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;

controlling, via one or more processors, one or more parameters of the EGR gas turbine system to decrease the portion of the electrical power provided to the electrical grid in response to an over-frequency event associated with the electrical grid, wherein controlling the one or more parameters comprises decreasing a flow rate of fuel to the combustor in response to the over-frequency event; and

decreasing a concentration and/or flow rate of oxidant in the combustor in response to the over-frequency event, wherein the EGR gas turbine system comprises a shaft coupled to an electric generator, and wherein a droop governor control is applied to control the electric generator, wherein a flow rate of the oxidant is decreased by an air stroke reference (ASR) from a higher flow rate to a lower flow rate subsequent to the over-frequency event.

2. The method of claim 1, comprising operating the EGR gas turbine system in a stoichiometric combustion mode before decreasing the flow rate of fuel, wherein the flow rate of fuel is decreased more quickly than a decrease in the oxidant.

3. The method of claim 1, comprising deriving a speed/load error for a shaft of the EGR gas turbine system and applying a cross-channel term to the speed/load error to decrease the flow rate of fuel.

4. The method of claim 3, comprising filtering the cross-channel term via a deadband/clamp after applying the cross-channel term to the speed/load error to decrease the flow rate of fuel.

5. The method of claim 3, wherein the cross-channel term comprises a constant value, a scalar value, a transfer function, or a combination thereof.

6. The method of claim 1 comprising:

deriving an equivalence ratio error based on an equivalence ratio reference and a measured equivalence ratio;

deriving a speed/load error for a shaft of the EGR gas turbine system;

applying a cross-channel term to the speed/load error to derive a cross-channel result;

applying a filter to the cross-channel result to derive a filtered cross-channel result; and

comparing the equivalence ratio error to the filtered cross-channel result to derive a fuel stroke reference, wherein the fuel stroke reference is applied to decrease the flow rate of fuel to the combustor.

7. The method of claim 1, comprising applying equivalence ratio control to decrease the flow rate of fuel.

8. The method of claim 1, wherein the EGR gas turbine system is part of an ultra-low emissions technology (ULET) power plant.

9. A system, comprising:

an exhaust gas recirculation (EGR) gas turbine system, comprising:

a combustor configured to receive and combust a fuel with an oxidant;

a turbine driven by combustion products from the combustor;

a generator driven via a shaft of the turbine, wherein the generator is configured to generate electrical power and to export a portion of the electrical power to an electrical grid;

a control system comprising one or more processors, the control system comprising:

a droop governor control system configured to control the electrical power; and

an equivalence ratio control system configured to control one or more parameters of the EGR gas turbine system to decrease the portion of the electrical power exported to the electrical grid in response to an over-frequency event, wherein the equivalence ratio control system is configured to provide control signals to decrease a flow rate of fuel to the combustor in response to the over-frequency event when the EGR gas turbine system is operating in stoichiometric mode; and

at least one oxidant compressor disposed upstream of the combustor and configured to receive an inlet flow comprising an oxidant flow and a recirculated exhaust gas flow, wherein the equivalence ratio control system is configured to provide control signals to a control valve to decrease a ratio of the oxidant flow to the recirculated exhaust gas flow by reducing the recirculated exhaust gas flow in response to the over-frequency event.

10. The system of claim 9, wherein the equivalence ratio control system is configured to decrease the flow rate of fuel more quickly than a decrease in the oxidant.

11. The system of claim 9, comprising at least one oxidant compressor disposed upstream of the combustor, and wherein the equivalence ratio control system is configured to provide control signals to the at least one oxidant compressor to modulate one or more performance parameters of the at least one oxidant compressor in response to the over-frequency event, and 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.

12. The system of claim 9, wherein the control system is configured to:

derive an equivalence ratio error based on an equivalence ratio reference and a measured equivalence ratio;

derive a speed/load error for the shaft of the turbine;

apply a cross-channel term to the speed/load error to derive a cross-channel result;

apply a filter to the cross-channel result to derive a filtered cross-channel result; and

compare the equivalence ratio error to the filtered cross-channel result to derive a fuel stroke reference, wherein the equivalence ratio control system is configured to apply the fuel stroke reference provide control signals to decrease a flow rate of fuel to the combustor.

13. The system of claim 9, wherein the EGR gas turbine system is part of an ultra-low emissions technology (ULET) power plant.

14. A non-transitory, computer readable medium storing instructions executable by one or more processors, the instructions including comprising:

instructions, that when executed by the one or more processors, cause the one or more processors to determine that an over-frequency event is occurring in an electrical grid coupled to an EGR gas turbine system;

instructions, that when executed by the one or more processors, cause the one or more processors to decrease a flow rate of fuel to a combustor of the EGR gas turbine system in response to the over-frequency event; and

instructions, that when executed by the one or more processors, cause the one or more processors to decrease a flow rate of oxidant to the combustor after decreasing the flow rate of fuel to the combustor, wherein the EGR gas turbine system is operating in a stoichiometric combustion mode; wherein the instructions to decrease the flow rate of oxidant to the combustor comprise instructions, that when executed by the one or more processors, cause the one or more processors to modulate one or more of: 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 of at least one oxidant compressor disposed upstream of the combustor in response to the over-frequency event.

15. The medium of claim 14, comprising instructions, that when executed by the one or more processors, cause the one or more processors to:

derive an equivalence ratio error based on an equivalence ratio reference and a measured equivalence ratio;

derive a speed/load error for a shaft of the EGR gas turbine system;

apply a cross-channel term to the speed/load error to derive a cross-channel result;

apply a filter to the cross-channel result to derive a filtered cross-channel result; and

compare the equivalence ratio error to the filtered cross-channel result to derive a fuel stroke reference, wherein the fuel stroke reference is applied to decrease the flow rate of fuel to the combustor.