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Government Program Briefing: Smart Metering

Elizabeth Doris and Kim Peterson

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Purpose

This document is adapted and updated from a memo delivered to the City Council of New Orleans, the office of the Mayor of New Orleans, the Chairperson of the Citizen Stakeholders Group (New Orleans Energy Task Force) and the U.S. Department of Energy (DOE) Project Officer in March 2008. This briefing piece provides an overview of the benefits, costs, and challenges of smart metering.

This report is one in a subset of documents created to assist the city of New Orleans rebuild in a more energy-efficient way through policy and program development. The broader project included a wide variety of technical assistance in addition to the policy and program assistance, which was implemented by the National Renewable Energy Laboratory on behalf of DOE from 2006 to 2008. For more information, see the DOE website at: www.eere.energy.gov/deployment/new_orleans.html.

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What is Smart Metering?

Smart meters (also known as advanced meters) are a physical technology that is added to or replaces a typical gas, electric, or water meter (fitting in the same footprint). This case study focuses solely on electric smart meters. Most smart meters are computerized and allow for remote data collection through periodic (e.g. 15-minute, hourly, daily) communication to the utility on energy use. In this way, utilities can gather information on energy use. Smart meters also have the ability to provide output to customers on real-time energy use to allow for behavioral modifications. Grids with smart meters or "smart grids" attempt to predict demand and react to rapid changes in demand and supply to deliver efficient, reliable, and sustainable electric power.[1] Smart meters are part of a smart grid but the meters themselves do not comprise the entire smart grid solution, but rather a part of the physical backbone of the system.

Smart Meter Benefits

Utilities and consumers can both benefit from smart meters. Smart meters also benefit the environment and the economy by allowing for integration of more renewable energy resources into the grid and creating new markets for goods and services to support smart metering efforts.[2] Several utilities implementing smart metering programs list a range of benefits in their literature. The primary benefits are summarized here.

For the Customer

- **Fewer Power Interruptions.** Data collection and minor repairs can be done remotely, without scheduled maintenance.
- **Faster Power Restoration.** Problems can be identified and solved remotely.
- **More Accurate Billing.** Because an accurate measurement can be taken remotely, estimates and monthly meter reading are unnecessary. Customers know their exact monthly energy use. In some programs, customers can get instant or daily readouts, which allows them to change energy consumption patterns.
- **Rate Flexibility.** Utilities can offer customers more rate schedule choices that fit their consumption patterns, allowing customers to better manage their consumption.
- **Financial Savings.** By knowing when their electricity costs more, consumers can shift their demand to non-peak times. The benefits to the consumer of energy reductions associated with knowing patterns of energy use (10% to30% according to San Diego Gas and Electric (SDG&E)) as well as utility reduced maintenance costs and enhanced load management are generally used to justify programs.
- **Targeted Financial Assistance.** Some smart meter programs can notify low-income consumers of energy assistance programs when their energy consumption increases.

[1] This paper is limited to discussion of smart meters. For more information on smart grid-related concepts, see http://en.openei.org/wiki/Gateway:Smart_Grid.
[2] http://www.ccst.us/publications/2011/2011smartA.pdf.

- **Access to New and Cleaner Energy Technologies.** Smart meters will facilitate the integration of electric vehicles and smart appliances with the grid. Smart meters that are part of a smart grid allow utilities to better accommodate intermittent energy sources such as wind and solar.
- **Increased Privacy.** Since meters can be read remotely, there is no utility representative entering the premises.

For the Utility

- **Demand Control.** The utility will be able to monitor energy use and reduce peak demand. Load reductions allow utilities to avoid costs for building new power plants or relying on older, less efficient plants.
- **Reduced Operating Costs.** Computerized data collection systems reduce meter reading, disconnection, and maintenance costs.
- **Real-time Notification of Power Outages.** Smart meters allow remote problem solving, reducing the time needed to restore power or fix a customer problem.
- **Education.** Smart meters provide an opportunity for utilities to educate consumers about energy.

Economic Benefits

- **Job Retention/Creation**. The deployment of smart meters creates jobs in manufacturing, installation, and maintenance of the meters and related infrastructure; communications hardware and software services; information technology; and business analysis.

