U.S. DEPARTMENT OF

ENERGY

Electricity Delivery
& Energy Reliability

American Recovery and
Reinvestment Act of 2009

Customer Participation in the Smart Grid – Lessons Learned

Smart Grid Investment
Grant Program

September 2014

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RECOVERY ACT SMART GRID PROGRAMS

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Executive Summary

Unlike other smart grid investments, customer-facing technologies and programs—such as in-home displays, programmable communicating thermostats, and web portals—require effective communications and new interactions between utilities and customers to maximize the value of new capabilities. Effective outreach, education, marketing, and messaging are key ingredients for success.

> *Under the American Recovery and Reinvestment Act of 2009 (Recovery Act), the U.S. Department of Energy (DOE) and the electricity industry have jointly invested over $7.9 billion in 99 cost-shared Smart Grid Investment Grant projects to modernize the electric grid, strengthen cybersecurity, improve interoperability, and collect an unprecedented level of data on smart grid and customer operations.*

Utilities have typically interacted with customers on a limited basis—usually to start or stop service, troubleshoot service issues, or process monthly bills. With the deployment of smart grid technologies, customers can interact with the utility in a variety of new ways to better manage their electricity use.

There are 65 Smart Grid Investment Grant (SGIG) projects deploying smart meters and customer-based systems that provide unprecedented opportunities for utilities and customers alike to make smarter energy choices through access to near-real-time electricity use data.

Educating customers about their smart meter and in-home technology is only part of the challenge. Many utilities are also implementing new time-based rate, load management, and other customer-facing programs that help customers to learn their patterns of use, understand how programs will affect their rates, and make informed decisions about energy use and participation. These technologies and programs are only effective when customers fully understand the costs, benefits, and value proposition, and decide to play a larger role in managing their electricity consumption and costs.

Customer communicators in electric utilities who are piloting these programs have reported hands-on experience and lessons learned from implementing a variety of strategies, with varying degrees of success. This report features lessons learned from four SGIG projects that provide some initial insights on customer education strategies and best practices.

SGIG Projects Featured in this Report

Four SGIG projects representing different regions, business models, and objectives have addressed the challenge of communicating with customers in new ways:

- **Reliant Energy Retail Services** is one of about 100 retail electricity providers (REP) in Texas that compete to sign up households and businesses and sell them electricity. This is the only SGIG project involving REPs in Texas's unique and highly competitive retail electricity market.
- **Entergy New Orleans**, a subsidiary of Entergy Corporation, served about 150,000 urban customers at the start of the project in 2010. About 90% of these were residential, and many were low income. This is the only SGIG project focused primarily on smart grid applications for low-income customers.
- **Sioux Valley Energy** is an electric cooperative serving approximately 21,000 customers in 7 counties in South Dakota and Minnesota. This is one of the few SGIG projects involving an electric cooperative evaluating time-based rate programs.
- **Central Maine Power** serves more than 600,000 customers in a service territory that covers Maine's major commercial centers and 78% of the population. This is one of several SGIG projects deploying smart metering throughout the utility's service territory.

Summary of Major Findings

Table 1 summarizes several of the major findings about customer communication and education.

Table 1. Major Findings on Customer Communications and Education	
Customer Education Strategies	i. Smart meter and customer system programs involve complicated equipment and **require customers to "climb learning curves" that require extensive communication and education**. Utilities must be prepared to dedicate sufficient resources to the trial-and-error of the education process.
	ii. It is essential to clearly notify customers of their bill status if they are on pre-payment plans or when "critical peak events" occur. **Cell phone text messaging is among the most popular and effective means of customer notification**.
	iii. There is **no one-size-fits-all approach to customer education**. Utilities used multiple communication channels, including text messages, emails, apps, web portals, telephone calls, bill inserts, and social media.
Community Outreach and Public Meetings	iv. **Community outreach and public meetings are particularly important in the early stages** of smart metering deployments to educate local officials about utility plans and to hear feedback from the general public on issues and concerns. Early outreach improved overall community

		approval and meter adoption.
	v.	**Reaching low-income customers is a special challenge** that can be addressed successfully by involving local community and non-profit organizations in program planning and implementation.
Call Centers, Web Portals, and Customer Devices	**vi.**	Utilities are making call centers available 24/7 and designing web pages to **give customers quick access to information about their consumption and costs**. Customers want rapid and often self-guided access to the information they need.
	vii.	**Customers generally like their in-home devices**, and manufacturers are rapidly making changes as projects learn more about both needed and unneeded features.

