



Update on Advanced Metering for California's Large Utilities

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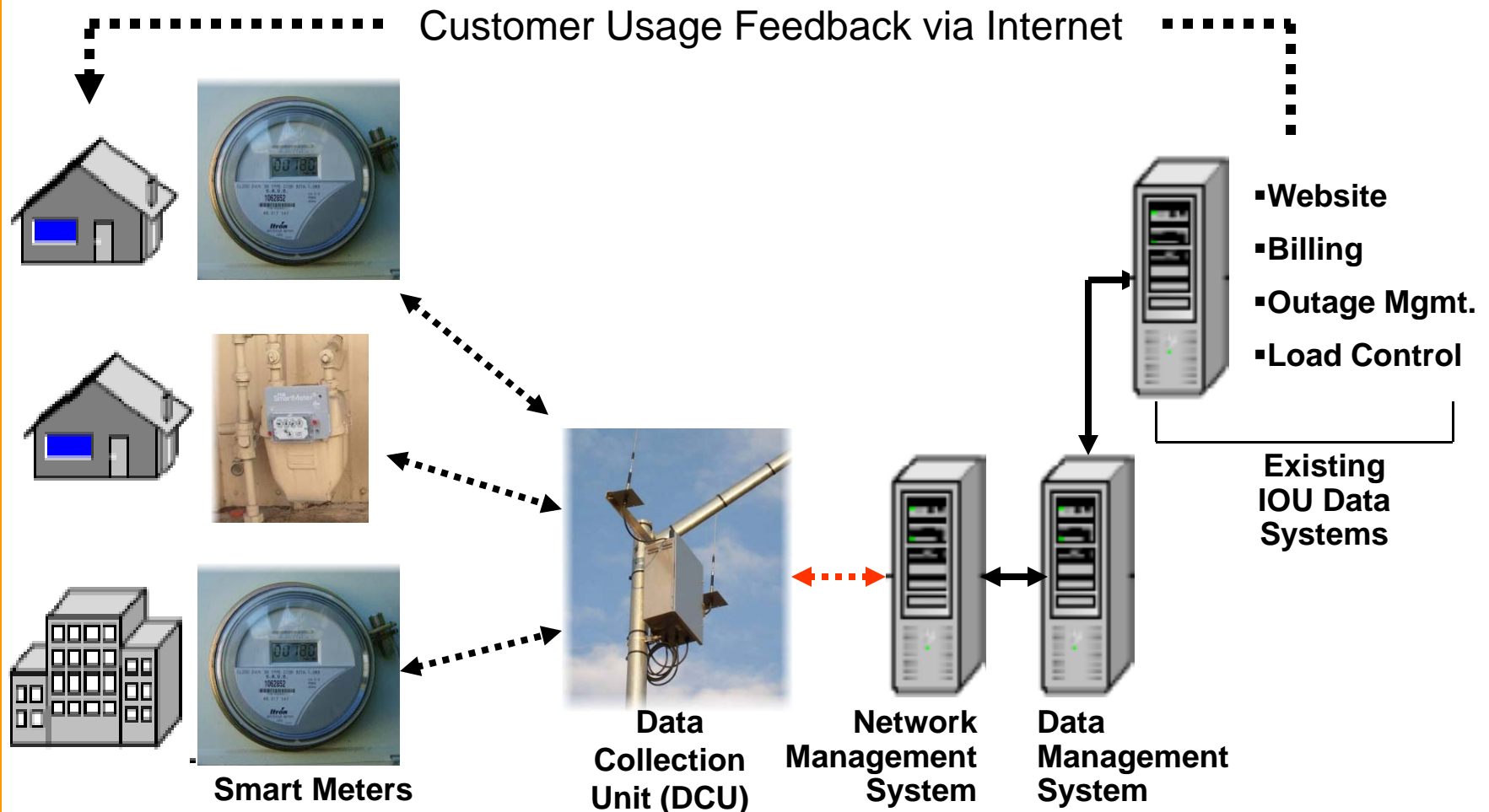
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Today's Topics

- **AMI System Hardware Overview**
- **CPUC Minimum Requirements**
- **Potential Benefits**
- **Status of California AMI Systems**
- **Comparison of IOU AMI Programs**

AMI provides a “Smart Meter” and two-way communication system with the utility



At a minimum, AMI systems must cost-effectively:

Enable dynamic pricing and feedback

1. **Allow implementation of prescribed price responsive tariffs (CPP, TOU, hourly RTP)** by measuring, storing, and transmitting interval (e.g. hourly) usage data to the IOU
2. Provide **customers access** to their interval usage data
3. Support customer understanding of their hourly usage patterns and how they relate to energy costs

