PG&E SmartMeter

SmartMeter Program Overview

CEC Load Management Standards

AMI Workshop

May 27, 2008

The PG&E **SmartMeter** Program

- Automated meter reading for all customers
- 10 Million meter upgrades
- A network to collect meter reads remotely and communicate with the meters
- IT systems to manage and store the reads, and make them available to PG&E business applications (e.g. CC&B)
- Frequent meter reads - daily for gas, hourly or 15 minute interval for electric
- Enables demand response rates
- Enhanced capabilities over time

Current **SmartMeter** Program Benefits

Customer Benefits

- **Greater convenience** - no need to unlock gates or secure dogs for monthly meter reads
- **Reduction in delayed, inaccurate and estimated bills**
- **Voluntary pricing plan options** that empower customers to shift or reduce energy usage when demand is at its highest
- Online access to energy **usage information that enables customers to better understand their usage and manage their bills**
- **Improved outage detection**

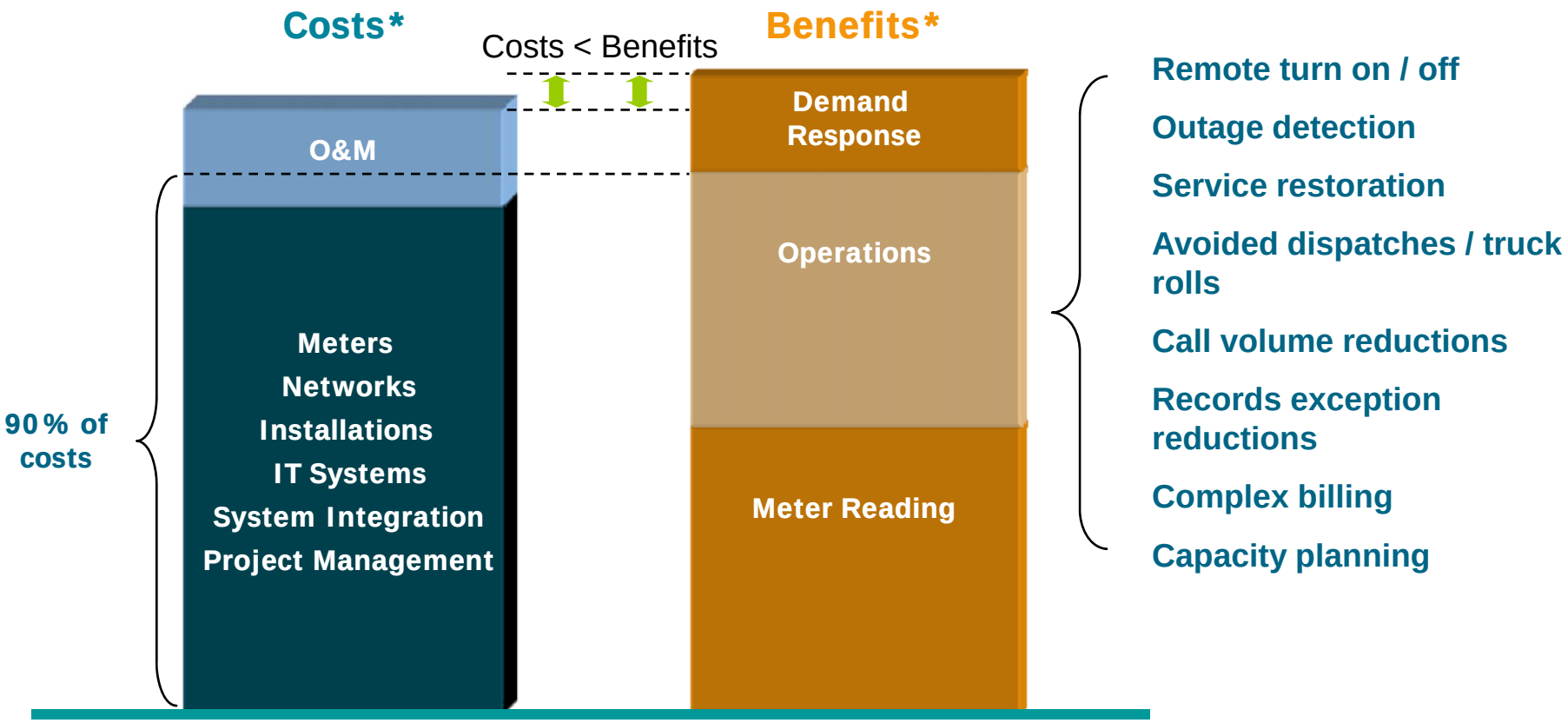
Operational Benefits (PG&E)