1.   The Importance and Challenges of Customer Communications

Effective customer communication is paramount for any utility installing smart meters and customer-based systems, but can present challenges for both the utility and the customer. In many cases, customers have little experience with smart meters, the hourly data they provide, or how to manage their electricity use and costs daily or even hourly during critical peak events. Likewise, these technologies are new to utilities and many are gaining technology expertise as they deploy the systems while simultaneously communicating with their customers.

Complicating this challenge is the sheer number of new and interdependent technologies and techniques that utilities are introducing, including time-based rate and load management programs; new devices such as in-home displays (IHDs), programmable communicating thermostats (PCTs), and home area networks (HANs); and information systems such as web portals, bill comparison calculators, and energy management software.

Getting customer communications "right" is essential for success. It empowers customers to increase their involvement in electricity markets by participating in demand-side management, and even installing distributed energy resources such as rooftop photovoltaic arrays and combined heat and power systems.

Utilities understand that more frequent and informative customer communications are needed—either face-to-face, on the phone, or most often electronically, using automated messages and responses. Internet and web-based tools, including social media, are being heavily used, as they are in virtually all marketing activities. Traditional techniques such as public meetings, mailings, and phone calls are also important. Pilot projects have found that there is no single right way, and several communication methods are often needed. The job of smart grid customer education is never done.

Three communications activities are particularly noteworthy for the opportunities they provide in addressing specific customer needs, and are explored individually in this report:

- **Customer notification methods and education strategies:** This includes electronic and other notifications of both billing status and "day before" announcements of critical peak event days. For these efforts to work properly, messages need to be successfully delivered and received.
- **Community outreach and public meetings:** These meetings play a valuable role in the early stages of smart meter deployments to raise awareness and bring potential issues to the surface. Public concerns about smart meters have led several states to offer "opt-

out" programs. Community outreach efforts, in several instances, have shown benefits in addressing customer concerns.

- **Call centers, web portals, and customer devices:** These techniques are used extensively by electric utilities and in other business sectors, but the challenges of smart metering and customer systems have caused many of the SGIG projects to test new ideas and implement approaches they have never tried before.

Collectively, utilities that are piloting smart metering and customer system projects have climbed learning curves, identified mistakes, and determined best practices as they test and assess a variety of approaches to customer communications. Some notable project experiences are shared in this report; others will be included in subsequent reports, and all are made public on www.smartgrid.gov.

2.   Overview of the Four Featured SGIG Projects

Experiences and lessons-learned from the 65 SGIG smart meter and customer system projects are providing valuable insights into the importance of customer communications and their role in smart grid deployments. Of these 65 projects, there is a subset of nine that are collaborating with DOE to conduct special consumer behavior studies (see the side bar).

This report includes information from four SGIG projects that are NOT participating in these consumer behavior studies. These four projects provided reports on the challenges and lessons learned they experienced with customer communications. These experiences are similar to those of all of the SGIG smart meter and customer system projects. The four projects include:

> *SGIG Consumer Behavior Study (CBS) Projects*
>
> *The nine SGIG CBS projects are conducting a total of 11 consumer behavior studies in accordance with research protocols established by DOE and Lawrence Berkeley National Laboratory. These studies are intended to produce comparable statistical results across the CBS projects on customer acceptance, retention, and response and address the impacts of time-based rates, information programs, and customer systems (e.g., IHDs, PCTs, and web portals) on peak demand, electricity consumption, and customer bills. Results from the SGIG CBS projects can be found on the DOE website.*

- Reliant Energy Retail Services (Reliant), a retail electricity provider (REP) in Texas
- Entergy New Orleans (ENO), an investor-owned utility
- Sioux Valley Energy (SVE), an electric cooperative in South Dakota
- Central Maine Power (CMP), an investor-owned utility

