AEP OHIO
A unit of American Electric Power

gridSMART®

2012 Smart Grid Program Peer Review Meeting

AEP Ohio gridSMART® Demonstration Project

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AEP Ohio gridSMART® Demonstration Project

Objectives

- To build an integrated secure smart grid infrastructure.
- Attract, educate, enlist and retain consumers using innovative business models that provide tools to reduce costs, consumption and peak demand.
- Gather data on technology and smart grid business models to forecast national impact.

Life-cycle Funding

2010 - 2013
$73,660,317

Technical Scope

- 110,000 AMI meters and associated infrastructure
- Consumer Managed Energy Technology (experimental tariffs, consumer programs, web portal; smart appliances, and plug-in electric vehicles)
- Innovative Demand Management
- Distribution Automation and Reliability Technology
- Cyber Security and Interoperability.

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Advanced Metering Infrastructure

- Improve efficiencies
- 110,000 meters deployed 02/2010
- Outage Management System Interface
- Monitor system; Report results
- $386K$_{2012}$ / $156K$_{2013}$

Demand Response

- Consumer energy efficiency & peak shaving
- PUCO approval; 6 programs as of 12/2011
- 3100+ participants; ~0.4kw – 1.0kw peak reduction per customer
- Gather & report results; Continue recruitment
- $3,548K$_{2012}$ / $1,495K$_{2013}$

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Smart Appliances (SA)

- Generate energy efficiency
- Gain knowledge of SA
- Installed appliances in 10 homes
- Appliances connected to meter 03/2012
- Continue deployment
- Collect data & report results
- $\$51K_{2012}$ / $\$7K_{2013}$

Web Portal

- Consumer tool to better understand energy usage
- Launched 08/2010
- Rate comparison added 03/2011
- Alert for abnormal usage
- Collect data & report results
- $\$174K_{2012}$ / $\$352K_{2013}$

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Plug-in Electric Vehicles

- Impact of charging on grid
- Pricing driver for off-peak charging
- 11 vehicles deployed 05/2012 (63,544 all-electric miles driven to date)
- 36 charging stations 10/2011
- Collect data & report results
- $214K$_{2012}$ / $197K$_{2013}$

Distribution Automation Circuit Reconfiguration

- Improve reliability
- Reduce switching & labor $
- Commissioned 70 circuits 12/2011; visible in DMS
- DMS upgrade: GE ENMAC -> GE GENe
- More than 1.3M customer interruption minutes saved
- Collect data & report results
- $699K$_{2012}$ / $304K$_{2013}$

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Volt Var Optimization

- Reduce energy consumption/ peak demand
- Commissioned 17 circuits 02/2011; visible in DMS
- Demonstrated benefits 10/2011; ~ 3% EE and PDR
- Continue improvements
- Collect data & report results
- $\$75K_{2012}$ / $\$50K_{2013}$

Community Energy Storage

- Improve reliability / backup power
- Reduce peak consumption
- First units installed 09/2011
- Design improvements identified 01/2012
- Install 20 units in 2012
- Install 60 units in 2013
- Collect data & report results
- $\$2{,}962K_{2012}$ / $\$62K_{2013}$

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Cyber Security

- Identify vulnerabilities
- Ensure grid security
- Cyber Security Operations Center 12/2011
- Threat information sharing portal 12/2011
- Continue utility recruitment
- Collect data & report results
- $748K$_{2012}$ / $84K$_{2013}$

Interoperability

- Participate in the development of NIST standards
- Vet reliability / security of information exchanges
- Use cases developed and testing underway 05/2012
- Continue testing
- Collect data & report results
- $532K$_{2012}$ / $130K$_{2013}$

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Modeling and Simulation

- Ability to gauge impact of future technology deployments
- 32 circuits and all technologies modeled 02/2012
- Run simulations (1,300+)
- Collect data & report results
- $747K$_{2012}$ / $308K$_{2013}$