- **Reduced operating costs**
- **Lower power purchase costs** resulting from reduced peak loads
- **Improved billing efficiency**
- **Improved power outage restoration**

California Benefits

- **Enhanced grid reliability**
- **Avoided rotating outages**
- **Less reliance on older, less-efficient power plants to meet peak demand**

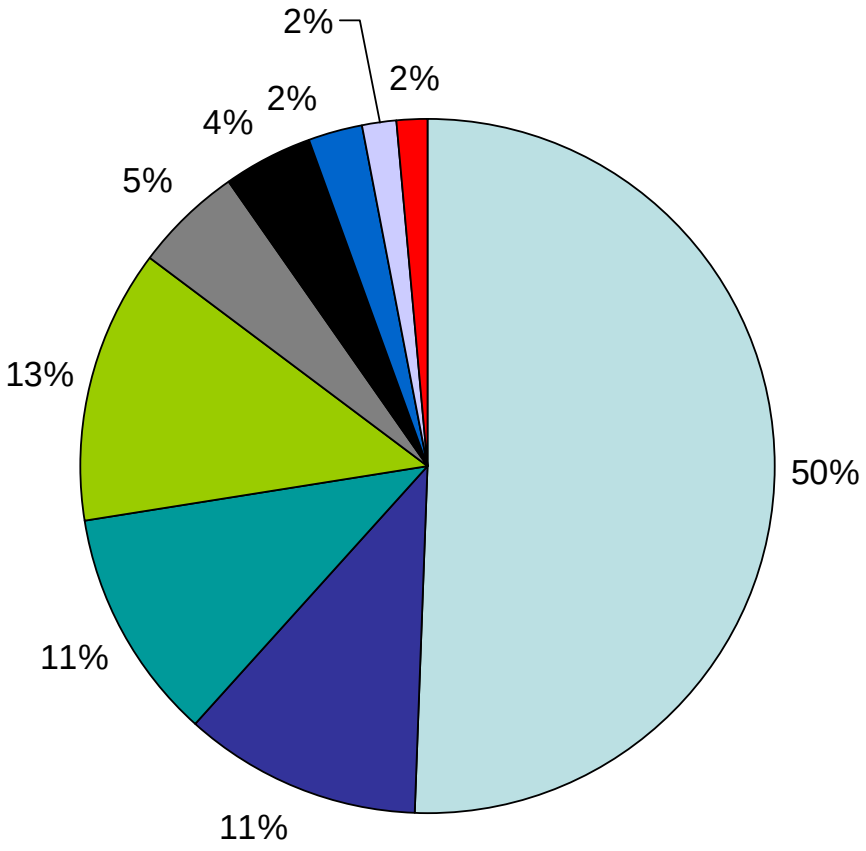
SmartMeter Program Will Pay For Itself



- The **SmartMeter** program has a **positive business case**: Projected benefits exceed projected costs over a 20 year program life
- **Operational efficiencies** (including meter reading savings) cover most program costs
- **Demand response benefits** (i.e. procurement cost savings) cover the remaining increment of program costs and promise to provide additional benefits in excess of costs

