NERC Compliance Combustion Turbine Simulator

Combustion Turbine Simulation and Testing Lab –Glen Allen, Virginia

Microfusion provided Dominion Combustion Turbine Test Lab with three combustion turbine simulators that are in compliance with the NERC standard CIP-007, requirement using THINK Simulator. The three combustion turbines are:

- GE Frame 5 CT
- Westinghouse's 191 and
- Westinghouse 251

The Combustion Turbine Simulators allow Dominion to:

- Verify that the turbine control logic integrates properly and functions as expected.
- Provide a platform to validate operating procedures for both normal and emergency conditions.
- Checkout communication links between PLC and Operator Screens for proper signal ranges, states and connections.
- Verify that control via the operator display screens functions as expected, allowing the operator to deal with normal and emergency operations.
- Test the effects of security patches and/or antivirus software updates prior to implementation.
- Validation of firewall settings prior to field

The CTs are modeled to allow for normal operation, startup, shutdown and unit trips, and the capability to introduce disturbances to reflect real life scenarios.

In addition, the simulators allow operation scenarios such as Generator Breaker Trips, Loss of Flame, and Over-speed to be introduced during simulation.

The accuracy of all models critical parameters at steady state for any selected MW output are modeled to be within +/- 3% of the actual value, and the transient response accurate enough to allow for loading and running the control logic from the "real" system on the simulator without adjusting any tuning parameters.

The critical parameters include:

Fuel Input to the CT
Fuel Discharge Pressure
Air Flow
Compressor Inlet Air Temperatures
Compressor Discharge Pressure
Blade Path Temperatures
Exhaust Temperatures
Bleed Valve Positions
Bearing Temperatures
Flame Detectors
Valve Position
Turbine Shaft Speed
Vibration
Generator MW Output
Generator VARs
Generator Voltage
Generator Current (Amps)