2.1   Reliant

Reliant is one of about 100 REPs that compete to sign-up Texas households and businesses and sell them electricity. Among the unique features of the restructured electricity market in Texas is a statewide web portal (Smart Meter Texas) that warehouses 15-minute-interval load data from smart meters. It encourages REPs to offer attractive rates and other service offerings and helps Texas electricity customers better manage their electricity consumption and costs while reducing peak demands. Reliant's project has a total budget of more than $54 million (including almost $20 million in Recovery Act funds from DOE) and uses many types of advertising and promotions (see Reliant's website), including customized web portals, software tools, and social media. Figure 1 shows an advertisement for Reliant's web portal.

During its SGIG project, Reliant has reached 600,000 customers out of a target market of about 625,000 with smart meter-enabled products and services designed to enhance customer

capabilities and encourage energy efficiency and load management responses. These include time-based rates and pre-payment program enhancements and installation of devices such as PCTs, IHDs, and smart appliances. The Reliant project is the only SGIG project involving REPs and the unique Texas retail electricity market, and it complements an SGIG smart meter deployment project by CenterPoint in Houston.

2.2 Entergy New Orleans (ENO)

ENO, a subsidiary of Entergy Corporation, served about 150,000 urban customers when the project started. About 90% of these were residential and many were low income. ENO's SGIG project, (known as "*SmartView*") has a total budget of almost $10 million (including almost $5 million in Recovery Act funds from DOE) and involves smart

Figure 1. Reliant's Messaging Focuses on Customer Control and Saving Money.

meters, IHDs, PCTs, and web portals to support evaluation of customer education, critical peak rebates, and air conditioning load controls for reducing customer electricity consumption and peak demands. ENO's SmartView project is the only SGIG smart metering project focused primarily on low-income customers.

2.3 Sioux Valley Energy (SVE)

SVE is an electric cooperative serving approximately 21,000 customers in 7 counties in South Dakota and Minnesota. SVE's SGIG project (known as "EmPOWER") has a total budget of about $8 million (including about $4 million in Recovery Act funds from DOE) and involves evaluation of a critical peak pricing pilot during the summer of 2011 and a critical peak rebate pilot during the summer of 2012. The pilots included more than 800 mostly residential participants (both treatment and control groups) during each summer period (June to August). Communications activities included day-ahead notification for more than 35 critical peak events by emails, text messages, IHD messages, and phone calls. SVE had a unique 800-
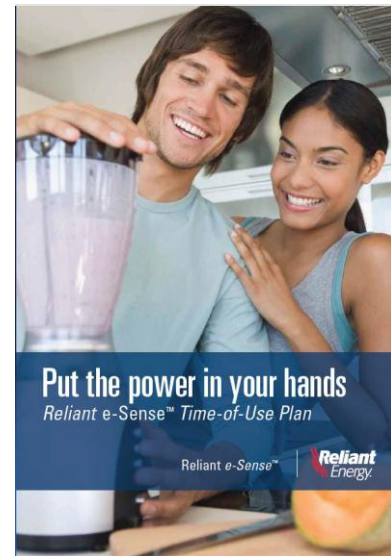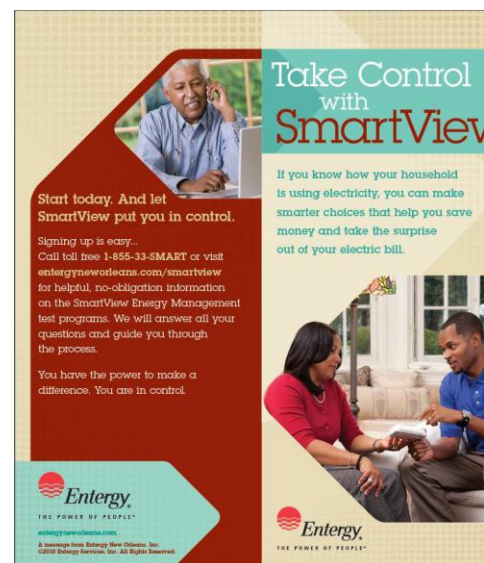

Figure 2. ENO Messages Focus on Customers Taking Greater Control of Consumption and Costs.

number for customer questions, offered a unique email address for correspondence with customers, and trained several customer service representatives to be available for customer inquiries through SVE's call center. SVE's EmPOWER project is one of the few SGIG smart meter project involving an electric cooperative studying customer acceptance and response to time-based rate programs.   Results on the peak demand reductions from the first year of the SVE time-based rate pilot program (critical peak pricing) are summarized in an SGIG case study completed in 2012.

