Demonstration of a Coordinated and Integrated System:
Fort Collins RDSI/FortZED Jump Start

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City of Fort Collins

U.S Department of Energy Smart Grid Program Peer Review
Golden, CO, November 2-4, 2010
Presentation Outline

Fort Collins, CO

Report Topics:
- Project Relevance
- Approach & Project Management
- Technical Accomplishments, Quality and Productivity
- Technological Transfer, Collaborations and Partnerships

2010 Smart Grid Peer Review
Fort Collins, CO

- Population: 131,000
- 53 square miles
- Median age 29.4 yrs.
- 48.2% 4+ yrs. of college
- Median Income: $68,200
- High Tech employers:
  - HP, Intel, LSI, Avago, AMD, Agilent
- Clean Energy employers:
  - Woodward, Advanced Energy, Spirae, Solix
Fort Collins Electric Utility

- 62,000 homes and businesses
- 99+% underground system
- Aggressive energy conservation
- Electric Energy Supply Policy goals:
  - reduced energy bills
  - delayed investment in new generation
  - cleaner air and reduced global warming potential
  - continued high reliability and competitive rates
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Fort Collins RDSI at a Glance

- Two feeders that feed downtown Fort Collins and the CSU campus
- Almost 5 MW of load reduction capability from a variety of asset types
  - load reduction
  - conventional generation
  - renewable energy
- Diverse partner organizations
  - industrial,
  - commercial
  - service sector
RDSI Project Relevance

- Targeted Peak(S) Reduction
  - Circuit- distribution level resource
  - System - G&T level resources

Benefits:
  - Modernize electric grid
  - Enhanced integration of distributed resources
  - System stability and security
  - Improved system robustness
  - Reduced demand on system and bill savings
**FortZED – Zero Energy District**

A **ZERO ENERGY DISTRICT** is one that creates as much energy locally as it uses.

<table>
<thead>
<tr>
<th>Class</th>
<th># of Customers</th>
<th>Energy Consumption (KWh)</th>
<th>Peak Demand (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>5,903</td>
<td>38,969,441</td>
<td>20,962</td>
</tr>
<tr>
<td>Small Commercial (&lt;50 KW)</td>
<td>1,264</td>
<td>42,216,865</td>
<td></td>
</tr>
<tr>
<td>Commercial (&gt;50 KW)</td>
<td>88</td>
<td>54,389,657</td>
<td>6,609</td>
</tr>
<tr>
<td>Comm/Ind (&gt;750 KW)</td>
<td>2</td>
<td>100,482,920</td>
<td>18,059</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>7,257</strong></td>
<td><strong>236,058,883</strong></td>
<td><strong>45,630</strong></td>
</tr>
</tbody>
</table>

**FortZED** represents 10% - 15% of FCU’s system in terms of energy consumption, peak demand, and number of customers.
# Fort Collins RDSI – Project Partners

<table>
<thead>
<tr>
<th>Project Lead</th>
<th>Resource</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Fort Collins</td>
<td>Prime Contractor</td>
</tr>
<tr>
<td>Fort Collins Utilities</td>
<td>Utility Company</td>
</tr>
<tr>
<td>City of Fort Collins</td>
<td>DG, DSM, PHEV, and Thermal Storage</td>
</tr>
<tr>
<td>New Belgium Brewing</td>
<td>Solar PV, DG, and DSM</td>
</tr>
<tr>
<td>Colorado State University Facilities</td>
<td>DG, DSM, and Thermal Storage</td>
</tr>
</tbody>
</table>
## Fort Collins RDSI – Project Partners