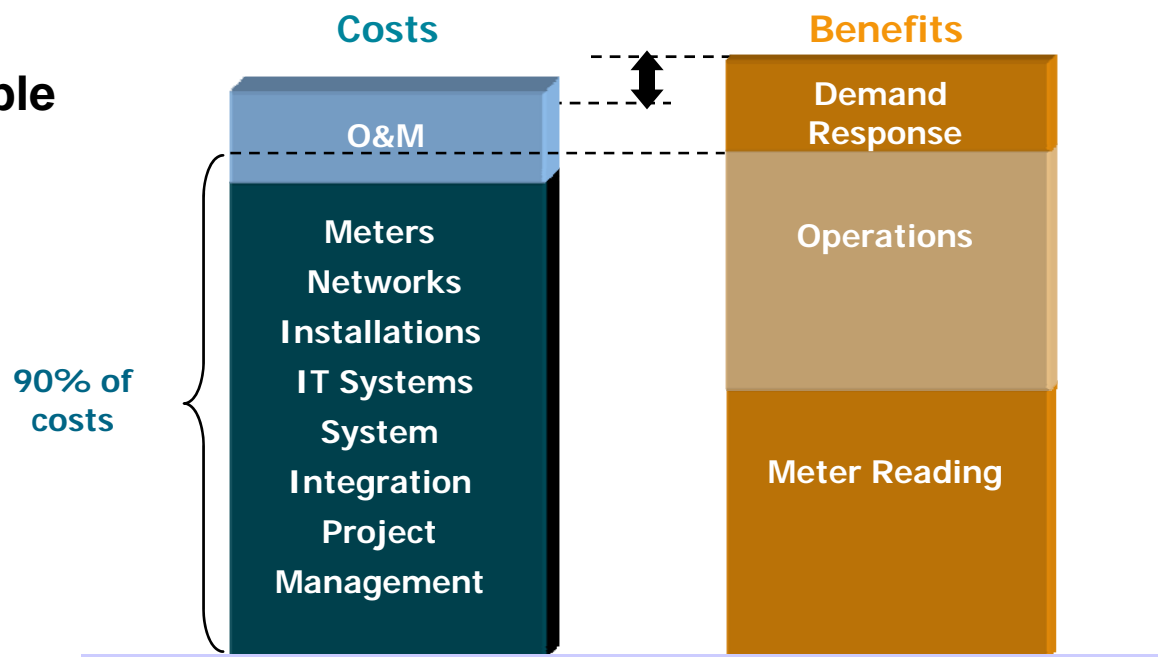
Increase system efficiency

4. Enhance system operating efficiency (remote meter reading, outage management, improved forecasting, theft reduction)
5. Interface with Direct Load Control (DLC) communication technology
6. Support IOU billing, customer support, and outage management applications