2.4   Central Maine Power (CMP)

CMP serves more than 600,000 customers in the least densely populated state east of the Mississippi River; its service territory covers Maine's major commercial and population centers and 78% of the population. CMP's project has a total budget of almost $196 million (including almost $96 million in Recovery Act funds from DOE) and involves a web portal for customers to monitor their electricity consumption and costs, and a pilot "Bill Alert" service offered to 38,000 residential customers. More than 3,200 customers enrolled to receive weekly updates by email, text message, or phone call with billing information on their electricity use and cost. Other aspects of CMP's SGIG project, including operational and maintenance savings from smart meter operations, were discussed in an SGIG case study completed in 2014.
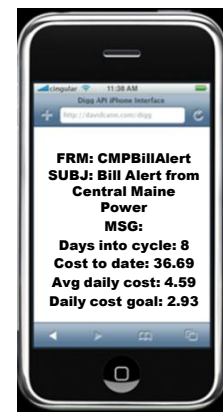
Figure 3. CMP's Pilot Program Uses Weekly Text Messages.

3.   Customer Notification Strategies

Utilities are evaluating a range of techniques for notifying customers about program actions, including traditional methods like phone calls and bill stuffers along with new methods like emails, text messages, web postings, and social media. Projects have found that no single approach stands out as the most effective; instead, multiple channels are often necessary to ensure that the messages get delivered and understood.

3.1   Reliant

As an REP, Reliant is not a distribution utility and does not own or operate substations, feeder lines, and meters. Competing with about 100 REPs in the Texas retail electricity market, Reliant faces "tests" every day on the effectiveness of its marketing and customer notification approaches. Reliant has invested substantial resources revising its website, customer emails, advertising, and customer service center to increase the appeal of these resources to customers. This includes extensive marketing research involving surveys, focus groups, and analysis of website usage patterns. Research has delivered several findings and best practices:

Reducing the number of **website** clicks it takes to get to the most desired information is an important simplifying factor. Reliant's research has shown that many smart meter-related customer offerings can be complicated and difficult for many customers to grasp. Wherever possible, Reliant aims to simplify its offerings to increase levels of customer interest, awareness, enrollment, and retention. Reliant reports that about 90% of its website users are able to access desired information without having to click to a secondary page.

Customers don't like spending a lot of time getting questions answered. Based on statistics gathered about customer inquiries, Reliant's customer service representatives are trained to anticipate questions and customize responses to address specific concerns. Reliant has also engaged celebrities to represent its brands in the marketplace and attract new customers. Many of Reliant's communications practices go beyond those of traditional utilities because of the competitive pressures it faces in the Texas retail marketplace.

One size does not fit all when it comes to sending information to customers; multiple approaches are almost always required. For example, Reliant offers electricity consumption information to customers by mobile phone; text messages and other apps; web pages and tools; call centers; weekly email summaries; and bill inserts. Reliant has found that some customers prefer self-guided channels and that customers often enjoy looking up their own information or accessing communications on their own schedules. A popular approach has been weekly emails, which summarize customers' consumption and costs to date and offer

visually appealing graphics for assessing the status of their monthly bills. Click-through rates on these notifications are high and opt-out rates are low. Reliant customers report that weekly emails are valuable because it helps avoid "bill shock" at the end of the month and gives them a sense of control over their consumption and costs.

Reliant heavily uses social media to reach customers. Reliant reports that its Facebook page is popular and has as many (or more) "likes" than the Facebook pages of other utilities. All of its TV and radio ads can be found on YouTube. Reliant regularly uses Facebook to send information to customers; its social media strategy focuses on keeping messages humorous and appealing to attract younger customers.

