

# We put science to work.™

# Innovations

## from Savannah River National Laboratory

U.S. DEPARTMENT OF ENERGY • SAVANNAH RIVER SITE • AIKEN • SC

[srnl.doe.gov](http://srnl.doe.gov)

### SRNL Fast Facts

- > Located at the U.S. Department of Energy's Savannah River Site near Aiken, South Carolina
- > Operated by Savannah River Nuclear Solutions
- > "National Laboratory" for DOE Office of Environmental Management
- > Applied research, development and deployment of practical, high-value and cost-effective nuclear materials management and technology solutions in the areas of national security, clean energy and environmental stewardship
- > Supporting customers at SRS, DOE and other federal agencies nationally and internationally

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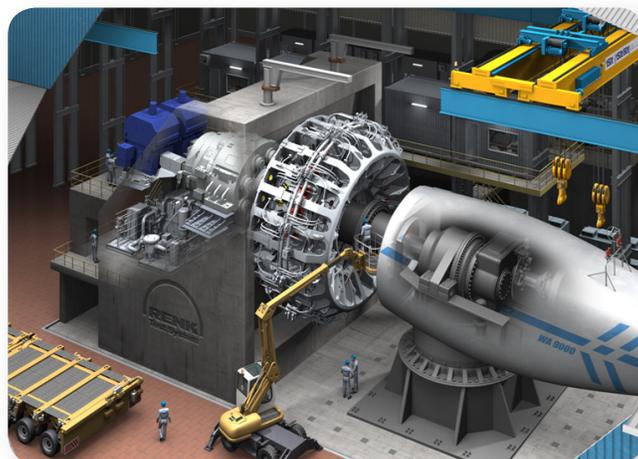
## SRNL, Clemson University Join Forces for World's Highest Power Grid Simulator

The electrical transmission infrastructure in the United States needs to be updated to improve efficiency, reliability and security. Central to that update is the development and certification of new technologies that can be added into the existing electrical grid and meet this challenge. The nation lacks a high fidelity independent capability for testing, validating, and certifying new electrical power system technology without the risk of service disruption or grid collapse. A paradigm shift in the electric power industry is vital in meeting the needs of the future. This shift begins with the creation of a high power grid simulator that puts real hardware to the test.



### Partnerships in innovation

The Savannah River National Laboratory and Clemson University have joined forces in the design and construction of an electrical grid simulator for testing multi-megawatt power systems. The system will be capable of testing, certifying, and simulating the full-scale effects of new large-scale power system technology under stressed or hypothetical operating conditions. This unique grid simulator capability with appropriate programmatic focus will accelerate innovation and commercialization of new power systems by reducing risk to utilities and rate payers.



Courtesy of Clemson University

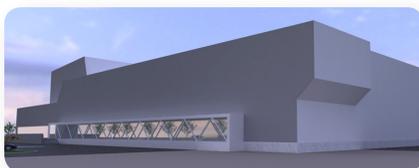
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## Out-of-the-Box Thinking: Providing the tools to help technology succeed

In order to accomplish this project at a reasonable cost, Clemson University, SRNL, and the Department of Energy Office of Energy Efficiency and Renewable Energy are leveraging the large electrical infrastructure at the Clemson University Restoration Institute (CURI) Wind Drivetrain Test Facility at the former U.S. Navy Base in North Charleston, SC. An ongoing program is being leveraged to the benefit of the utility industry, rate payers, regulators, and needs of the Research and Development community, including access to small businesses and entrepreneurs. It is through innovative thinking that researchers realized this unique opportunity. A facility designed for a specific purpose could be pushed one step further. Not only could the grid simulator be used for wind energy, it could be used to improve the infrastructure of the nation. The advancements that come with a smart grid also open concerns for cyber security. The Smart Grid Simulator will allow for the testing of cyber security approaches and technology in order to eliminate vulnerabilities. The simulator will rigorously test equipment at full scale for code compliance, examine energy storage and distribution capabilities, and investigate wireless sensors and cyber security – all without exposing transmission systems to risks.

## Impact

The 15MW grid simulator will be the highest power experimental utility-scale facility in the world, combining testing of



*Courtesy of Clemson University*

energy sources with advanced power instruments and systems. The grid simulator along with the CURI Drivetrain Test Facility will position South Carolina as a world leader in the development and integration of new energy systems, such as off-shore wind and small modular nuclear reactors into the electrical transmission system. Large utilities, as well as small business and entrepreneurs, will be able to test new ideas in a realistic environment. The Grid Simulator will be an invaluable tool in developing cyber security approaches for ensuring the sanctity of power systems. Small business collaboration with large industry sets the groundwork for an innovation engine and economic development hub for the region.



**Hardware in the Loop:  
Current Calibration  
Laboratory**



## Innovation from Science to Successful Deployment

- The grid simulator will be valuable to the wind power, solar energy, energy storage, smart grid and cyber security industries.
- The simulator will serve as a platform to test, validate, and certify new technology, as well as educate the future workforce in power systems engineering.
- The ability to independently test equipment at the multi-megawatt power level without the risk of impacting utility equipment or customers is a key factor in the introduction of new technology to the marketplace.
- Creating an ongoing national program to ensure the simulator is made available to small businesses, researchers, and entrepreneurs is the next step in the simulator's return on investment to the taxpayer.



**Savannah River National Laboratory**<sup>™</sup>  
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