New Frontiers of Smart Grid

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SDG&E Smart Meter Program

- $572 million capital project installing 1.4 million electric and 900,000 gas meters in service territory by Q2 2011
  - Two-way communication meters
  - Remote disconnect and Home Area Network capability
  - Opportunity for real-time pricing and in-home services

Initial Test Phase - 5k Meters to be Installed
Q2 2008

- 2008: Begin Mass Meter Installation - Q1 2009
- 2010: Complete Meter Installation - Q2 2011
- 2011

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# Smart Grid Deployment Plan

<table>
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<th>Vision</th>
<th>• Smart Market, Customer &amp; Utility. Meet environmental policies.</th>
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<td>Baseline</td>
<td>• Inventory of SG investments and assessment of privacy &amp; security.</td>
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<tr>
<td>Strategy</td>
<td>• Provide benefits to consumers and compliance with SB17.</td>
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<td>Security</td>
<td>• Describe Grid and Cyber Security strategy.</td>
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<td>Roadmap</td>
<td>• Timing of deployment of SG technologies.</td>
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<td>Cost</td>
<td>• Cost estimates for SG investments for next 5 years.</td>
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<td>Benefits</td>
<td>• Analysis: policy driven, environmental goals, economic, etc.</td>
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<td>Metrics</td>
<td>• Measure performance.</td>
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Source: CPUC
SDG&E’s plan development used a framework based on the NIST smart grid conceptual model, with 3 additional “cross-cutting” domains.
## The Changing Landscape

### 2008
- >6,000 customers with NEM (mostly PV), peak capacity ~24 MW
- 50MW wind interconnected
- ~1,000 MWh in RPS from biomass, conduit hydro, digester gas, landfill gas and wind
- Very small number of 1990s era and do-it-yourself electric vehicles in the service area

### 2014
- ~45,000+ customers with NEM (mostly PV), peak capacity ~300+ MW (end of year)
- ~275 MW wind, ~530 MW utility scale solar interconnected – 700MW add’l due online in 2014
- Over 5,000,000 MWh in RPS primarily from solar and wind
- ~10,000+ electric vehicles in the service area (end of year)
SDG&E’s Smart Grid Progress

2008

- Analog electric and gas meters manually read monthly and data shared via bill
- Outages known through phone calls from customers
- Limited automation through SCADA in substations (<1,000 endpoints)
- No high resolution sensing capabilities (PMUs)
- Limited, full energy sectionalizing / reclosing
- Limited GIS and traditional SCADA used for system management
- DOE Borrego Springs microgrid envisioned

2014

- 1.4M electric and 900K smart meters remotely read daily and data shared via green button
- Outages known through power off notifications from smart meters
- Significant expansion of automation (SCADA in substations and on circuits ~2,000 endpoints)
- PMUs installed on critical transmission lines; under development & testing for distribution
- Low energy pulse reclosing capabilities
- GIS and OMS/DMS system deployed
- Borrego Springs microgrid functional
What the Future Holds...

Renewables & EVs
• 33+% RPS exceeded, primarily solar and wind
• Up to 200,000+ EVs integrated with the grid
• Continued growth in distributed PV, >1,000MW behind the meter

Energy Storage
• 165+MW of energy storage connected at transmission, distribution, and customer

Expanded Distribution Automation
• Distribution PMUs as high resolution sensing source feeding a variety of distributed and centralized applications
• Microgrid controllers managing DER in a federated system
• Distributed Energy Resource Management System (DERMS) using weather and economic forecasting to optimize the system and improve reliability
• Smart Inverters providing volt/vAR support

Customer Choices
• TOU and other rate choices available to all customers
• Significant increase in customer capability to manage demand (up and down)
Demand, Net of Renewable Energy
Time-Variant Rate & Grid Integrated Charging

Implement an innovative day-ahead, time-variant pricing plan for workplace and multi-unit dwelling customers

• SDG&E-owned grid-integrated charging technology, allowing EV batteries to provide benefits of energy storage

• Hopefully, offering charging services that benefits all customers through grid optimization; will contract with third parties to provide service

Support Governor’s ZEV Action Plan for 1.5 million ZEVs by 2025
μGrid Network
Questions?

Thank You

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