<table>
<thead>
<tr>
<th>Tech Partner</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spirae</td>
<td>Smart Grid Platform – DER/Power Management System</td>
</tr>
<tr>
<td>Brendle Group</td>
<td>Demand Side Management and Program Development</td>
</tr>
<tr>
<td>Colorado State University</td>
<td>Robust Controls and PHEV R&amp;D</td>
</tr>
<tr>
<td>Advanced Energy</td>
<td>Photovoltaic Inverter</td>
</tr>
<tr>
<td>Woodward Governor</td>
<td>Power Management and Mixed Fuel R&amp;D</td>
</tr>
<tr>
<td>Eaton</td>
<td>Switchgear/Power Components and Small Generator Switchgear R&amp;D</td>
</tr>
<tr>
<td>VanDyne Super Turbo</td>
<td>Diesel Gensets for added project Power</td>
</tr>
<tr>
<td>InteGrid</td>
<td>Platform for Controls R&amp;D, DER Integration and Simulation</td>
</tr>
</tbody>
</table>
Fort Collins RDSI – System Overview

Communication System:

- Utility Control Center
  - BF Remote HMI
  - RTSPS
- RDSI Control Center
  - Solar Peak Load Management SW
- Bluefin Enterprise
  - 10Mbps fixed IP address

EAS
- City Hall DSM
- 216 Mason DSM
- 117 Mason DSM
- Aztec DSM
- Op. Ser. DSM
- Transit DSM
- 231 College DSM
- Streets DSM

SCADA
- CSU Bluefin Embedded Gateway RTU
- EECL Bluefin Embedded Gateway RTU
- InterGrid SCADA
- DAS

Use Models:
- 2Mbps fixed IP address
- 5 kW Solar
- 100 kW Genset
- 175 kW Genset
- 350 kW Genset
- 20 kW Solar
- 200 kW Solar
- 500 kW Genset
- 100 kW Genset
- Fuel Cell
- Water Heater
- Waste Heat
- 230 kW Genset
- 80 kW Genset
- 60 kW Genset
- 200 kW Genset
- Van Dyne
- Swim Plant

Power Meters:
- Fountain
- 10 kW Solar
- 0 kW Genset
- DSM Group 1
- DSM Group 2
- New Belgium Bluefin Embedded Gateway RTU
- Modbus

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Project Management Structure

- DOE
  - Primary Project Coordinator
  - Chief Interface with DOC

- City of Fort Collins
  - Julie Sieving
  - Dennis Sumer

- Brendle Group
  - Julie Sieving
  - Steve Brunner

- Spirae
  - Nathan Howard
  - Jeff Harrell

- CSU
- Eaton
- InteGrid
- Spirae
- Woodward

- Larimer County
- City of Fort Collins
- CSU Facilities
- InteGrid
- New Belgium Brewery

- Project Management Team
  - Meets Weekly
  - Monitor all activities
  - Escalate issues as needed
  - Communication hub
  - Day to day facilitation
  - Keep Exec. Committee informed

- Steering Team
  - Meets As Needed
  - Make authorizations for their organizations
  - Provide guidance
  - Make aware of changes

- Technical Team
  - Meets As Needed

- R&D Projects

- Brendle Group provides quarterly reports and advises on Demand Side Management (DSM)
Project Management at Work

Barriers, Risk, Mitigation, and General Coping Skills

- Evolving asset mix
- Impacts from economic downturn
- Utility requirements and standards
- Strong project acceptance and support!
Achievements to Date

**Highlights**

- Distribution system in demonstration configuration
- Baseline feeder data collection implemented
- Communications and control architecture has been deployed
- Majority of all assets are in place and operational
- Control strategies have been defined and agreed to by partners
- Fort Collins RDSI story being shared with community and beyond
- January 3, 2011 - Project Kick-off with Governor Ritter
Technology Transfer

- Technology provided by Woodward and Eaton have enabled integration of existing back up generation resources at multiple partner sites.
- Research at EECL has enabled the inclusion of emerging technologies like PEVs and Fuel Cells as well as the evaluation of advanced control strategies.
- The core control solution provided by Spirae enables a diverse array of assets to be leveraged to achieve the project goals.
- The analysis and outreach provided by the Brendle group will enable the outcomes and lessons learned from the project to be clearly communicated.
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Questions and Answers

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