3.2 ENO

Among other approaches, ENO offered three types of customer training: face-to-face, over-the-phone, and mail. For the face-to-face training (what ENO calls "high touch") ENO and its community partners conducted 32 training sessions involving 518 customers. For the over-the-phone training ("medium touch"), ENO held ten conference-call sessions involving 170 customers. For mail training ("low touch"), customers who requested mailed instructions or did not specify a training preference were mailed instructions. Almost 2,000 customers received training materials in this way. **A majority of surveyed SmartView participants reported finding the mailed materials either "very easy" or "somewhat easy" to use.**

ENO notified its peak time rebate participants of critical peak event days by calling them the day before the event. During the events, the background of both the IHD and PCT displays turned red to signal that the peak event was in effect. ENO reports that a minority of air conditioning load management participants were aware that the peak day events were in effect—indicating that the load control strategy did not significantly impact their level of comfort during the events. During the first summer of the pilot, ENO had 20 peak time rebate events and 23 air conditioning load management events; during the second summer, there were 14 peak time rebate events.

3.3 SVE

In time-based rate programs that involve critical peak prices (CPP), variable peak prices (VPP), and critical peak rebates (CPR), utilities identify days when reductions in peak demand are needed and notify customers a day ahead of these events so that they can reduce demand to either avoid higher peak prices (CPP and VPP) or receive incentive payments for reductions in demand (CPR).

SVE's rate project involved a two-year pilot program testing CPP rates (summer 2010) and CPR rates (summer 2011) on customer volunteers (treatment and control groups). SVE conducted a total of 37 notifications of critical peak event days over those two summer periods. Table 2 shows survey results and customer preferences for various notification methods. **The table shows that phone calls were the most common and preferred approach, but that text messages were preferred the most.** Nearly three-fourths of the survey respondents said that they were always aware of critical peak event days after being notified by 4:00 p.m. the day before.

Table 2. SVE Notification Methods and Customer Preferences		
Form of Notification	Number of Customers	Percentage Saying this was the Preferred Approach
Email	93	67%
In-Home Display	55	67%
Text Messages	93	87%
Phone Call	162	68%

3.4   CMP

For bill alert programs to be successful, customers need to receive and use notification messages in time to take steps to adjust their consumption and manage their monthly bills. **About 70% of participating customers stated that bill alerts caused them to take action to manage their electricity usage, and participants reduced their annual electricity usage by 1.8%.** In addition, CMP asked if the bill alerts were successful in helping customers pay their bills on time. About 49% said the alerts were at least "somewhat" or "very" successful in helping them pay their bills. This level of effectiveness was the same for both high-usage and typical-usage customers. More of the customers with histories of trouble paying bills on time (about 60%) found the alerts to have been "somewhat" or "very" successful in helping them pay their bills.

Table 3 shows customer preferences for bill alert notification methods. **For CMP's customers, email was the most preferred method by far**. Figure 4 shows survey responses from bill alert program participants, who were asked to rank their preferences for different pieces of information provided in the email and text message notifications from most useful (1) to least useful (4). **Information on electricity costs to date and average daily electricity costs was preferred to information on daily cost goals and dollar amounts over or under the goal**.

Notification Preference	Enrollment Channel			Overall
	Email (N = 1,487)	Telemarketing (N = 1,621)	Direct Mail (N = 129)	
Email Only	84.1%	57.8%	79.1%	70.7%
Telephone Only	0.3%	30.4%	10.1%	15.7%
Text Message Only	5.6%	9.9%	8.5%	7.9%
Email & Text Message	9.3%	1.6%	2.3%	5.2%
Telephone & Email &/or Text Message	0.6%	0.4%	0.0%	0.5%
Total	100%	100%	100%	100%

