Alabama Power
Smart Neighborhood®
October 2019
Olu Ajala, PE, MBA – Senior Research Engineer

Research & Development

Reynolds Landing

Distributed Energy Resources
Who We Are:

Southern Company is one of America’s premier energy companies
We provide clean, safe, reliable, affordable energy and customized solutions.

- **Capacities in 50 States**
- **7 Electric & Natural Gas Utilities**
- **9 Million Customers**
- **Approximately 29,000 Employees**
- **Approximately 44,000 MW of Generating Capacity**

In November 2018, Southern Power agreed to sell its combined-cycle facility in Mankato, Minnesota.
We support U.S. customers and businesses nationwide

Our family of companies

- Electric utilities in 3 states
  - Alabama Power
  - Georgia Power
  - Mississippi Power

- Other Subsidiaries
  - Southern Linc
  - Southern Nuclear
  - Southern Telecom
  - Pivotal LNG
  - Sequent Energy Management

- Wholesale Electric Utilities
  - Southern Power

- Natural Gas Utilities
  - Southern Company Gas
    - Atlanta Gas Light
    - Chattanooga Gas
    - Nicor Gas
    - Virginia Natural Gas

- Customized energy solutions
- Fiber optics and wireless communications

*Southern Company has a 50% equity interest in the Southern Natural Gas pipeline system through a subsidiary of Southern Company Gas.
What We Do:

Southern Company provides energy through our core businesses
Energy Supply Mix

- Electric: 53%
- Gas: 47%
Electric
Sources of Generation

- Gas: 47%
- Coal: 27%
- Nuclear: 15%
- Renewables: 11%

*For the year ended of Dec. 31, 2018. Includes power purchase agreements.*
Electric Utilities
Our three traditional electric utilities

- These subsidiaries provide retail electric service and are regulated by federal energy agencies and the public service commissions in the states they serve.

- Independent customer satisfaction surveys are a key performance indicator for our electric utilities, which consistently rank in the top quartile in both the American Customer Service Satisfaction Index and the JD Power & Associates Electric Utility Rankings.
Objective
Design and build a first-of-a-kind smart home community to understand and prepare for evolving customer expectations and future grid needs.

Scope
Demonstrate distributed energy resource (DER) use cases optimizing cost, reliability, and environmental impact with a community-scale microgrid.

Demonstrate 62 high-performance homes with connected home technologies providing an improved customer experience.

Demonstrate buildings-to-grid integration with real-time utility-to-customer interaction.
Demonstrate 62 high-performance homes with connected home technologies providing an improved customer experience.
Demonstrate DER use cases optimizing cost, reliability and environmental impact with a community-scale microgrid.

Total DER output used by the neighborhood: 189,000 kWh (27.5% of total neighborhood consumption)
Transactive Controls

Microgrid

SMART NEIGHBORHOOD®

Water Heaters

Heat Pumps

Sensors

CSEISMIC

VOLTTRON

Utility Grid
Microgrid – Lessons Learned

Seamless, Automatic Islanding
Multi-source, Grid-forming
Protection Schemes
Voltage/PF Control at PCC
Remote Operations
Transactive Control
PV Smoothing
Protection and Controls

• Protection settings for the Shannon-Oxmoor Microgrid:
  ► Overcurrent-sensing primarily for grid-connected events
  ► Voltage-sensing primarily for islanded events

• Settings allowed the microgrid to island safely and respond appropriately to grid events

• The islanding recloser was adjusted to a more sensitive setting to island faster and improve rates of successful islanding events

• Frequency settings for the DER recloser are wider than those for the PCC recloser
Tests successfully performed with ORNL’s CSEISMIC
- PV Smoothing
- Power factor control
- Economic Dispatch to XM price signal
- Zero energy flow

Future testing
- Dispatch with home loads
- Test long-term island capabilities
- Collaborate with the national labs to evaluate other commercial controllers
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