*** 20 year Present Value of Revenue Requirement**

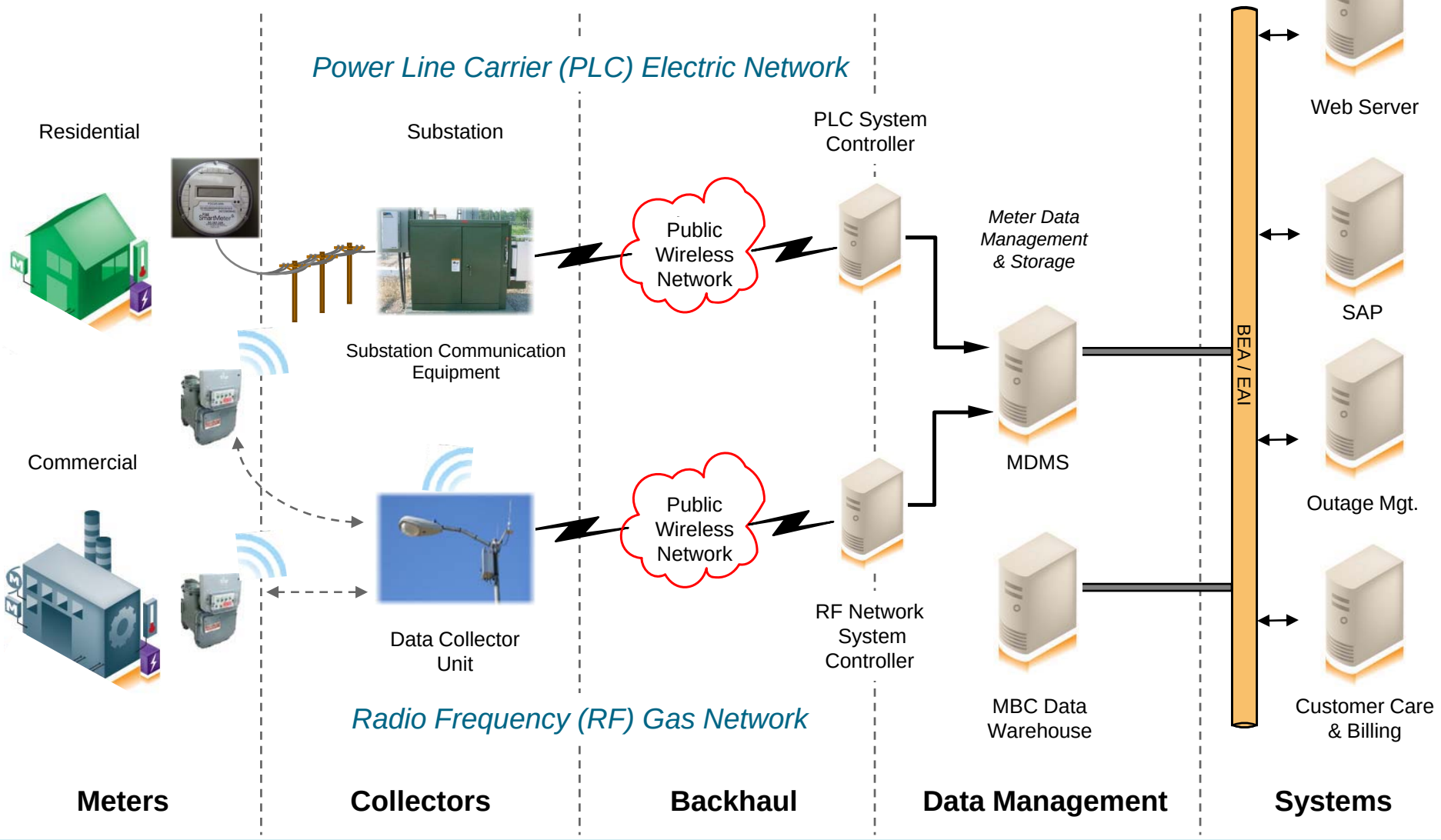
Annual SmartMeter Benefits from Operations
(at full deployment)