Environmental Benefits

- **Better Air Quality**. If utilities can shave peak load, they can avoid using less efficient, more polluting power plants that are often used to generate peak demand power requirements.
- **Reduced Fuel Consumption.** Since smart meters are read remotely, utilities do not have to send vehicles out for meter reads, which reduces emissions from driving.

Challenges of Implementing Smart Meters

Utilities may experience challenges in smart meter implementation. Potential concerns include:

- **Exposure to Radio Waves.** A number of communities have enacted smart meter bans or moratoriums citing ratepayer concerns over exposure to radio waves. A 2011 study conducted as a result found that the radio wave exposure from constantly running smart meters was less than 5 times that of running microwave ovens.[3]
- **Higher Utility Costs**. In some cases customers complained about higher bills after smart meters were installed and have questioned whether the meters accurately measure their energy consumption. In response, both the California

[3] http://www.ccst.us/publications/2011/2011smartA.pdf.

and Texas Public Utilities Commissions ordered independent smart meter testing. In Maine, customers are allowed to opt out of smart metering if they pay the associated costs of keeping their old meters that must be read manually. Opt-outs create challenges for utilities, such as having to provide non-standard service and adverse system performance for load management and outages, which can downgrade system reliability. As of February 2011, Central Maine Power is seeing an opt-out rate of 1.5% of their customers.[4]

- **Increased Utility Expenses.** Since smart meters alone do not comprise a smart grid, utilities must still make investments in hardware and software, often revamping their billing systems, to fully realize the benefits of smart meters.
- **Privacy.** Ensuring privacy and security of customer information gathered by smart meters is another potential challenge for utilities. California became the first state to adopt rules to protect customer data.[5]

Smart Meter Costs

The cost of smart meters ranges from $100 to $250 per meter, and can approach $500 when smart grid costs are amortized over the meters. California utilities have been able to purchase meters in bulk for their entire service territories at approximately $50 to $75 per meter. Utilities typically pass these costs on to ratepayers. However, smart meters may be less costly than traditional "time of use" meters.[6]

Examples of Smart Meter Programs

The deployment of smart meters is increasing rapidly worldwide. Thirty-eight U.S. states are currently pursuing smart meter deployment and 60 million meters are expected to be in place by 2019.[7] The remainder of this briefing describes a selection of these programs, ranging from large investor-owned utilities to municipal utilities, and how they work. In most cases, the utility provides and installs the smart meters, thereby making the initial investment for the program, and rolls the programmatic costs into the ratepayer rates.

Florida Power and Light

Florida Power and Light, a multi-state utility, is deploying 4.5 million smart meters to its residential and small business customers. Approximately 1.5 million have already been installed[8]. The deployment will cost $800 million with $200 million coming from a federal stimulus grant. The remaining costs will be built into consumer rates[9]. The smart meter rollout could provide 1,000 new jobs.[10]

[4] http://www.emeter.com/smart-grid-watch/2011/what-does-it-cost-to-opt-out-of-a-smart-meter/.
[5] http://gcn.com/articles/2011/08/19/california-adopts-rules-on-smart-meters.aspx.
[6] http://en.wikipedia.org/wiki/Smart_meter.
[7] http://www.sdge.com/documents/smartmeter/PUCTFinalReport7-30.pdf.
[8] http://www.palmbeachpost.com/money/fpl-getting-smart-on-energy-use-1266055.html.
[9] http://www.palmbeachpost.com/money/fpl-getting-smart-on-energy-use-1266055.html.
[10] http://gigaom.com/cleantech/smart-grid-miami-fpl-ge-cisco-silver-spring-rolling-out-1m-smart-meters/.

State of California (San Diego Gas and Electric,[11] Pacific Gas and Electric,[12] and Southern California Edison)

The state of California has asked all utilities to change to smart electric and gas meters as part of its energy action plan. However, some municipalities have banned smart meters so the California Public Utilities Commission (PUC) has ordered utilities to devise opt-out plans.[13]

SDG&E is replacing its 1.4 million meters with smart meters with scheduled completion at the end of 2011. The pilot program showed that SDG&E customers used 14% less energy when they had information from the smart meters.[14] The meters are purchased in bulk by the utility (estimated costs $50 to $75) and installed free of charge to the customer. The programmatic costs, including the meter, are rolled into the ratepayer base fees. SDG&E literature indicates that up-front capital expense is $500 million with overall savings to customers of $60 to $65 million over the 32-year lifetime of each meter. SDG&E customers with smart meters can participate in a peak time rebate program.

