A Smarter, Cleaner Energy Future

Program Overview

June 17, 2009

Ted M. Reguly
Director, Smart Meter
San Diego Gas & Electric
SDG&E Smart Meter Goals

• Install AMI/smart metering for all our San Diego County and Southern Orange County electric and gas business and residential customers by end of 2011
  • Historic opportunity – touching every customer premise -never been done before

• Enhance customer service and improve utility operations

• Provide foundation for SDG&E’s smart grid, smart premise, smart transportation

• Ensure delivery of net positive benefit case based on thorough business case development and execution

• Recognize this is not a typical utility infrastructure project
  • This is new program that touches virtually every department
  • Leading edge technology means we are some of the first

And most importantly, we’re not “just” installing a new meter…
We’re starting to recreate our relationship with customers and transforming our company
What is “smart metering”? 

• Advanced Metering Infrastructure (AMI) or smart metering: 
  • Replaces old-technology – analog, mechanical meters and manual meter reading. 
  • Installs 1.4 million cutting-edge meters using digital, solid-state (no moving parts) technology capable of remotely taking meter readings at any time.
More Than “Just” the Meter

• It’s also smart communicating metering
  • Allows for remote measuring of energy usage
  • Two-way communication between the customer and SDG&E
  • Ties in 900,000 gas meters – add device to existing gas meter

Note: Existing communications infrastructure to be utilized
History

• Compelling argument for “advanced metering infrastructure” (AMI) or smart metering in California
  • All California investor-owned utilities (IOU) ordered by the California Public Utilities Commission (CPUC) to prepare business cases
    • Following 2000-2001 energy crisis
    • Peak electricity demand issues
    • Provide all customers more “real-time” information
    • Save energy, save money, help the environment
  • SDG&E Investment required
    • $572 million (capital/O&M) 2007-2011
    • Meet California Energy Commission (CEC) 6 Policy Goals, State Energy Action Plan, SDG&E operational and customer requirements
  • Program approved by the CPUC in April 2007
    • Since then completed field tests, 2 RFPs, final infield evaluation of selected technology: Itron
Project Approach

• Vendor and technology neutral as possible
  • Vertical integration where it makes sense
• Open standards, standards-based architecture
• Interoperability, future-proofing
• Thorough RFP process
• Consistent focus on business improvement
• Recognize this is nascent technology
  • This is not business as usual
• Risk management
  • Phased release approach
  • Rigorous testing
  • Robust security architecture
  • Walk before running

• Focus on internal and external stakeholders
  • It’s all about the customer
SDG&E’s Business Case Overview

$572MM Capital/O&M approved April 2007

- Install 1.4 million smart/AMI electric meters for all customers
  - Solid-state electric meter technology with ZigBee chip
    - 2-way communications
    - 4 channels
  - Electric interval data reads
    - Residential hourly, C&I 15 mins.
  - Remote disconnect/connect integrated within 200 amp meter
    - Programmable load limiting switch
  - On demand reads, demand reset
- Adding module to existing 900,000 gas meters
  - Daily gas reads
SDG&E’s Business Case Overview cont.

- Next-day data for customers online/phone
- Home area network (HAN)
  - Local connectivity to remote devices, load control technology
  - Case includes 57K programmable communicating thermostats (PCTs) for Small/Medium C&I
- 55% Operational benefits, 45% Demand Response
- Support price responsive tariffs (TOU, CPP, PTR, etc.)
- Information systems, integration with legacy systems
- Firmware downloadable to the meter
- Remote device configuration/firmware & feature updates
- Tamper/theft
- Voltage
- Outage/restoration
- Security architecture

Vendor and technology neutral as possible
Meter Applications

- Consumption Reads – Delivered/Received kWh
- Interval Data Recording – 2 Channels of hourly data (Delivered & Received kWh)
- Time-of-Use Metering (On-site, calculated from IDR)
- Net Metering (On-site, calculated from IDR)
- Generator Output (PV) (Sub-metering)
- Hybrid Car Charging (Sub-metering)
Mesh Network