- Meter Reading Savings - $86.2M
- Other Employee-Related Costs - $18.9M
- Billing Benefits - $18.6M
- Remote Turn-on & Shut-off - $21.6M*
- Metering Operations - $8.6M
- Outage Restoration - $7.2M
- Avoid Dispatch (Power is On) - $4.2M
- Reduction in Call Volumes - $2.7M
- Other (gas and electric T&D capacity planning, EON retirement) - $2.6M

Total annual benefit from operations = $170.6 Million (*Upgrade includes additional benefits)

First Generation **SmartMeter** Technology



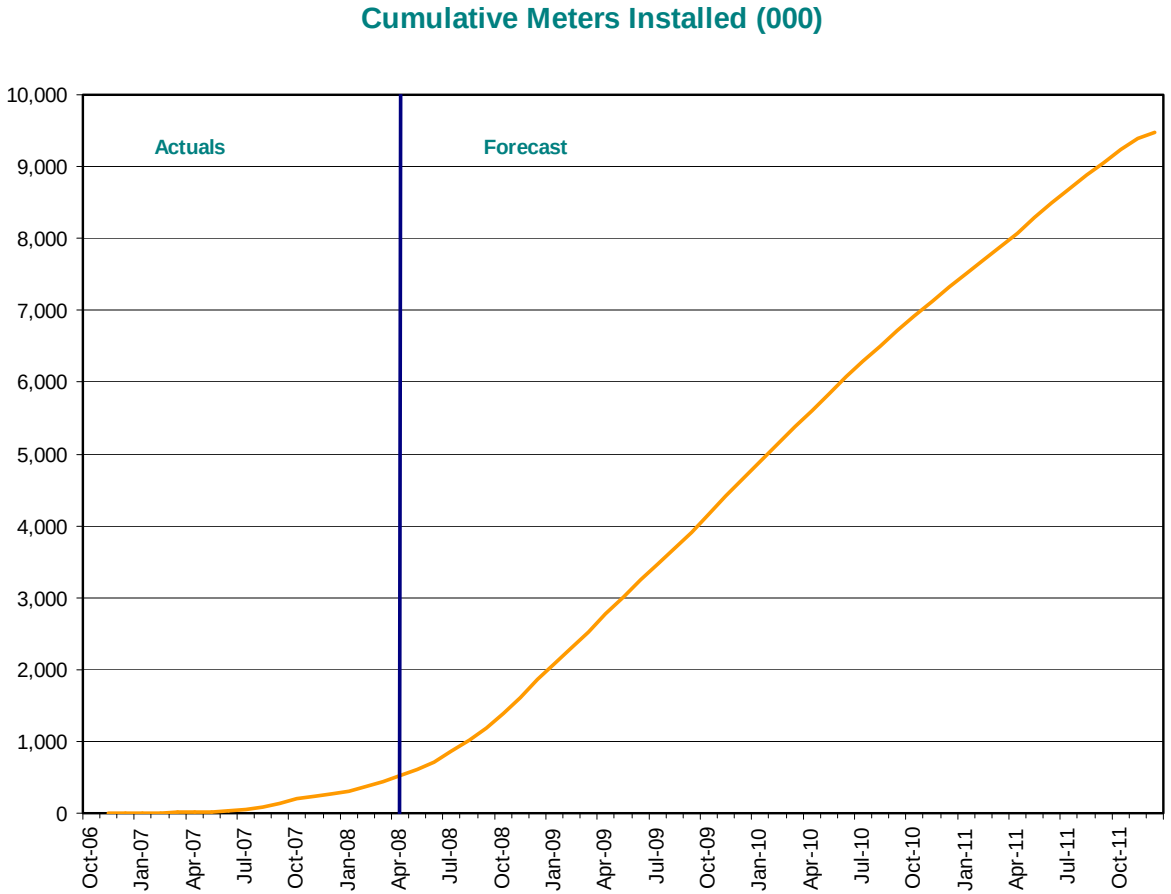
Projected Deployment Plan*

Key deployment decisions

- Internal installers or external contractor
- Benefits realization approach: incremental vs. batched
- Geographic sequencing approach