Metrics and Benefits

- Ability to analyze impact of project deployment
- Identified stakeholder requirements 12/2010
- Identified data sources 12/2011
- Preliminary TPR 03/2013
- Final TPR 03/2014
- $801K$_{2012}$ / $478K$_{2013}$

Significance and Impact

- Improve distribution efficiency and reliability by 30%
- Reduce energy consumption by 1,800 megawatt hours
- Reduce peak demand by 15MW
- Reduce consumer costs by $5.75 million
- Reduce fossil fuel emissions by 16,650 tons
- Offer innovative consumer products
- Enable consumers to reduce energy consumption by 15%
- Enable consumers to reduce peak demand by 30%
- Representative project area
  - Within 3% of national averages (race, age, income & home ownership)
  - Mirrors PJM geography and climate

Interactions & Collaborations

Contact Information

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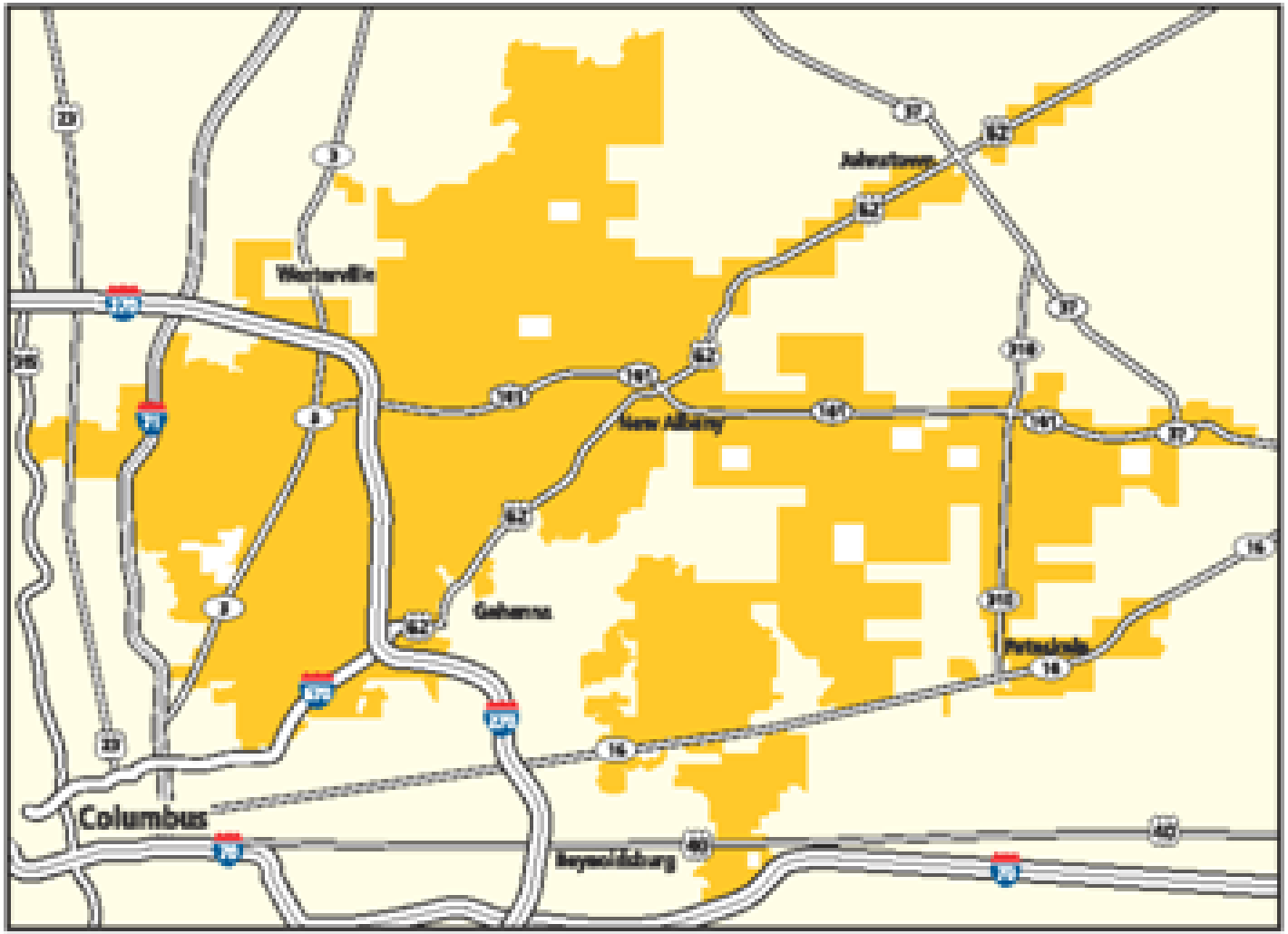
Appendix