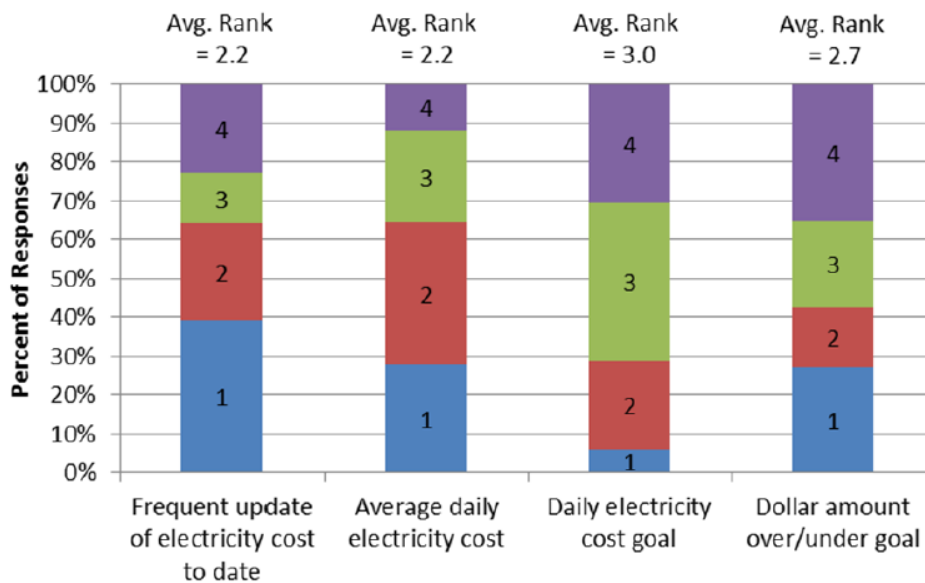**Table 3. CMP Customer Preferences for Bill Alert Notification**

Figure 4. CMP Customer Preferences for Different Types of Bill Alert Information

4.   Community Outreach and Public Meetings

Community outreach and public meetings—a traditional form of customer communications—played an important role in the ENO, SVE, and CMP projects. As an REP competing in a mass market, Reliant did not use this approach, which is highly targeted to specific communities or organizations.

4.1   ENO

ENO's focus on low-income customers relied heavily on partnerships with local community organizations. At the outset of its SmartView project, ENO invited New Orleans nonprofit and community development organizations to attend a project scoping meeting to inform and engage them in customer solicitations, customer training sessions, and other supporting activities. ENO then issued a Request for Proposal, to which seven community organizations responded and ultimately contributed to ENO's SmartView program in various ways.

ENO credits its partnerships with the community groups for its success in recruiting target low-income customers for education, enrollment, and support activities for SmartView. Community groups had historically worked with ENO on energy efficiency education, and all said they valued working with ENO on SmartView and the goal of helping low-income customers save money on their electricity bills.

Figure 5 shows the extent that local community channels succeeded in reaching prospective participants. The offices of community organizations were the most frequent way that customers learned about the programs. It also shows the variety of mechanisms and their relative contributions to the recruitment process.
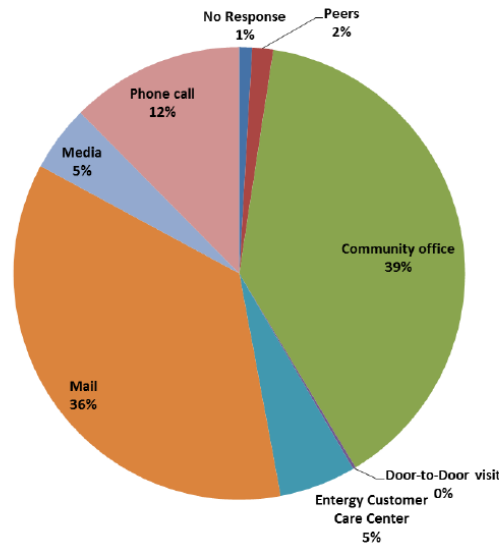
Figure 5. ENO's Recruitment Methods for Customer Participation

ENO continues to work with community groups to reach out to low-income customers now that the initial pilot phase of the SmartView project is complete. **One of the biggest benefits for ENO was strengthening their long-lasting relationships with these community organizations**, which continue to partner on customer education about topics such as energy efficiency and conservation.