- Relies on deployment of smart devices that have the ability to relay communications from peer units.
- Elements interact so that a self- configuring and self-healing network forms; a collector or “take-out” point is used to link the communications to other elements.
- Network requires sufficient density to form the mesh; however, this also can be a drawback since congestion and routing need to be managed to ensure adequate throughput.
Smart Energy “Ecosystem”

Energy Flow

- Solar Power
- Smart Home
- Smart Office
- Fuel Cell
- Energy Storage
- Smart Grid and OpEx
- Enhanced Oil Recovery
- Gas Storage
- Biofuels
- CO2
- Energy Storage

Smart Meter

© 2008 San Diego Gas & Electric Company. All copyright and trademark rights reserved
Why is Smart Metering Important for the San Diego Region?

Smart metering will serve as the foundation for SDG&E’s future service model, with an emphasis on improved service and operational efficiency.

An intelligent, modernized smart grid creates a digital energy system to meet future needs.

Smart Grid = Modernization of the aging grid system to generate and distribute electricity most effectively, economically and securely for future needs.
Foundational To Smart Grid

Optimize use of technology to improve service to customers and operational efficiency

Advanced Grid Components

Sensing, Metering and Measurement

Integrated Communication

Advanced Control Methodologies

Decision Support

FUTURE

SMART GRID

TODAY

AMI/SMART METERING
SDG&E Smart Grid Approach

The Smart “Green” Grid is a **business transformation** that has **distinct key themes at different phase of development**.

**VISION**

- **Self-Healing**
- **Motivates & Includes the Customer**
- **Resist Attacks**
- **Provides Power Quality for 21st Century Needs**
- **Accommodates All Generation and Storage Options**
- **Enables Products, Services, & Markets**
- **Optimizes Assets and Operates Efficiently**

**Point of View**

- **Utility**
- **Customer**
- **Regulator**
- **3rd Party**

**Current and Future Projects & Initiatives**

**Seven Smart Grid characteristics as defined by DOE**

© 2008 San Diego Gas & Electric Company. All copyright and trademark rights reserved
How Does Smart Metering Benefit Customers?

1. Enhances reliability and outage detection, and speeds restoration

2. Gives customers more control over their everyday energy usage, opportunity for lower bills:
   - Better energy usage information
   - New incentive programs/allows for various rates

3. Improves customer service
   - Meter reads on demand
   - More flexible and customized services
   - Future smart homes and businesses

4. Reduced need to access property, more privacy

5. Helps the environment
Home Area Network (HAN) – Vision

- CA IOU’s AMI HAN Vision (June ’07)
  “Enable responsive, smart energy environments within the home that are gracefully integrated with people”

- Satisfy higher customer experience expectations

- Demand response enabler
  - Direct load control
  - In-Home notification of peak day events and price
  - Programmable communicating device/thermostat communication

- Energy conservation enabler
  - Enables energy information for customers
  - Near real time energy feedback

- Ubiquitous deployment provides market catalyst for enabling commercial energy innovations
HAN – The Future

Areas identified as necessary longer term priorities:

• OpenHAN certification process
  • Develop common testing criteria
  • Compliance with requirements

• Encourage new HAN devices
  • Distributed generation metering
  • Plug-in vehicle energy measuring
  • Appliance communication & optional control modules

• New program development
  • Work with DR, EE and conservation programs
  • Investigate integrating with Web-presentment
Home Area Network (HAN)

- **Emerging market in terms of capabilities – RFP now underway**
  - Demand Response (DR) and Load Control
  - Basic metering [measurements, historical information, etc]
  - Pricing [rate information, price tiers, TOU rate]
  - Text messages [short ~80 characters]
  - Security
  - Open standards and protocols that comply with nationally recognized non-proprietary standards, inter-operability (working with the other CA IOU’s)
  - Supports three types of communications: public price signalling, consumer specific signalling and control signalling
  - Supports solar/distributed generation, plug-in hybrid metering, gas and/or water meter communications, back office to Internet

- **Type of information/devices customers will eventually see**
  - Real-time usage data (unlike next day with online presentment)
  - Programmable communicating devices/thermostats (PCTs)
  - In Home Displays (IHDs)
  - Load Control Devices
  - Energy Management Systems, etc.
  - Sub-metering and prepayment systems
Data Presentment