Feb. 19, 2004 ACR in R.02-06-001

Potential Benefits of AMI

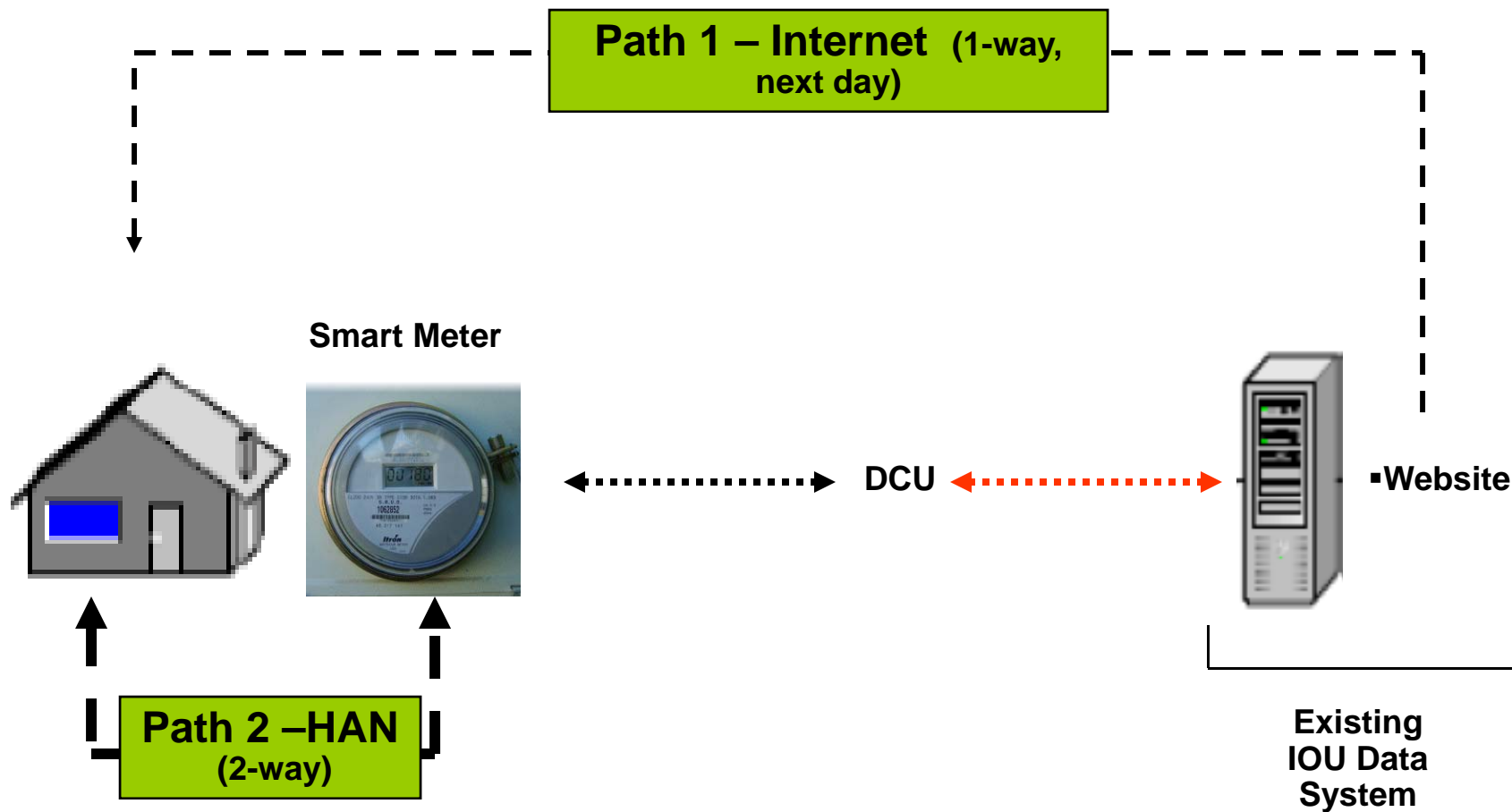
PG&E Example



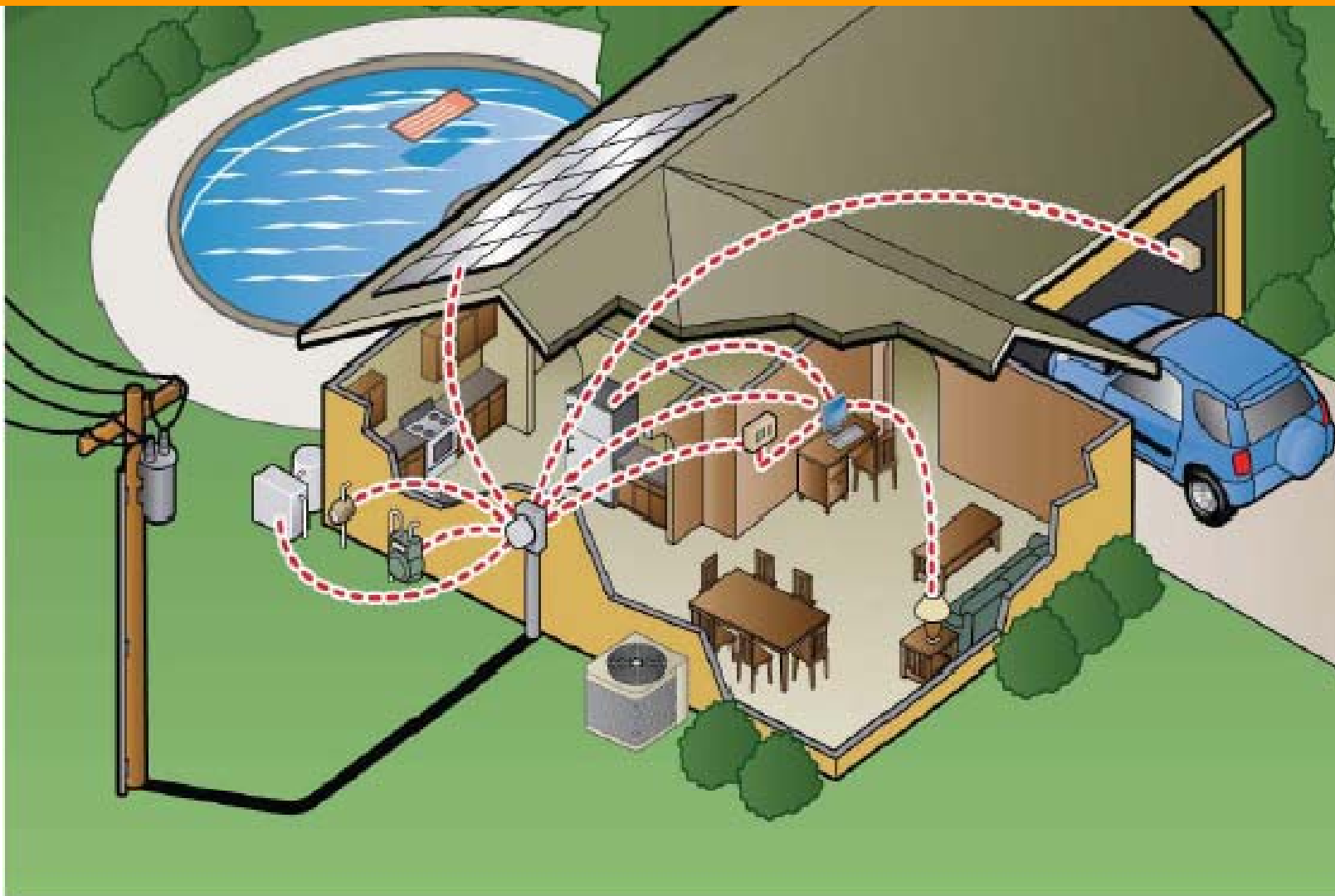
- Reduce utility operational costs
- Improve service and grid reliability
- Enable dynamic pricing statewide
- Enable new products and programs to conserve energy and reduce GHG emissions

