Generic Combined Cycle (GCC) Simulator

Full Scope Training Simulator for Operational Plant Theory and Training

The Generic Combined Cycle (GCC) simulator is a full scope replica of a 1X1X1 Combined Cycle Gas Turbine (CCGT) power plant controlled using GSE's Jade Instructor Station complete with built-in initial conditions, remote functions, malfunctions, component failures, and a self-paced startup procedure. It creates a comprehensive and authentic training experience that provides an understanding of the knowledge required to successfully operate a CCGT power plant.

OVERVIEW

The GCC simulator is a full scope replica of a 1X1X1 CCGT power plant that utilizes natural gas to feed a gas turbine generator (GTG), a heat recovery steam generator (HRSG) system, with low NOx duct burners and a condensing reheat steam turbine generator (STG).

The GCC simulator includes a real-time high-fidelity JTopmeret model of multiple plant systems, a JElectric electrical distribution and generator model with auto sync and voltage regulation, a robust JControl simulated distributed control system (DCS), and a custom JDesigner Human Machine Interface (HMI) complete with an audible alarm system.

GSE full scope simulators are powerful tools for exploring power plant theory and operational training. They are often adopted as part of research and education programs at universities and labs worldwide. The GCC simulator is also suited to research involving human factors, controls optimization, and power plant cyber security.

The GCC simulator is created using only in-house GSE software and licensing, making it easy for users to create multi-student classrooms using the same simulation model or hosting online via the could for easy and maintenance-free access.

The GCC is modeled using GSE's thermal-hydraulic engineering tool, JTopmeret. JTopmeret is a graphical user interface that assists in developing two-phase, multi-component, non-thermal equilibrium, high-fidelity plant systems models.

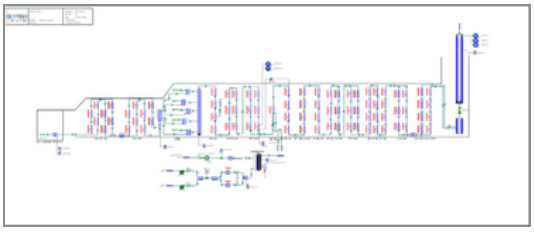
HIGH-FIDELITY MODELS

- Fuel Gas System
- Gas Turbine
- HRSG Air & Ammonia
- HRSG Steam & Feedwater
- Main Steam, Condensate & Steam Turbine
- GTG & STG Lube Oil Systems
- Cooling Water Systems
- Waste Water System
- Instrument Air System
- Electrical Distribution

Key Features

Reference PIDs

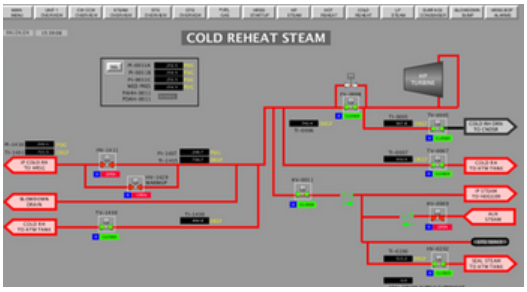
The GCC model includes the reference PIDs/JTopmeret drawings used to model each of the plant systems. This gives operators transparency as to the current state of the model, where valves, transmitters, and plant equipment are located and how each system interfaces with one another.



Reference PID for the Gas System

HMI Graphics Display

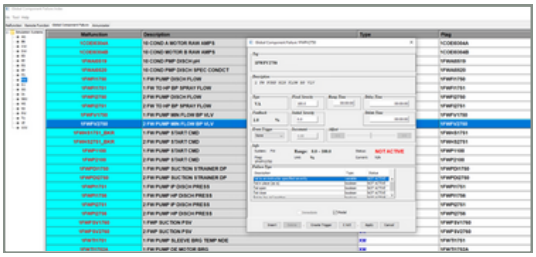
The HMI is created using a custom library of icons using GSE's JDesigner and JEditor software. The Graphics displays along with control group, faceplate, trend displays and audible alarm system provide operators with control and monitoring capabilities of a fully functional CCGT plant.



HMI Graphic with Control Faceplate

JStation

GSE's JStation allows the instructor to manipulate, control, monitor and evaluate the simulator during training sessions, including run/freeze the simulator, snap and reset Initial conditions, backtrack to previous simulator conditions, implement remote functions, malfunctions, global component failures, and trend and monitor model variables and parameters throughout the simulator.



JStation Remote Function Index

Self-Paced Procedure Training (SPPT)

The GCC simulator includes 10 pre-configured, self-paced training plant procedures. Exercises include multiple system-specific start-up procedures that walk the operator through setting the plant up for a GTG start, rolling the GTG, lining up the HRSG for steam production, and rolling the STG from cold conditions to full load with duct burners.

GCC Simulator Value

The GCC simulator is a great tool for users who want high-fidelity training on CCGT plant systems and operations are not in the market for a custom full-scope simulator or need to distribute training to a diverse workforce. With SPPT, individuals can effectively train on the simulator without the need for an instructor present.

- Very cost-effective compared to custom simulators
- Web-hosted solution eliminates IT and maintenance headaches
- A high-fidelity plant model provides realistic feedback
- Train on plant procedures, cause and effect scenarios, and troubleshooting skills
- Self-Paced Procedure Training enables individual use of the simulator
- Improve situation awareness by practicing a wide variety of potential plant events
- Useful platform for research into human factors, control optimization, and plant cyber security threats

GSE SOLUTIONS®

ABOUT GSE SOLUTIONS

GSE Solutions supports nuclear power and energy fleets worldwide with design engineering, high-fidelity simulation, thermal performance, and engineering program services that strengthen plant-level operational excellence. Our industry-proven experts collaborate closely with customers and across GSE to unify legacy project knowledge with modern best practices, delivering integrated execution—reducing rework, cost, and risk. Backed by 55 years of experience and powered by innovative software and hardware, GSE delivers solutions that perform — advancing long-term plant performance and reliability.

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