• Basic usage presentment
  • Residential solution from Itron
  • Provided to customers with meter(s), validated data via My Account
  • Next day information
  • Includes carbon calculation
  • Looking at adding Tiers

• Third party presentment providers
  • Google, Positive Energy

• Customer co-design process to develop tools/offers
  • Employees and customers participating in testing/developments
Leveraging Smart Meter

- **Time dependent rates:**
  - Critical Peak Pricing (CPP) for business
  - “Peak Time Rebate” (PTR) for residential

- **Demand response programs:**
  - Enhanced incentives for automated controls (HAN is one control option)
  - Emerging Technology Projects – laboratory testing new in-home products
  - Residential Automated Controls Pilot – field testing new in-home products

- **Energy efficiency programs:**
  - “Customer Energy Network” – enable 3rd party service providers to display meter data, ie Google PowerMeter
  - Emerging Technology projects
    - Positive Energy customer feedback pilot
    - Field testing in-home displays and appliance monitoring technology
Leveraging Smart Meter cont.

• Energy Efficiency Programs cont.:  
  • Micro-Grid Pilot Proposal  
    • Objective:  
      • Test system operational issues associated with an “islanded” electric distribution system  
    • Approach:  
      • Identify a single substation as test site  
      • Maximize LIEE, EE, DR, PV and Smart Meters in test area  
      • Supplement with traditional distributed generation  
    • Expected Outcome:  
      • Incremental market impacts of highly targeted/visible programs  
      • Identification of parameters that impact market acceptance  
      • Quantification of the costs and benefits of a “near net zero” community  
      • Understand system requirements in a “near net zero” community
Geographic Installation Path

Installation strategy is meter route based, resulting in 3 key deployment areas:

1st Northern

2nd Metro

3rd Orange County
Schedule

- Spring/Summer 2009 – Mass installations underway in Escondido then rest of North County - Residential and small business customers to start

- Spring 2010 – North County installs wind-down, Central/East/South San Diego installs start

- Summer 2010 - Medium and large customers installs start

- End of 2010 – Orange County installations ramp-up

- End of 2011 – Mass installations complete
Total Mass Deployment Installs
Based on 2009 stretch plan of 400k installs

Total Monthly Electric and Gas Installations

Escondido only
Escondido Start

Approximate initial installation area
Spring/Summer 2009
First Step with Customers: Installation & Awareness

Key First Impression: Installation Opportunity

- Communicate Smart Meter basics, installation experience, energy use/savings/education, peak & notification
- Drive customers to online presentment/My Account & enabling technology to engage with energy consumption, start tier/rate education
- Promote programs, rates and enabling technologies through segment-specific communications
- Create advocates for conservation, EE, DR and other SDG&E energy objectives

Tactics to achieve customer performance targets over time

Before/During Installation: Q4 2009+
2010
2011+
Outreach & Communications

• Most of 2009 will be focused on North County
  • Escondido to start, then community by community approach

• “90-60-30” day ahead of install plans
  • Based on various inputs/research from Tierrasanta 5K, field tests
  • Monthly customer communications calls with SCE/PG&E
  • Baseline pre-surveying of customers, post-install data being collected
  • www.sdge.com/SmartMeter updated from online user research

• 60-90 days prior – schedule elected officials, chambers, city managers, EDCs, key community leader dialogues
  • Briefings ongoing
  • Bill insert and bill messages
  • Positive media coverage
  • Information at branch offices
Outreach & Communications cont.