AEP Ohio's gridSMART Project

Northeast Central Ohio Area



AMI Meters

SILVERSPRING NETWORKS

SMART Shift Plus℠

- IHD and PCT

Control4

Smart Cooling

Radio Thermostat

SMART Choice℠

- ePCT and HEM

Radio Thermostat

Battelle
The Business of Innovation

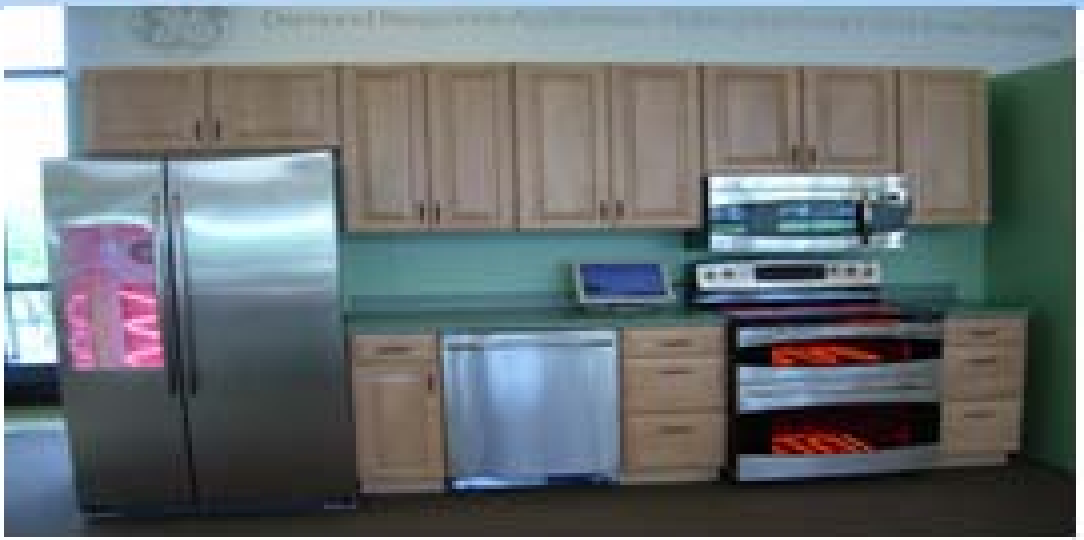
SmartSynch

SMART Cooling Plus - Load Control Switches (LCS)

Energate

eVIEW (In Home Display)

SMART Appliances℠



Plug-in Electric Vehicles and Chargers

Distribution Automation

Distribution Automation Deployment 80 Circuits in NE Columbus, Ohio

Distribution Automation

3 Phase Bank
Cooper
Regulator Control

SILVERSPRING SEL G&W S&C COOPER

Distribution Automation Reclosers

(Circuit Reconfiguration)

