

3KEYMASTER™ Renewable Energy Simulators

Grid, Smart Grid, & Renewable Simulators

CURTISS - WRIGHT

Nuclear Power Products and Services



What is Smart Grid?

The traditional electrical grid is used to carry power from generators to a large number of users or customers serviced by the specific area grid. In contrast, emerging smart grid technology uses two-way flows of electricity and information to create an automated, distributed, and intelligent energy delivery network.

The smart grid allows the power industry to observe and control parts of the system at a higher resolution system wide. The smart grid integrates recent advances in technology, allowing real time information to be sent and received to and from various parts of the grid, facilitating efficient grid management.

Key Components

Operation of today's complex power systems requires comprehensive knowledge about the dynamics of power generation and distribution systems. The system operator's awareness about the electrical grid behavior and its interaction with renewable and traditional Power Generation, Transmission, Distribution, and Consumption reduces the risk of blackout conditions.

- Grid Dynamics Frequency Control
- Operator Interaction
- Voltage Control
- Voltage Stability
- Angle Stability
- Power Oscillations
- System Restoration
- Total System Blackout
- Partial System Blackout
- Substation and Switchyard AC/DC Transmission Grid System

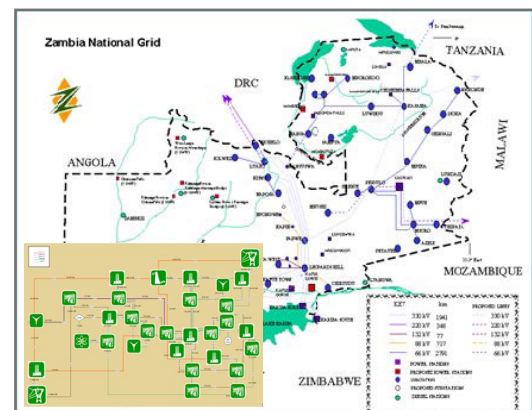
*: WSC, a legacy brand of Curtiss-Wright's Simulation Group, headquartered in Frederick, MD, is a global simulation and services company. Acquired by Curtiss-Wright in 2024, WSC is recognized for the quality and efficiency of their products and flexible team-oriented approach to serving its customers.

Grid Simulator

Curtiss-Wright's Simulation Group* has recently developed a grid simulator for three interconnected countries in Africa to train system operators on grid control in countries where grid frequency and voltage can vary due to the lower grid stability. This grid simulator includes simplified generation capabilities using Hydro Power and other type power generators.

Grid Simulator Features

- GUI-based object-oriented design
- Access to all engineering diagrams used for modeling and information display—e.g., one-line diagrams, logic and control, and electrical protection
- High-quality digitized panel images for use in panel graphics for substation and breaker and disconnecter controls
- Powerful visualization using model parameters, multi-variable trend charts and tables, and watch objects
- Powerful executive system to run the models in real time for full realism in system behavior
- Complete suite of engineering-grade modeling tools and components library



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Renewable Simulators

The impact of solar and wind energy is most apparent in grid management and control. This makes grid simulators an essential element in educating system and plant operators on active and reactive power flow, frequency and voltage control, voltage and angle stability, and power system oscillations.

Our Simulation Group has updated its modeling library to include simulation of the world's largest solar plant. The simulator was developed in the 3KEYMASTER™ environment using standard FlowBase model library objects. The primary consideration of the solar plant model is to accurately model the heat flux on the collector surface. The rest of the plant model follows a conventional thermal power plant schematic including a boiler, turbine, and all of the balance of plant auxiliaries.

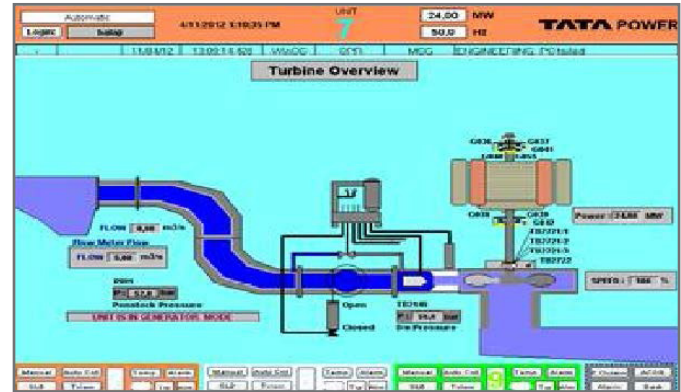
Large scale solar power plants and wind farms are working their way into the world's generating capacity. These power plants can be complex, and operators will greatly benefit from a full-scope, high-fidelity simulator for both operator training and system analysis.

Solar Power Simulator

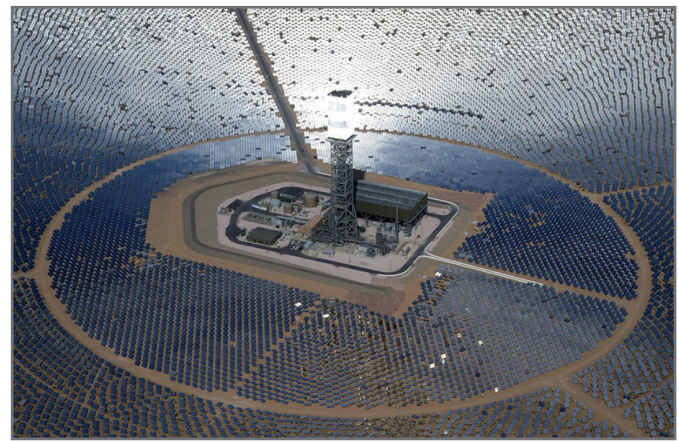
We have used the Simulation Assisted Engineering (SAE) approach for designing and building the full scope simulator for Ivanpah solar plant, located in the Mojave Desert of Southern California. The 377-megawatt Ivanpah Solar Electric Generating System is the world's largest solar thermal facility.

Hydro Power Plant Simulator

We developed a hydro simulator representing the operation and dynamics of a 24MW Hydro power plant. The simulator replicates behaviour of a plant in all normal and abnormal modes of operation. The simulator is comprised of the Generator Unit, Gate and Switchyard Control Operator Stations, and Instructor Station. The operator station displays allow for full equipment operation and monitoring of plant systems and dynamics.



Hydro Power Plant Simulator



Ivanpah Solar Electric Generating System

CONTACT INFORMATION:

7196 Crestwood Blvd., Suite 300, Frederick, MD, 21703 USA
simulation@curtisswright.com | +1.301.644.2500