- 60 days prior – schedule community involvement/events – partner with EE/Lighting
  - Town Council/Planning meetings, street fairs, volunteer activities, Rotaries/Kiwanis/service organizations/homeowners associations
  - Proactive contact with community publications
  - Pre-notify employees/retirees living in deployment area
  - Access Resolution team preceding deployment path

- 14-30 days prior – direct mail customer notification letters based on geographic progression
  - Overview letter, program fact sheet, special envelope
    - Provide added value special offer: Residential free therm kit; Small C&I brochure
  - All materials in English & Spanish
  - Install vendor: VSI will perform 95% of installs
    - Notification letter specifies to expect VSI
  - Unique business customer mailing
Installation Day Experience

• **Upon arrival at premise**
  • Installers knock on door/announce arrival
  • Informs customer visit purpose, what to expect
  • Installers carrying Smart Meter collateral for passers-by
  • VSI installers carry special ID

Gas upgrade:
approx 15-30 mins.;
No loss of service

Electric change out:
approx 5-15 mins.;
Brief loss of service
Installation Day Experience cont.

• Right after meter installed
  • Installer returns to customer to confirm service status
  • Leaves door hanger to confirm installation status, additional information
    • Door hanger will be specific to VSI or SDG&E
    • Indicates success, or need to return
    • “How to Read Your Meter” information attached
  • Representatives available for customer issues/question real-time in field, able to perform energy audits, program info
    • 3 PT Customer Programs retirees
    • 1 FTE dedicated to Business customers
  • Real-time dispatch coordination/triage via phone

• On-going pre-post installation customer surveying
  • Meter readers will continue to read meters for a period of time post-install
SCE, PG&E, SoCalGas

- SCE – 5.3M electric meters
  - Similar technology approach to SDG&E
  - Approved for $1.72B
  - Plan to complete installs in 2012
    [Link](http://www.sce.com/PowerandEnvironment/smartconnect/)

- PG&E – 5.1M electric meters; 4.2M gas modules
  - Original application approval July 2006 - $1.74B – wired solution
  - Changed technology approach – now wireless
  - Approved for additional $450M
  - Plan to complete installs in 2012
    [Link](http://pge.com/mybusiness/customerservice/meter/smartmeter/)

- SoCalGas – 6M gas meters
  - Just completed evidentiary hearings
  - Decision expected September 2009
• Information available on
  • [www.sdge.com/smartmeter](http://www.sdge.com/smartmeter)
**Meter Applications**

**Consumption Reads (kWh, kW)**
- Mechanical meter displays Net
- Solid State Meter configurable display
- Total Delivered kWh read
- Total Received kWh read

**Interval Data Recording (pulses or kWh)**
- Commercial 15 minute intervals
- Residential 1 hour intervals
- Optional (voltage)
**Meter Applications**

**Bi-directional Metering (kWh, kW)**
- Measures Delivered and Received
- Must record information on separate channels
- Must be used where different $ are assigned to delivered and received power

**Net Metering (kWh, kW)**
- Measures Delivered minus Received
- Records single quantity on 1 channel
- Can reflect negative consumption if generation is greater than usage
Generator/PV Metering – Customer load greater than Generation

- SDG&E Delivered Power
- Point of Service Meter
- Customer Load (Meter 1 + Meter 2)
- Generator Output Meter
- Customer Generator/PV
**Meter Applications**

**Generator/PV Metering – Customer load less than Generation**

- **SDG&E Received Power**
  - M1
  - Point of Service Meter (Bi-directional)

- **Customer Load**
  - (Meter 2 - Meter 1)

- **Generator Output**
  - M2

- **Customer Generator/PV**
Hybrid Car Metering – Measure Customer Charging Power

SDG&E Delivered Power → M1 → Customer Load(s)
Point of Service Meter
(Total Energy Consumption)

M2 → Additional Hybrid Car Meter
Customer Plug in Hybrid Car
# SDG&E Smart Grid Timeline

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Smart Meters installed; Deploy base technologies</strong></td>
<td><strong>Automated outage detection, restoration, and customer notification</strong></td>
<td><strong>Customer supply side &amp; storage decisions become the norm</strong></td>
</tr>
<tr>
<td>New Customer programs offered</td>
<td>Traditional utility relationship with customer is changing due to more mature new services for customers</td>
<td>PHEV adoption rises—utility becomes “gas station of the future”</td>
</tr>
<tr>
<td>Many Smart Grid components are initially deployed</td>
<td>Major regulatory issues are solved</td>
<td>Advanced grid technologies in place</td>
</tr>
</tbody>
</table>