Integrated Distributed Energy Resources Management Pilot

Said Abboudi
Chief Business Development Officer
BPL Global EMEA
Outline

- Jersey Central Power & Light / FirstEnergy Facts
- BPL Global Facts
- Integrated Grid Communications and Automation solution
- Integrated Distributed Energy Resources Components and Capabilities
- Integrated DER Operations Delivery Phases
JCP&L/FirstEnergy

» FE is a diversified energy company based in Akron, OH, USA
» JCP&L is one of FE’s seven electric utility operating companies
» Nation’s 5th largest investor-owned electric system
» JCP&L serves 1.1 million customers of 4.5 million FE customers
» 128,000 miles of transmission & distribution lines
» FE has nearly $12 billion in annual revenues
» FE owns and operates more than $31 billion in assets

Rankings among Electric Utilities

<table>
<thead>
<tr>
<th>Category</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>9</td>
</tr>
<tr>
<td>Customers</td>
<td>5</td>
</tr>
<tr>
<td>Revenues</td>
<td>8</td>
</tr>
<tr>
<td>Market Cap</td>
<td>7</td>
</tr>
</tbody>
</table>
BPL Global

» BPL Global is a Smart Grid Solutions provider based in Pittsburgh, PA
» BPLG offers integrated Smart Grid solutions from generation to the premises
» Areas of Expertise include:
  » Grid Efficiency
  » DER
  » Demand Management
» Grid Reliability and Operational Productivity
» Grid Communications
BPL Global Provided Solutions

Operations Center ➔ Energy Market

Centralized Generation ➔ Transmission Grid ➔ Distributed Renewable Generation & Storage ➔ Distribution Grid ➔ Residential and C&I Demand

Transformer Monitoring
Extend asset life and improve reliability

Substation Automation
Improve productivity and reliability

Distributed Energy Resource Management
Optimize underutilized renewable generation and storage resources

Reliability
Protect & extend asset life

Load Management
Meet demand growth for ~1/3 the cost of new generation

Grid Communications - Enable smart grid

Power SG® Solutions
Delivers the Intelligent Grid

- Substation Monitoring and Applications
- Feeder Monitoring and Automation
- Utility DER System Integration
- Customer System Integration

Local system and device assessment
Integrated DER management

FULL INTEGRATION ACROSS COMMON COMMUNICATION PLATFORM

- Storage & Distributed Generation
- Transmission Automation
- Substation Automation
- Distribution Automation
- Customer Integration & AMI

Communications Infrastructure

Jersey Central Power & Light
A FirstEnergy Company
Integrated DER System Capabilities

DER Master Control (MC) – monitors wholesale energy market for price and/or capacity requirement signals for service opportunities and for system reliability; aggregates DER from multiple Local Managers for optimal wide area management.

DER Local Manager (LM) – monitors condition of the local grid (distribution feeder) to identify, assess and manage efficiency and reliability service requirements.

Active monitoring

<table>
<thead>
<tr>
<th>DER Master Controller</th>
<th>DER Local Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configurable Market Based Services</td>
<td>Configurable Operations Based Services</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distributed resources</th>
<th>Load management resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distributed generation</td>
<td>Distributed Advanced Storage</td>
</tr>
<tr>
<td>C&amp;I Direct Load Control</td>
<td>Residential Direct Load Control</td>
</tr>
</tbody>
</table>

Granular management of connected assets
Fully Integrated DER Project Delivered in 3 Phases

- Phase 1 – Direct Load Control and Management
- Phase 2 – State Monitoring w/Integrated Storage
- Phase 3 – Intelligent, Integrated DER Management
Phase 1 - Direct Load Control and Management

- Premises load information viewed by Operator on user interface
- Local Grid Sensing and Control
- Load management validation and verification via reports and audit logs
- Customized load control programs to support operations and capacity constraint events
Integrated DER Management Pilot Details

- Project deployed starting Summer of 2008
- 8 MW; 3500 residential customers, up to 100 C&I customers
- 2-way Communications focused on Direct Load Control
- Targeted high growth area substations and associated circuits in JCP&L territory
- Operate for Operations and PJM Programs
- Project approved by NJ Board of Public Utilities
- BPL Global, co-development vendor
Beyond the Pilot……

Distributed System Integration Expansion

- Additional 15 MW residential and commercial direct load control
- State transition monitoring
- Electricity storage in substations and distributed on the grid
- Permanent peak load shift using thermal energy storage
Phase 2 - State Monitoring w/Integrated Storage

- Monitor and visualize state transitions of individual devices
  - Line mounted sensors
- Action plans for state management
  - Operator created
  - Push enabled
  - Real time verifiable
- Integrated electricity storage
- Integration of substation IEDs/EMS/SCADA systems
- Customized verification reports
Typical Hybrid DER Configuration
Phase 3 - Intelligent, Integrated DER Management

- **Full state estimation**
  - Normal, Stressed or Emergency Conditions

- **System wide alarm coordination**
  - Minimize outage restoration times, improve operational reliability metrics

- **Automated action plan & coordinated response based on utility developed rules**

- **Integrated DG operations**
  - Utilize installed assets more efficiently

- **Enhanced weather analysis**
  - Localized weather information to improve load forecasting
Typical Hybrid DER Configuration

Transmission

Xfmr
NAS

Distribution

Storage

Load Control (Residential)
Distributed Generation
Renewable Energy
Load Control (Commercial)

Customer Loads
Hybrid DER Configuration – Emergency

Transmission

Open Switch

Xfmr

Storage

Load Control (Residential)

Distributed Generation

Renewable Energy

Load Control (Commercial)

Storage

Customer Loads
Hybrid DER Configuration – Emergency

Customer Loads

Xfmr

Transmission

Open Switches

Distributed Generation

Renewable Energy

Load Control (Residential)

Load Control (Commercial)

Storage

Distro

Storage
For Additional Information Contact:

FirstEnergy Corp.
Eva Gardow
Project Manager
egardow@firstenergycorp.com

BPL Global
Europe, Middle East, Africa
Said Abboudi
sabboudi@bplglobal.net

North America
Mark Rupnik
mrupnik@bplglobal.net