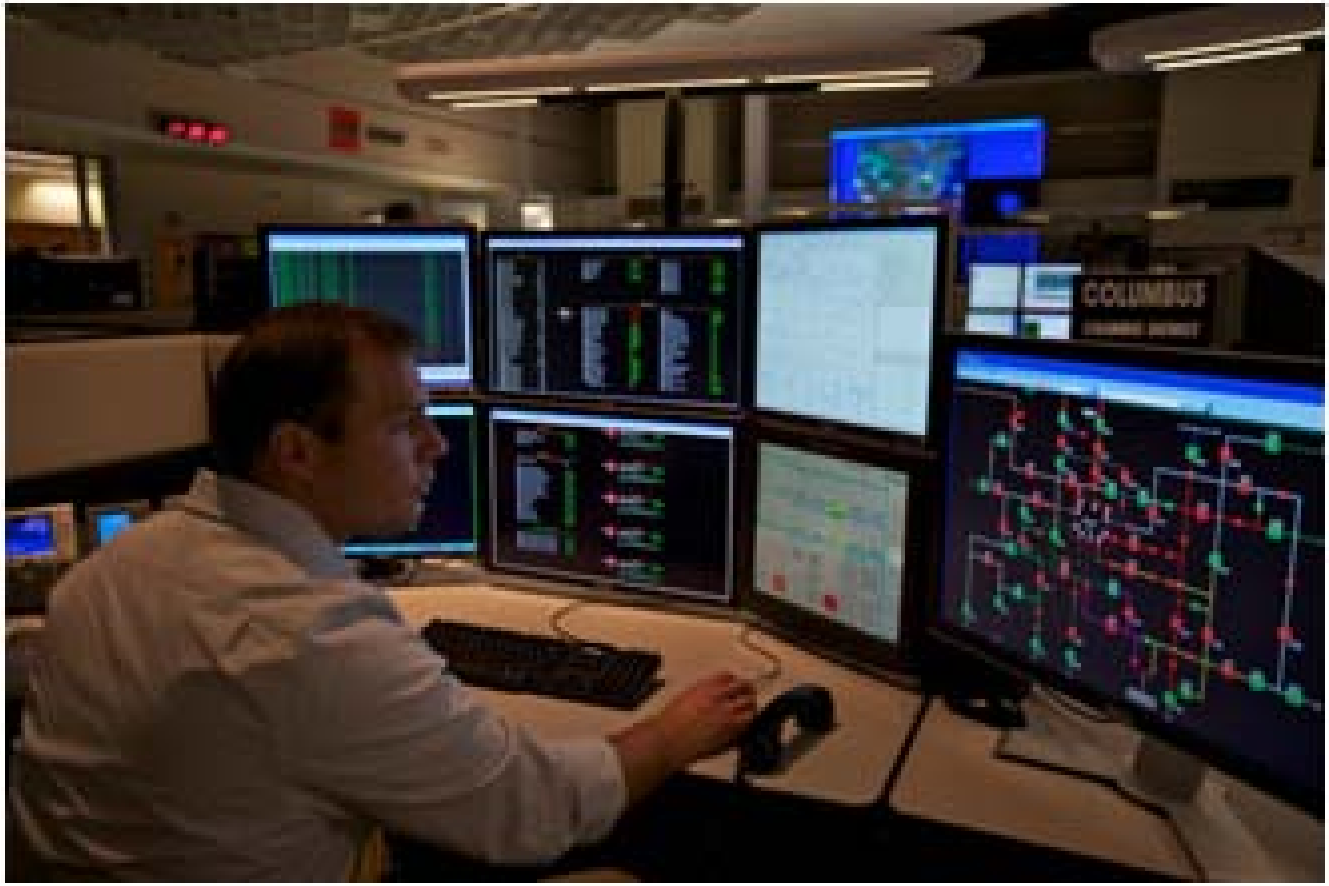
Distribution Automation

SEL 351S
Recloser Control

Distribution Automation

SEL 3354
Distribution
Automation
Control (DAC)

Distribution Automation



gridSMART Desk
Distribution Dispatch Center

Volt Var Control (VVC)

Station Regulator with Cooper Controls

General Electric (GE) Remote Terminal Unit (RTU)

Volt Var Control (VVC)

S&C Intellicap Control
With SSN E-Bridge Radio for communications

Volt Var Control (VVC)

PCS UTILIDATA

Adaptivolt
Remote Terminal Unit
(RTU)

Community Energy Storage (CES)

Samsung Battery

Cyber Security Operation Center

LOCKHEED MARTIN

Mobile Display Unit - Customer Engagement