



## Georgia Tech Research Corporation Sensing Electrical Networks Securely and Economically (SENSE)

### Project Description

The project will develop and demonstrate a modular, secure low-cost sensor network system for monitoring low-cost distribution assets. Ultra-low-cost sensors fabricated using techniques compatible with volume production will be developed to offer multiple sensing modalities. The sensors will be modular with multiple options for energy harvesting and storage, and will integrate artificial intelligence and self-learning features, and will be designed for easy installation and commissioning. The sensors will support multiple communication pathways and standard protocols to assure interoperability.

### Goals/Objectives

- Develop, build, and test ultra-low cost modular and configurable sensors, based on 3D printed sensor technology, to measure voltage, current, and temperature.
- Develop and demonstrate secure ubiquitous low-cost sensor networks for distribution service transformer monitoring that are also applicable to monitoring of capacitor banks, reclosers, and fuses.
- Derive a Return on Investment (ROI) model and business model that provides a sustainable approach for implementing the developed sensor network.

### Key Milestones

- Functionality of fully integrated prototype verified. Capabilities for sensing, secure communications, energy harvesting, local intelligence and environmental conformance tested and verified. (October 2019)
- Field demonstration at electric distribution utility host completed. (October 2020)

### Benefits

- Economically viable system for monitoring of low-cost distribution assets.
- Modular system allowing multiple sensing modalities, energy harvesting, and multiple communications options.
- Base unit includes a novel intermittent connectivity-based Bluetooth communications pathway that offers virtually zero marginal cost for data transfer with no compromises on cyber or physical security, or sensor performance.

Milestone	Completion Date
Core Functionality of Minimum Viable Prototype (MVP) verified (voltage, current and temperature sensing)	October 1, 2018
Functionality of "Bronze" Prototype verified (sensing, local intelligence, secure communication and environmental conformance)	October 1, 2019
Acceptance of Functional Specification for sensor by Electric Distribution Utility Partner	January 1, 2020
100 units of ruggedized "Gold" product built per functional specification	February 1, 2020
Field Demonstration at Electric Distribution Utility Demonstration Host completed	October 1, 2020

### CONTACTS

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### PARTNERS

Oak Ridge National Laboratory  
Southern Company

### PROJECT DURATION

10/01/2017 – 09/30/2020

### BUDGET

**Total Project Value**  
\$1,872,872

**DOE/Non-DOE Share**  
\$1,415,178 / \$457,694

### PROJECT IMPACTS

- Platform for monitoring, diagnostics, and prognostics of low-cost distribution assets.
- Indication of changing loading on parts of the network due to increased deployment of distributed energy resources.
- Data collected can provide additional utility benefits such as outage alerts, identification and location of intermittent faults, loading forecasts and data on ANSI voltage limit compliance at the grid edge.

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