IntelliGrid Program 2015
Project Set 161D

Distributed Energy Resources / Demand Response

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Agenda

• Welcome & Introductions
• Opening Remarks
• Program Background
• Distributed Energy Resources
• 2015 Program Plan for 161D
• Supplemental Projects
• Emerging Technologies and Technology Transfer: 161A
• Review & Wrap up
Information and Communication Technology (ICT) Program

The ICT Program conducts research, development and demonstrations that cut across operating domains and the IT and OT departments.

Research Areas:
- Interoperability
- Communications
- Data Management & Analysis
- Systems Integration
- Advanced Metering
Distributed Energy Resources and Demand Response (161D)

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Changes for 2015
- Narrowed focus of 161D
- Added Project Sets:
  - Enterprise Architecture (161E)
  - Advanced Metering/AMI (161F)

Drivers
- Facilitates engagement with member subject matter experts
- Enables members to effectively apply the research results

Changing Program name to ICT
- More descriptive of the specific research areas
Collaborations

Key Collaboration Areas:
• P174 - Integration of Distributed Energy Resources
• P170 - End-Use Energy Efficiency and Demand Response
• P182 - Understanding Electric Utility Customers

Other Collaboration Areas:
• P183 – Cyber Security and Privacy
• P18 – Electric Transportation
• P94 – Energy Storage and Distributed Generation
ICT for Distributed Energy Resources (161D)
The escalating role of DER & DR:

Research drivers include:

- **High penetration** of DER including renewables and managing variability
- A growing and diverse **variety of loads**
- **Aggregation** of multiple types of DER and DR at both customer and utility locations
- Deployment of **3rd party systems**
- Challenges in **M&V** for DER/DR

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DER Broken Down by Definition

**Resource**
- **Resource** – the ability to impact the operation is beneficial

**Energy**
- **Energy** – related, directly or indirectly, to energy consumption or production

**Distributed**
- **Distributed** – It is physically located at a variety of locations.

**Implications:**
- May have a plurality of purposes for dispatch
- Architecture and methods utilized for resource management
- Distributed location implies communication
- Standards are needed for communication
- Need way to measure and verify the impact
- Similar devices but variety of ownership/control/aggregation
- Other variables: type, ownership, command vs. inform, etc.
Sub-Project Fit:

Implications:
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Example Issue:
Same/Similar DER accessed via different architecture or channels -

ISO/RTO

Distribution Utility

Aggregator
Utility Focused

Direct vs. Program-based

Independent 3rd Party Cloud Aggregators

161D
Open Standards for DER / DR

ISO/RTO

Distribution Utility

Aggregator
Utility Focused

Independent
3rd Party Cloud Aggregators

Direct vs.
Program-based

WEQs, REQs

PAP19

CIM

4.x

MultiSpeak

CEA 2045

SEP2

ANSI C12.19
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Distributed Energy Resources and Demand Response

DISTRIBUTED ENERGY RESOURCES

- Customer-Owned Resources
- Single or Multi-Site Building Management
- Energy Storage
- Curtailable Loads
- Other Resources

Information - Status, Protocols, Measurement ...

161D: Standards & Interop
161D: Arch & Methods
161D: Verification

ADDITIONAL
MANAGED
REDUCED or DEFERRED
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Standards & Interoperability

- Immersion in current and emerging standards
- Cross-check architecture relative to requirements and standards
- Provide input to standards bodies
- Report out, and gather input, during informational webcasts
- Track and monitor progress of standards development
- Interoperability testing or demonstrations
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Example: CEA-2045
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Architecture & Methods

• Cross-check architecture relative to requirements and standards
• Track & monitor architecture utilizing standards
• Integration testing
• Pilots and demonstrations utilizing smart grid architecture
• Interfacing with third party & customer systems
• Interfacing with cloud-hosted systems
Hypothesis:
The modernized grid no longer needs to focus on a single resource nor a single class/type of resource, but rather on single **standardized access** to a variety of dissimilar resources.
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Architecture & Methods

Example: Virtual Resource
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Architecture & Methods

Example: Virtual Resource

Contingency provided by VPP
Architecture & Methods

CES and VVO aggregate response meets the target goal.
Example:
Can standards and architecture enable cross-utilization of DER?
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Example: Cross-Utilization with multiple technologies
Example: Harmonization with other devices and systems
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**Measurement & Verification**

- **Measurement requirements**
  - Resolution
  - Accuracy
  - Program

- **Measurement methods**
  - Traditional Programs
  - Buildings
  - Cloud-hosted systems
  - Customer-owned systems & devices
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Measurement & Verification

Through-Wall connection between utility meter and digital metering installation

Example: Addition of a building meter

CENTER FOR ELECTRIC POWER ENGINEERING (CEPE), HTTP://POWER.ECE.DREXEL.EDU
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Standards & Interoperability
Architecture & Methods
Measurement & Verification

Approach:

- Immersion in current and emerging standards
- Assessment of DER/DR architecture and methods with utilities, networks and end device stakeholders.
- Engagement with independent providers of DER/DR including third-party cloud-hosted implementations
- Integration of customer-owned devices & systems
- Assess integration of legacy DR into cohesive system
- Examine measurement & verification requirements and sub-metering guidelines

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Discussion

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Supplemental Projects
Automated Demand Response and Ancillary Services Demonstration

Objectives and Scope
• Evaluate Standards for Automated Demand Response (DR), focusing on OpenADR 2.0
• Assess OpenADR 2.0 Information Module Against
  – Focus on Ancillary Services (Fast DR) Programs
• Evaluate technical challenges associated with adoption
  – Implementation
  – Integration
  – Scalability

Research Strategy
• Use OpenADR to support Different Use Cases and Test in Field Deployment
• Provide Feedback to Standards Process

Advance Standards for Automated DR & Ancillary Services
The Socket Interface is the Standard
Emerging Technologies & Tech Transfer (161A)
Emerging Technologies and Technology Transfer: 161A

Approach:

• Analysis of emerging standards, technologies and practices for smart grid implementations
  – Smart Grid Standards Tracking, Analysis and Contribution
  – Communications Technology Tracking and Analysis

• Technology transfer support for ALL Integrated Communication and Technology (ICT) R & D projects.

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Interoperability Standards & Communications Technology Tracking and Analysis

Issue

• Rapidly evolving standards and communications technologies can have a major impact on utility deployments
• Tracking development can be overwhelming and costly

Approach

• EPRI staff is deeply involved in standards development and industry activities
• EPRI staff reports on developments and activities and provides analysis on the impacts to utilities

Saving utility staff time *tracking* standards activities, while gaining a better understanding of the *impact* of standards
ICT Technology Transfer Activities

Issue
• To receive value from our research, our member stakeholders must be aware of what we are doing and implement the results

Approach
• Communicate research results in a variety of ways:
  – Technical reports
  – Webcasts
  – Newsletters

Receive the results of our work in the format that works best for YOU!
Together...Shaping the Future of Electricity

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