CLAIMS

1. A method, comprising:

combusting a fuel and an oxidant in a combustor of an exhaust gas recirculation (EGR) gas turbine system that produces electrical power and provides a portion of the electrical power to an electrical grid; and

controlling one or more parameters of the EGR gas turbine system to increase the portion of the electrical power provided to the electrical grid to provide a Primary Frequency Response (PFR) in response to a transient event associated with electrical power in the electrical grid, wherein controlling the one or more parameters of the EGR gas turbine system comprises

increasing a concentration and/or flow rate of the oxidant in the combustor in response to the transient event, and increasing a flow rate of the fuel to the combustor in response to the increased concentration and/or flow rate of the oxidant to maintain a substantially stoichiometric equivalence ratio in the combustor, and wherein the transient event comprises a period of rapid change in frequency or voltage of the electrical power in the electrical grid.

2. The method of claim 1, wherein controlling the one or more parameters of the EGR gas turbine system further comprises increasing a flow rate of fuel to the combustor in response to the transient event and in response to determining that the EGR gas turbine system is operating in a fuel-lean combustion mode, wherein operating the EGR gas turbine system in the fuel-lean combustion mode comprises operating the combustor of the EGR gas turbine system with excess oxidant present, and wherein increasing the flow rate of fuel to the combustor comprises temporarily increasing the flow rate of fuel to the combustor in response to the transient event.

3. The method of claim 1, wherein controlling the one or more parameters of the EGR gas turbine system further comprises introducing an inlet flow comprising the oxidant and a recirculated exhaust gas to an oxidant compressor disposed upstream of the combustor in the EGR gas turbine system, and wherein increasing the concentration of the oxidant in the

combustor comprises increasing a ratio of the oxidant to the recirculated exhaust gas in the inlet flow in response to the transient event.

4. The method of claim 3, wherein a flow rate of the recirculated exhaust gas is decreased by a programmable amount from a first flow rate to a second flow rate immediately or after a first programmable time delay subsequent to the transient event; and further comprising gradually increasing the flow rate of the recirculated exhaust gas to the first flow rate after a second programmable time delay subsequent to decreasing the flow rate of the recirculated exhaust gas.

5. The method of claim 1, wherein controlling the one or more parameters of the EGR gas turbine system further comprises controlling one or more performance parameters of at least one oxidant compressor disposed upstream of the combustor in the EGR gas turbine system, and wherein increasing the concentration and/or flow rate of the oxidant in the combustor comprises increasing the one or more performance parameters of the at least one oxidant compressor in response to the transient event, and wherein the at least one oxidant compressor comprises a main oxidant compressor, a booster oxidant compressor, or a combination thereof.

6. The method of claim 5, wherein the one or more performance parameters of the at least one oxidant compressor comprise: an inlet guide vane position, a variable stator vane position, a speed, an inlet throttle valve position, a discharge throttle valve position, or a recycle valve position.

7. The method of claim 5, wherein increasing the one or more performance parameters of the at least one oxidant compressor comprises increasing the one or more performance parameters of the at least one oxidant compressor by a programmable amount from a lower output setting to a higher output setting immediately or after a first programmable time delay subsequent to the transient event; and further comprising gradually decreasing the one or more performance parameters of the at least one oxidant compressor to the lower output setting after a

second programmable time delay subsequent to increasing the one or more performance parameters of the at least one oxidant compressor.

8. The method of claim 1, wherein controlling the one or more parameters of the EGR gas turbine system further comprises decreasing a local consumption of the electrical power in response to the transient event to increase the portion of the electrical power provided to the electrical grid, and decreasing the local consumption of the electrical power comprises reducing one or more performance parameters of a product gas compressor by a programmable amount from a higher output setting to a lower output setting immediately or after a first programmable time delay subsequent to the transient event; and further comprising gradually increasing the one or more performance parameters of the product gas compressor to the higher output setting after a second programmable time delay subsequent to decreasing the one or more performance parameters of the product gas compressor.

9. The method of claim 8, wherein the one or more performance parameters of the product gas compressor comprise: an inlet guide vane position, a variable stator vane position, a speed, an inlet throttle valve position, a discharge throttle valve position, or a recycle valve position.

10. The method of claim 1, wherein controlling the one or more parameters of the EGR gas turbine system further comprises temporarily increasing one or more programmable constraints of the EGR gas turbine system immediately or after a first programmable time delay subsequent to the transient event, and wherein the one or more programmable constraints of the EGR gas turbine system comprise a torque limit, a speed limit, a pressure limit, a flow rate limit, or a power limit of the EGR gas turbine system.

11. The method of claim 1, wherein the EGR gas turbine system is part of a power plant.

12. The method of claim 1, comprising detecting the transient event associated with the electrical power in the electrical grid via sensors coupled to the electrical grid.

13. The method of claim 1, wherein controlling the one or more parameters of the EGR gas turbine system further comprises increasing the portion of the electrical power provided to the electrical grid occurs within 10 seconds of a beginning of the transient event.