Pacific Gas and Electric (PG&E) has deployed over 4 million smart meters since 2006.[15] The meters cost approximately $220 each including installation.[16] As of September 2011, PG&E had replaced 78% of its electric meters with smart meters.[17] PG&E also offers time-based rates to customers with smart meters.

Southern California Edison will install nearly 5 million smart meters to all residential and small business customers by the end of 2012. The total program cost is $1.6 billion with customer rates increasing 1.6% to recoup costs and is incorporated into overall rates rather than being shown as a separate service charge on customer bills. [18] Smart meter customers will also be able to participate in time-based rates.

State of Texas (CenterPoint Energy, Oncor, and AEP Texas)

Texas legislators passed a bill in 2005 encouraging smart metering by utilities, and in 2007 passed another bill encouraging the rapid deployment of smart meters.[19] To mitigate potential customer complaints, the utilities are funding public education and subsidizing the cost of in-home energy displays so that low-income customers have real-time price data. Texas does not currently have an opt-out program for customers who do not want smart meters.

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[11] http://www.sdge.com/smartmeter.
[12] http://www.pge.com/myhome/customerservice/meter/smartmeter/.
[13] http://smartgridcc.org/metering-challenges/regulator-orders-smart-meter-opt-out-policy.
[14] http://www.sdge.com/smartmeter/buildingfortomorrow.shtml.
[15] http://www.pgecurrents.com/2011/02/09/pge-plans-smartmeter-roll-out-in-san-francisco/?gclid=CI2vjber-qoCFQGFQAodMz9_GA.
[16] http://www.nytimes.com/2009/12/14/us/14meters.html.
[17] http://www.pge.com/myhome/customerservice/smartmeter/programdata/.
[18] http://www.sce.com/customerservice/smartconnect/common-questions.htm.
[19] http://www.sdge.com/documents/smartmeter/PUCTFinalReport7-30.pdf.

CenterPoint has installed 450,000 smart meters with plans to install a total of 2 million meters by mid 2012.[20] The utility recovers the cost through a monthly $3.05 service charge. The company's website states that its smart grid projects have created 553 jobs as of March 31, 2011.[21]

OnCor has already deployed smart meters to over 1 million residential and commercial customers and is expected to install 3.4 million smart meters by the end of 2012. The utility recovers the cost through a monthly $2.19 service charge per residential account. [22]

AEP Texas began its smart meter deployment in 2009 and plans to convert all of its 1.1 million customers to the technology by 2013. The current monthly service charge to recoup its costs is $2.89.[23]

Austin Energy (Austin, Texas)[24]

Austin Energy, a community-owned utility, has 360,000 customers and completed its smart meter deployment in 2008 with 100% coverage in its service territory. The utility is now working on further developing the smart grid. The primary reason for the advanced metering is to promote energy efficiency through direct load control, smart thermostats, and integrated customer demand response systems. No costs for the smart meters will be passed on to the ratepayers.[25]

Salt River Project (Phoenix, Arizona)[26]

The Salt River Project has deployed over 700,000 smart meters as of August 2011. It plans to deploy 1 million smart meters in total to all its residential and commercial customers by 2013 and will install 14,000 smart meters per month until completion. The utility is using $56.9 million in federal stimulus funds to supplement the project. Customers can enroll in a time-based pricing plan, resulting in savings from reduced usage during peak hours. The utility estimates that smart meters will save more than 249,000 labor hours, 1.3 million miles driven, and 135,000 gallons of fuel.[27]

Boulder, Colorado (with Xcel Energy)

Boulder's SmartGridCity is a partnership with the investor-owned utility that serves the community to explore smart grid tools in a real world setting. Xcel Energy has installed 23,000 smart meters as part of the project.[28] The costs for the project are borne by all Xcel Energy ratepayers in Colorado. Escalating costs have led the Colorado PUC to further regulate the smart grid project.[29]

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[20] http://www.sdge.com/documents/smartmeter/PUCTFinalReport7-30.pdf.
[21] http://www.centerpointenergy.com/services/electricity/residential/smartmeters/economicbenefits/.
[22] http://www.sdge.com/documents/smartmeter/PUCTFinalReport7-30.pdf.
[23] http://www.sdge.com/documents/smartmeter/PUCTFinalReport7-30.pdf.
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