Key lessons learned

- Technology shapes deployment
- Planning lead time
- Network attachment rights
- Meter access and configuration challenges



* Vendor Deployment Plan: Excludes growth in customer base through 2011 of roughly 1M

Advances In Automated Metering Technologies

- Advanced Meters
  - Solid-state
  - Integrated remote connect / disconnect switch
- Advanced Energy Communication Networks
  - Higher bandwidth
  - Open architecture
  - Mesh technology
- Home Area Networks (HAN)
  - Emerging standards

"We expect PG&E to monitor market place developments so, whenever feasible, it can upgrade its AMI system and offer its customers technology upgrades."

- CPUC, July 2006

Customer Home Area Network (HAN)

HVAC, IP-enabled appliances and distributed generation will all be tied together through an integrated energy management system (EMS)

SmartMeter to Smart Grid Vision

PG&E SmartMeter

Road map of potential services

Cumulative Benefits

Phase 1 – today
Integrate existing services to new platform

Customer products and services
- Interval rates
- Net metering

Utility operations benefits
- Meter reading
- Limited disconnect
- Basic load control
- Limited SCADA
- Basic outage management

Phase 2 – near term
Transform existing services using advanced communications capability

Customer products and services
- Prepay billing options
- In-home displays
- Demand response programs
- Basic energy management system

Utility operations benefits
- Remote connect/disconnect
- Distribution automation
- Advanced outage management
- Confirmed load control
- Load limiting
- Distributed storage and generation
- Solar generation output
- Plug-In hybrid vehicle SmartCharging

Phase 3 – future
Enable future services and foster innovation

Customer products and services
- Automated energy management
- Real-time pricing
- Energy trading

Utility operations benefits
- Micro-grids
- Fault prediction
- Smart Grid
- Distributed battery
- Vehicle to Grid
- Other distributed generation (e.g., fuel cell technology)

SmartMeter network seamlessly exchanges information between utility assets

Time

Potential Future SmartMeter Program Benefits

Customers

- ❑ Real time energy usage data to premise from meter
- ❑ Building automation
- ❑ Home energy/bill management tools and systems
- ❑ Smart thermostat (programmable communicating thermostat – PCT)
- ❑ Appliance control and monitoring
- ❑ In-home displays

PG&E

- ❑ Direct load control (air conditioner, water heater, pool pump, etc.)
- ❑ Critical Peak Pricing (CPP) and other demand response programs and rates
- ❑ Targeted regional/area Time of Use (TOU) programs
- ❑ Smart thermostat control (programmable communicating thermostat – PCT)
- ❑ Distribution planning
- ❑ Distribution voltage management
- ❑ Gas system planning
- ❑ Pre-pay metering
- ❑ Distribution fault detectors
- ❑ Capacitor bank controls
- ❑ Transformer load monitoring
- ❑ Meter health monitoring
- ❑ Preventive line maintenance data (momentary)
- ❑ Identification of facility performance or customer usage anomalies
- ❑ System load forecasting and settlement
- ❑ Enhanced outage data management
- ❑ Energy load research program flexibility
- ❑ Gas distribution maintenance (e.g. cathodic protection monitoring)

CPUC/State

- ❑ Energy resource planning
- ❑ Data for ISO system control
- ❑ Load control programs
- ❑ Demand response programs

SmartMeter Program Highlights

- Largest planned implementation of AMI technology in the U.S. to date – 10.3 million meters
  - $1.7 B in funding (CPUC, July 2006); additional funding request pending before the CPUC
  - 5 year deployment: 2006 – 2011
- The program will pay for itself through operational savings, demand response, and energy efficiency
  - Among the first critical peak pricing programs for residential customers in the nation
- The **SmartMeter** project continues to take advantage of evolving technologies
  - We are moving toward our vision of the Smart Electric Grid
- Technologies deployed through the **SmartMeter** program establish a platform for future innovations that will benefit our customers, our operations, and the State of California