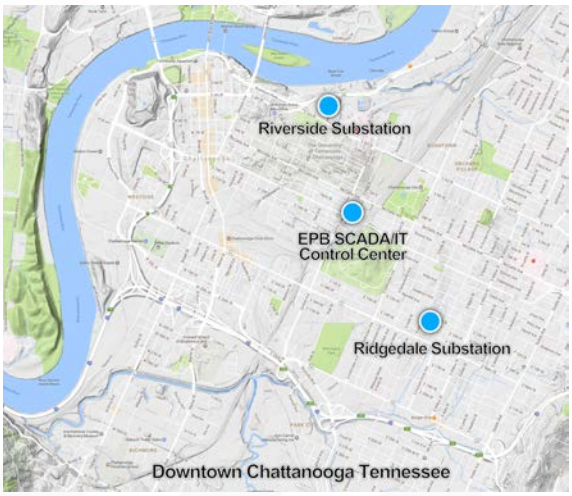
Southeast Regional Consortium

CHALLENGE



Time-sensitive network testing locations.

Different geographical regions across the United States face specific electric grid challenges, such as recurring weather extremes, integration of distributed energy resources (DERs), and an aging electricity infrastructure. On the hurricane-prone Southeast Coast of the United States, damage to electrical infrastructure is not merely inconvenient—it can cause loss of life and millions to billions of dollars in economic losses. Advancing the state of the grid in the Southeast to improve overall system resiliency will reduce the impact of these weather events. Engaging regional stakeholders is crucial to effectively developing new technologies to address the unique regional challenges they face. This involvement will help overcome barriers in transitioning modern, new grid technologies to industry.

APPROACH

The Southeast Regional Consortium is conducting collaborative research to enhance responsiveness, enable faster restoration of power, and increase the concentration of DERs for overall system resiliency. Led by Oak Ridge National Laboratory (ORNL), Savannah River National Laboratory, the University of Tennessee, the Center for Advanced Power Energy Research, and the Clemson 20 MVA Electrical Grid Laboratory—along with critical industry partners, such as Duke Energy, Tennessee Valley Authority, Southern Company, Chattanooga Electric Power Board (EPB), and Santee Cooper—this effort includes four technical projects:

1. Development and testing of distributed control technologies and algorithms for the future EPB distribution center microgrid through hardware-in-the-loop testing at ORNL. ORNL's distributed control framework—Complete System-Level Efficient and Interoperable Solution for Microgrid Integrated Controls—will be applied to a detailed model of the future EPB microgrid that includes photovoltaics, inverters, communications, storage, and loads to accurately simulate

At-A-Glance

PROJECT LEADS

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PARTNERS

- Electric Power Board
- University of North Carolina–Charlotte
- Santee Cooper
- Duke University
- Clemson University
- Southern Company
- Tennessee Valley Authority

BUDGET

$1 million

DURATION

April 2016 – March 2017

TECHNICAL AREA

System Operations and Control

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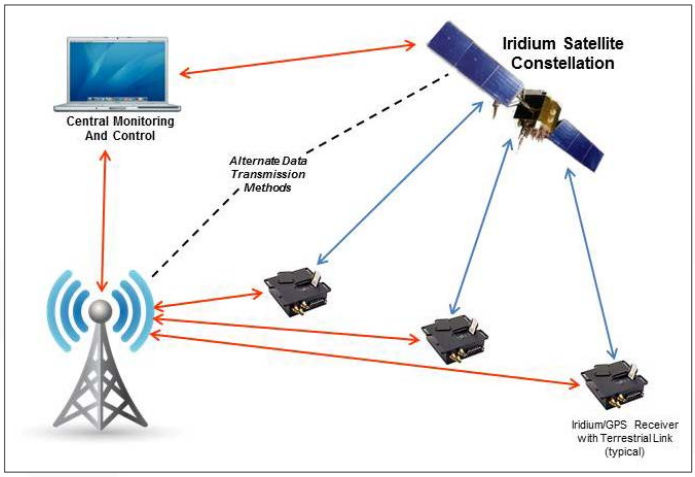
the EPB microgrid from bits to electrons. This will be done using ORNL's Distributed Energy Communications and Controls laboratory low-voltage hardware-based microgrid simulator and Real-time Digital Simulator.

2. Development and validation of a cyber-resilient dual-mode, terrestrial and satellite-based wireless sensor/control network—applicable not only to the Southeast, but any region in the United States due to the use of satellite networks.
3. Testing of new time-sensitive network technologies using dark fibers on the EPB fiber-optic data network.
4. Development of step distance protection for distribution systems using passive optical sensors.

   Step distance protection is currently only applied at the transmission level.

In addition, the consortium is convening a workshop to connect regional stakeholders, foster shared understanding of the technical challenges facing utilities in the Southeast, and discuss the new technologies emerging from DOE grid modernization efforts.



EXPECTED OUTCOMES

Distributed control technologies will improve distribution system resiliency while increasing the concentration of DERs, and dual-mode wireless networks will allow rapid detection of cyber-attacks. Time-sensitive networks will provide the information needed for fast digital control over networks and transient monitoring in distribution systems.

The increased resolution of optical sensors will provide increased visibility, opportunities for new more resilient protection schemes at the distribution level, improved fault localization, and bi-directional power flow. Dual wireless sensing/control will create weather-independent information networks that will help restore power to critical loads more quickly during storms.

Building on existing collaborations, the consortium will foster new engagements with the University of Tennessee, Clemson, Duke University, The University of North Carolina, EPB, Santee Cooper, Southern Company, Dominion, SRNL, and ORNL to assure that these and other emerging technology developments to create a modern resilient grid are more rapidly moved from laboratories to industry implementation.

LAB TEAM

OAK RIDGE National Laboratory

SRNL SAVANNAH RIVER NATIONAL LABORATORY™

Launched in November 2014 under the U.S. Department of Energy's Grid Modernization Initiative, the GMLC is a strategic partnership between DOE Headquarters and the national laboratories, bringing together leading experts and resources to collaborate on national grid modernization goals. The GMLC's work is focused in **six technical areas** viewed as essential to modernization efforts:

Devices and Testing | Sensing and Measurements | Systems Operations and Control
Design and Planning | Security and Resilience | Institutional Support