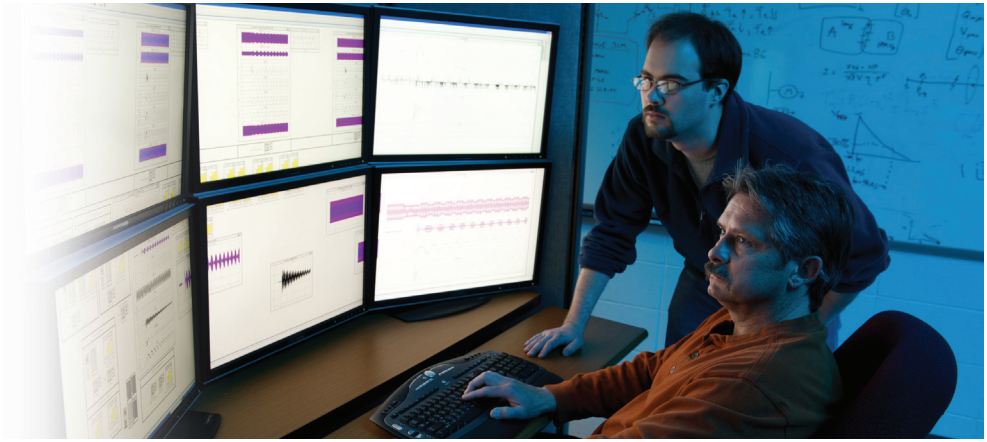


Real Time Digital Simulator

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Two power systems engineers use INL's RTDS to create a highly-detailed power grid model.



The term electricity is broadly used to define physical effects ranging from lightning to light bulbs. In reality, electricity is a complex phenomenon that has been studied for centuries, but used only recently for practical applications. Today, electricity and the energy it produces have been woven into our modern industrial society resulting in a complex series of networks, processes, and technology that must function in harmony at the same time. When electrical failures occur, the impacts can be widespread, as witnessed during the Northeast blackouts of 1965, 1978, and 2003.

To prevent accidental and deliberate power grid failures, utilities and research institutions rely on highly detailed computer simulations to create realistic consequence scenarios. One of the leading pieces of power simulation equipment used worldwide is the Real Time Digital Simulator (RTDS). This system creates a highly accurate power grid environment that can be used to run experiments without affecting actual power distribution.

This high-speed simulator is designed to specifically replicate electrical power systems and physical devices such as control systems and protection units. With RTDS, operators can visualize the effects of power grid disturbances and failures from the breaker level up to a major substation or distribution network. In the U.S., only a handful of RTDS systems and trained operators exist.

Researchers at Idaho National Laboratory (INL), in collaboration with the Department of Defense, are using a full-scale

RTDS system to continuously produce normal and abnormal power grid conditions that simulate interruptions. The library of collected data is used to build hardware, develop patches, and write code to improve the reliability and security of power grids nationwide. The lab's RTDS system has been used to accurately model major cyber disturbances and physical consequences. It has also provided researchers with real-time grid information to validate continuity of operations plans, and it assisted in the design of patented hardware for grid security.

Quick Facts

- RTDS has the capability to simulate alternating and direct current components or networks of any voltage.
- The RTDS system provides advanced hardware in-the-loop simulation capability, allowing for the testing and validation of power system hardware and smart grid tools.
- INL's RTDS system is used to research grid failures and assist in the development of solutions.
- INL is the only national laboratory with an RTDS system and trained operators.

For More Information

Scott A. McBride, P.E.
(208) 526-5878
scott.mcbride2@inl.gov

Warren Rees, P.E.
(208) 526-5376
warren.rees@inl.gov

