The Integrated Grid

Ken Geisler, VP Strategy
Siemens Smart Grid US/Canada
What We Can Bring to the Table:
As an Expert, Employer and Citizen

Global
- Operating in 190 countries
- $100 billion sales in fiscal 2013
- 362,000 employees
- $5.7 billion in R&D expenditures
- 29,800 R&D employees
- 290 manufacturing sites

U.S.
- Siemens USA is a separate entity
- Our largest country market
- $24.3 billion sales in fiscal 2013
- 53,000 employees
- $1.4 billion in R&D expenditures
- 6,300 R&D employees
- $50 million in job training
- 130 manufacturing sites
## Examples of Energy Progress in the US

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Iowa</strong></td>
<td>Helping Iowa reduce industrial CO2 emissions with a 1,050-megawatt (MW) wind turbine purchased by MidAmerican Energy Company. Largest onshore wind turbine project in the world.</td>
</tr>
<tr>
<td><strong>Massachusetts</strong></td>
<td>Supplying Cape Wind – the first offshore wind farm in the U.S. – with its industry-leading 3.6-megawatt (MW) offshore wind turbines, an offshore Electric Service Platform (ESP) and a service agreement for the first 15 years of commercial operations.</td>
</tr>
<tr>
<td><strong>Southern California</strong></td>
<td>Helping Pattern Energy implement the Ocotillo Wind power project in Southern California.</td>
</tr>
<tr>
<td><strong>Washington</strong></td>
<td>Installing 116 wind turbines at the 267-MW Tucannon River Wind Farm in the state of Washington, providing power for nearly 84,000 American households.</td>
</tr>
<tr>
<td><strong>Orlando</strong></td>
<td>Introducing our new World HQ and opening a new, state-of-the-art wind service training center in Orlando, Florida.</td>
</tr>
<tr>
<td><strong>Pennsylvania</strong></td>
<td>Levering Panda Power funds to delivery two power plant blocks for the 829-MW Liberty combined cycle power plant in Pennsylvania. In addition to supplying two power plant units fitted with H-class gas turbines for the Patriot combined cycle power plant in Clinton Township, Pennsylvania.</td>
</tr>
<tr>
<td><strong>Texas</strong></td>
<td>Helping Temple TX, implement a high-efficiency natural gas-fired combined-cycle power plant. Among the cleanest fossil-fueled plants in the U.S.</td>
</tr>
<tr>
<td><strong>Florida</strong></td>
<td>Supplying three H-class gas turbines to Florida Power &amp; Light Company to modernize the Grid and meet efficient generation objectives.</td>
</tr>
</tbody>
</table>
Evolution of the Energy Grid

1900
Thomas Edison develops the first electric systems

1950
Rural Electrification and continued Industrialization

1980
Grids are required to power the sprawling growth of suburbanization

2020
“Re-urbanization” of cities is changing the way we work and live and has the potential to expand awareness, education, and responsibility to energy use.
The State of the Utility Market

Key Challenges identified by sampling of 527 IOU/Muni/Coops

- Old Infrastructure: 48%
- Current Regulatory Model: 32%
- Aging Workforce: 31%
- Distributed Generation: 30%
- Flat Demand Growth: 28%
- Smart Grid Deployment: 23%
- Grid Reliability: 21%
- Coal Plant Retirements: 17%
- Renewable Portfolio Standards: 17%
- Energy Efficiency Mandates: 16%
- Emission Standards: 12%
- Cybersecurity: 11%

Decentralization of Grid Design and Generation

From centralized, unidirectional grid …

… to distributed energy and bidirectional energy balancing

Unidirectional Power Flow  Bidirectional Power Flow
## Grid Capabilities and Applied Technologies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>Active Grid, Visibility, Automate Outage Response, Streamline Operations</td>
<td>Distribution Management, Substation Automation, Feeder Automation, Voltage/VAR Management, AMI/Smart Metering, Social Media</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid Visibility</td>
<td>ANEC, VA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automation</td>
<td>Feeder Automation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Self-Healing” Grid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem Avoidance</td>
<td>Hawaiian Electric, HI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location Voltage Management</td>
<td>Substation Automation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Fleet” Management</td>
<td>“Self-Healing” Grid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ONCOR, TX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control Center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advanced Distribution Management</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sustainability and Resiliency Projects

- Grid Connected
- Energy Districts
- Integrated Renewable and Firm Generation
- Storage
- Demand Management
- Critical Infrastructure
- Support

ConEdison, NY
Distributed Resource Management

Parker Ranch, HI
Community Sustainability

Co-op City, NY
Community Micro-grid

Pantex, TX
Military Sustainability
What About Regulatory Policy?

Potential Approaches

- Reduce utility equipment depreciation schedule for selected devices (5yrs)
- Encourage adoption performance-based ratemaking policies
- Incent Investor Owned Utilities (IOU) to invest in Automation, Monitoring, Control and Analytics
- Incent state/city governments to identify and protect critical infrastructure in coordination with the regional utilities (CT, MA, NY, NJ)
- Congressman Donald Payne’s bill, H.R 2962 – The Smart Grid Study Act which calls for efforts to prepare, respond, mitigate and recover from natural disasters or cyber attacks. The bill will also provide for a cost/benefit of grid modernization.
- EPA’s Proposed Rule on GHG reductions could benefit Smart Grid technologies. EPA and State officials must have information on why DR and SG can fit into state compliance plans
Thank you!

Ken Geisler
Vice President, Strategy
Smart Grid Division
Infrastructure & Cities Sector
Siemens Industry, Inc

E-mail:
ken.geisler@siemens.com