



*INL led the creation of an eight-laboratory Global Real-Time Super Lab that will study how electricity can be rerouted across vast distances to address disruptions.*

## Global Real-Time Super Lab

*Eight-lab simulator linkup aims to boost future grid stability*

A team of researchers in the U.S. and Europe is integrating electrical grids globally in a way that resonates with the creation of the internet more than 50 years ago.

The group convened at Idaho National Laboratory in 2017 for a live demonstration of the Global Real-Time Super Lab (RT Super Lab), a concept that will study how electricity can be rerouted across vast distances to address disruptions. The team envisions that large-scale blackouts can be prevented by moving electricity intercontinentally, the same way utilities currently do regionally but at a much larger scale. Such global interaction can prepare America for next-generation power system challenges,

reduce the cost of outages and make electrical power grids of the future more resilient.

The effort builds on work done between the U.S. Department of Energy's INL and National Renewable Energy Laboratory (NREL). Researchers at Sandia National Laboratories and five universities, two of them in Europe, have joined the team to explore the idea that electrons can be sent around the world the same way as digital packets of zeros and ones over the internet.

### **Expanding Connections**

Leveraging assets and expertise at other national labs and academic institutions, the RT Super Lab concept brings more resources into the mix, with the following participants contributing specific capabilities:

- Sandia National Laboratories' Distributed Energy Technologies Laboratory.
- Colorado State University's high-performance computer-based energy management system.
- Washington State University's Smart Grid and Microgrid Laboratory.
- University of South Carolina's power electronics and distribution research.
- RWTH Aachen University's cosimulation framework.
- Polytechnic University of Turin's high-performance computer-based Energy Management System.

Changing the World's Energy Future



- NREL's Energy Systems Integration Facility.
- INL's Power and Energy Real-Time Laboratory.

#### **Research Objectives**

Along with rapid strides in interconnecting grid laboratories globally, another active research approach will

enable additional significant measurements to be exchanged between two connected real-time simulators. The preliminary results are promising, and the method will be utilized for geographically distributed real-time simulations connecting laboratories all across the world.

The demonstration also advances scientific research by exchanging personnel. For instance, the project benefited from the tools and methodologies developed by a professional exchange between RWTH and INL. The researcher exchange was a "12-month Ph.D. internship" program that allowed an RWTH doctoral candidate to spend more than a year at INL actively contributing to the research program. The RT Super Lab will provide a platform for other participants to pursue similar long-term personnel exchange activities to further research.

Power systems around the world are undergoing fundamental transitions to achieve long-term sustainability, reliability and affordability. The RT Super Lab allows simulation of large-scale systems, simultaneous development across different domains and a flexible collaboration that preserves the confidential details of individual groups.

The ability to move electricity around the globe rather than only within isolated networks holds the possibility of vast savings on infrastructure and energy consumption.

#### **For more information**

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