupled to the second oxidant compressor via the first gearbox.

10. The system of claim 7, comprising an interstage cooling system disposed along an oxidant flow path between the first and second oxidant compressors.

11. The system of claim 10, wherein the interstage cooling system comprises a spray system configured to output a spray along the oxidant flow path.

12. The system of claim 10, wherein the interstage cooling system comprises a heat exchanger disposed along the oxidant flow path, and the heat exchanger comprises a coolant path configured to circulate a coolant to absorb heat along the oxidant flow path.

13. The system of claim 10, wherein the interstage cooling system comprises a steam generator, a feed water heater, or a combination thereof, configured to cool compressed oxidant along the oxidant flow path by transferring heat to a feed water supply, wherein the steam generator is configured to generate steam for a steam turbine generator having a steam turbine coupled to an electrical generator, and the feed water heater is configured to preheat the feed water supply for eventual supply to a heat recovery steam generator (HRSG).

14. The system of claim 7, wherein at least one of the first or second oxidant compressors comprises a plurality of compression stages.

15. The system of claim 7, wherein at least one of the first or second oxidant compressors comprises one or more axial flow compressors, one or more centrifugal compressors, or a combination thereof.

16. The system of claim 1, wherein the main oxidant compression system comprises a second oxidant compressor, the first and second oxidant compressors are fluidly coupled in parallel to the gas turbine system, and the second oxidant compressor is coupled to the first gearbox via the first oxidant compressor.

17. The system of claim 1, comprising:

an electrical generator coupled to a shaft of the gas turbine system; and

a drive coupled to the first oxidant compressor, wherein the drive comprises a steam turbine or an electric motor, and the drive is coupled to an input shaft of the first gearbox; and

wherein the main oxidant compression system comprises a second oxidant compressor coupled to the electrical generator via a second gearbox, and the first and second oxidant compressors are fluidly coupled in parallel to the gas turbine system.

18. The system of claim 1, comprising a stoichiometric combustion system having the turbine combustor configured to combust a fuel/oxidant mixture in a combustion equivalence ratio of between approximately 0.95 and 1.05 fuel to oxygen in the oxidant.

19. The system of claim 1, comprising a heat recovery steam generator (HRSG) coupled to the gas turbine system, wherein the HRSG is configured to generate steam by transferring heat from the exhaust gas to a feed water.

20. The system of claim 19, wherein the HRSG is fluidly coupled to a steam turbine generator having a steam turbine coupled to an electrical generator, the steam turbine is configured to drive the first oxidant compressor via the first gearbox, to drive a second oxidant compressor of the main oxidant compression system, or any combination thereof.

21. The system of claim 19, wherein the EGR system is configured to route the exhaust gas from the turbine, through the HRSG, and back to the exhaust gas compressor, wherein the EGR system comprises:

a blower configured to motivate the exhaust gas toward the exhaust gas compressor;

a cooler configured to cool the exhaust gas; and

a moisture removal unit configured to remove moisture from the exhaust gas.

22. The system of claim 21, wherein the HRSG comprises a catalyst configured to reduce a concentration of oxygen in the exhaust gas.

23. The system of claim 1, comprising an exhaust extraction system coupled to the gas turbine system, wherein the exhaust extraction system is configured to remove a portion of the exhaust gas from the gas turbine system.

24. The system of claim 22, comprising a hydrocarbon production system fluidly coupled to the exhaust extraction system, wherein the exhaust extraction system is configured to utilize the portion of the exhaust gas as a pressurized fluid for enhanced oil recovery.

25. The system of claim 22, wherein the exhaust extraction system comprises a catalyst configured to reduce a concentration of oxygen in the portion of the exhaust gas.

26. The system of claim 1, wherein the main oxidant compression system is configured to supply the compressed oxidant as atmospheric air, oxygen enriched air having between approximately 21% and 80% by volume oxygen, oxygen depleted air having between approximately 1% and 21% by volume oxygen, or substantially pure oxygen comprising greater than 80% by volume oxygen.