Power Systems Conference 2009

Architecture for Distributed Energy Resources Control including Demand Response and Distribution Automation at First Energy

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FirstEnergy Summary Profile

- $13 billion in annual revenues and $32 billion in assets
- 4.5 million customers
- 18 generating plants; more than 14,272 MW
- Approx. 133,000 transmission and distribution circuit miles
- Approx. 14,000 employees

Rankings Among Electric Utilities (12 mos. ended 12/31/2007)

<table>
<thead>
<tr>
<th>Category</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>11</td>
</tr>
<tr>
<td>Customers</td>
<td>5</td>
</tr>
<tr>
<td>Revenues</td>
<td>11</td>
</tr>
<tr>
<td>Market Cap (as of 2/29/08)</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: EEI
DER Strategy Aligns with FirstEnergy IGCA
*Integrated Grid Communications Architecture*

**Enterprise Application & Data Integration (Common Information Model and Integration Bus)**

- **Dashboards**
- **T&D Operations**
  - EMS
  - DMS
  - Operations Planning
  - SCADA
  - DSM
- **T&D Planning & Engineering**
  - Systems Planning
  - Maintenance Mgmt
  - Asset Mgmt
- **Distribution Management**
  - GIS
  - OMS
  - MWM
- **Customer Services**
  - MDMS
  - CIS
  - Call Center
  - Billing

**Corporate Financial Apps and Systems**
- SAP
- ERP

**Power Procurement & Market Ops**
- Planning & Forecasting
- Bidding & Scheduling
- Trading & Contracts
- Resource Dispatch
- Settlements

**Communications Infrastructure**

**Storage & Distributed Generation**

**Transmission Automation**

**Substation Automation**

**Distribution Automation**

**Customer Integration & AMI**

*FirstEnergy Proprietary*
Integration of DER into JCP&L/FE Control and Communications Systems

Dashboards

Enterprise Application & Database Integration

Corporate Finance
- SAP
- ERP

Power Procurement & Market Ops
- Plan/Forecast
- Bid/Schedule
- Dispatch
- Trade/Contracts

T&D Operations
- EMS
- DMS
- Ops Planning
- SCADA
- DSM

T&D Planning & Engineering
- Asset Mgmt

Distribution Management
- GIS
- OMS
- MWM

Customer Service
- MDMS
- CIS
- IVR
- Billing

Communications Infrastructure

IDER Platform

Substation Automation

Distribution Automation

Customer Integration & Data

FirstEnergy

Smart Grid Demonstration Host Site Overview/Update
Project Update Slides, February 3, 2009
JCP&L/FE EPRI Host Site Demonstration Project

Comprised of:

- Integrated Control Platform and 8MW Direct Load Control pilot
- DLC Expansion
- Permanent Peak Load Shift program
- Electricity Storage program
- Distribution Sensors
- Other DER technologies

Project aligns with FirstEnergy IGCA Strategy

Project aligns with EPRI Smart Grid Strategy

Integration Planning, Analysis and Testing
Methodologies and Standards Development
Performance Requirements and Use Case Development
Integration Activities, Testing, and Analysis
Direct Load Control, Integrated Control Platform

Integrated Control Platform and 8MW Direct Load Control pilot

- Premise information viewed by Operator on user interface
  - Alarm triggers based on monitored device parameters
  - Individual & aggregated load information
  - Building temperature

- Local Grid Sensing and Control
  - Residential Load Controllers
  - Commercial & Industrial integration with energy management systems

- Load management verification via reports and audit logs
- Customized load control programs

JCP&L/FE Host Site Project
EPRI Smart Grid Demonstration

FirstEnergy Proprietary
State Monitoring, Integrated Control Platform

Integrated Control Platform and 8MW Direct Load Control pilot

Distribution Sensors

DLC Expansion

- Monitor and visualize state transitions of individual devices
  - Line mounted sensors

- Action plans for state management
  - Operator controlled
  - Real time verifiable

- Customized verification reports
Expanded Integration and Associated Benefits

Integrated Control Platform and 8MW Direct Load Control pilot

Distribution Sensors

DLC Expansion

Electricity Storage program

Permanent Peak Load Shift program

Other DER technologies

- Condition-based monitoring and state estimation via enhanced platform capabilities
- System alarm coordination
- Automated condition response
- Integrated Electricity Storage
- Integrated Permanent Peak Load Shifting

JCP&L/FE Host Site Project
EPRI Smart Grid Demonstration

Integrated Distributed Energy Resources Management
Integrated Control Platform

Direct Load Control 8 MW Pilot

Permanent Peak Load Shifting

Integration Planning, Analysis and Testing
Methodologies and Standards Development
Performance Requirements and Use Case Development
Integration Activities, Testing, and Analysis
Overview of Project Activities

Task 1: Project Planning and Objective Setting
Task 2: Equipment Deployment (Installation)
Task 3: System Integration Activities
Task 4: Monitoring and Performance Assessment
Task 5: Performance and Integration Requirements
Task 6: Benchmarking Project to Existing Methodology and Standards
Task 7: Develop Use Case Scenarios
Task 8: Develop Business Case Scenarios
Task 9: Tasks to Support System Use
Task 10: Smart Grid Demo Project Analysis Activities
Thank You!