Graphic provided by PG&E

Two Methods of Providing Customer Feedback



Optional Features – Home Area Network (HAN)



Graphic provided by SCE

Status of Advanced Metering in California

- **PG&E**
 - Original application approved July 2006
 - Over 500,000 electric and gas meters installed
 - DCSI PLC electric meters installed to date
 - Upgrade application filed December 2007
- **SDG&E**
 - Application approved April 2007
 - Final vendor selection this month
 - 5,000 meter pilot starting in July 2008
 - Full-scale deployment to begin 2Q 2009
- **SCE**
 - Application filed July 2007
 - Itron selected as meter vendor
 - Settlement between DRA and SCE, not with TURN
 - **SoCalGas** -Party in SCE's AMI application

California Large AMI System Comparison

	PG&E	SDG&E	SCE
Scale	5.1 million electric meters 4.2 million gas meter modules	1.4 million electric meters 900,000 gas meter modules	5.3 million electric meters SoCalGas MAY connect to this system
Total Costs	\$1.74 billion approved \$623 million requested for upgrade	\$581 million approved	\$1.72 billion requested
Deployment timeline	2007- 2012	2008- 2011	2009- 2012

California Large AMI System Comparison - Electric

AMI Features	PG&E		SDG&E	SCE
	Approved	Upgrade	Approved	Pending
Meter Type	Module retrofits and new solid-state	New solid-state meter	New solid-state meter	New solid-state meter
Communications network	PLC for its electric: RF for gas	Radio frequency (RF) expected	RF (mesh technology) expected	RF (mesh technology)
Customer information feedback	Next-day internet access	Next-day internet access + HAN	Next-day internet access + HAN	Next-day internet access + HAN
Hourly data for residential	Yes	Yes	Yes	Yes
15-minute data for Small C&I	Yes	Yes	Yes	Yes
Net-metering capable	Yes	Yes	Yes	Yes
Voltage measurement	Yes	Yes	Yes	Yes
Two-way communication	Yes	Yes	Yes	Yes
Outage detection	Yes	Yes	Yes	Yes
Theft/tamper detection	Yes	Yes	Yes	Yes
Remote connect/discon't	Limited	Yes	Yes	Yes
Remote upgradability	No	Yes	Yes	Yes
Home Area Network (HAN) Gateway	No	Yes	Yes	Yes

AMI and Smart Grid

- ☐ **AMI systems will likely be a building block of a Smart Grid**
- ☐ **AMI functional requirements are defined - Smart Grid requirements have not been defined and will evolve**
- ☐ **AMI's basic functions need not change over time, and modern AMI hardware can be remotely upgraded to add functionality**
- ☐ **The form and function of the Smart Grid will evolve to integrate new distributed generation, electricity storage, and other technologies we have not yet developed**