4.2   SVE

As an electric cooperative, SVE has long used public meetings as a critical way to deliver information to and get feedback from customers on a regular basis. Annual meetings in each of the 11 districts, held during March and April, typically begin with seminars on overall business issues such as power costs and supplies.

SVE uses these meetings to provide information on smart metering and deployment; SVE's pilot time-based rate programs under its SGIG project; and the company's web portal and energy efficiency programs. SVE plans to use these meetings to receive feedback about future smart grid investments and plans. **To encourage participation, SVE offers "door prizes," and about 15% of their customers typically attend. One of the issues is finding ways to expand participation in the meetings to include more young adults.**

4.3   CMP

Prior to installing smart meters, CMP contacted 320 municipalities by mail or phone and completed 140 briefings with town councils and the public. The process involved targeted

efforts to understand and address specific customer concerns about data privacy, home security, and the perceived health effects of smart metering.

CMP's customer engagement strategy also included proactive communications with customers before smart meters were deployed and "rapid response" communications when customers raised questions and concerns during and after the deployment process. As a result, only one town imposed a moratorium on smart meter installations that was subsequently lifted. In fact, **about 97% of the customers in this town eventually decided to participate in CMP's smart meter program**.

5.   Call Centers, Web Portals, and Customer Devices

These communications tools, many of them new to both customers and utilities, played large roles in customer education for smart metering projects.

5.1   Call Centers

Call centers are often the first and primary way many customers communicate with their utilities, often for billing issues, outage reporting, and program information. Utilities deploying smart meters and customer systems have extensively used call centers to educate customers and respond to inquiries.

ENO's dedicated call center—the ENO Support Center—along with a walk-in Customer Care Center provided proactive outbound calls and support for participants when they called the dedicated toll-free number or came in with inquiries or technical issues. Table 4 demonstrates ENO's proactive customer education. **In 2011, about two-thirds of all calls were outbound; in 2012, the outbound call volume increased to about 84%. The quantity of both inbound and outbound calls generally peaked in the months of June through September, when ENO's time-based rate and load management programs were in effect**.

	2011	Primary Reasons (2011)	2012	Primary Reasons (2012)
Outbound Calls	32,610	• Enrollment and Training • PTR event notifications • Courtesy check-ins during events • Schedule and to assess effectiveness of field visits • Ensure customers knew how to adjust thermostat settings	14,823	• Calls to ACLM participants regarding swap out of thermostat • Courtesy reminders and check-ins relating to device functioning • Notification of second set of PTR events • Encouragement to all groups (incl. Control) to complete post-pilot survey
Inbound Calls	14,355	• Training (for medium and low touch) • Provisioning device • Technical support	2,816	• Technical support
Total Call Volume	46,965		17,639	

*PTR participants were notified of events by phone the evening prior to an event day. For ACLM events, participants were not notified; ACLM events were predetermined at the beginning of the program.

Table 4. ENO's SGIG Project Call Center Activity in 2011 and 2012

Reliant's call center is open 24 hours every day of the week. Call center personnel receive training in Reliant's various product offerings and **perform analysis on each incoming call using a software tool that categorizes customer requests and personality types (e.g., controllers, entertainers, thinkers, and "greens"). The analysis delivers guidance and information about the best ways to frame responses and most efficiently address customer needs**. Reliant says that customer satisfaction ratings are relatively high when compared with other retailers. Of all of the REPs in Texas, they have among the fewest complaints per thousand customers registered with the Texas Public Utilities Commission.

SVE's call center was operated in conjunction with its web portal. In addressing customer inquiries about bills and other matters, **SVE call center personnel advised customers to log into their web portal so that they could jointly review information in real time**, hour-by-hour, day-by-day, and during peak periods. **CMP** also operates call centers, but they were not a major factor in the bill alert pilot program.

5.2   Web Portals

The vast majority of utilities with extensive smart meter deployments now offer web portals and energy management and bill comparison software that empowers customers to actively control their consumption and costs. These include "dashboards" that use visually appealing displays of electricity use patterns and suggestions for changing behavior to reduce consumption and save money. **Many utilities deploying smart meters with web portals have experienced difficulties attracting customers to access and use their web portals, and the ultimate value of these tools is still an open question.**

Reliant is continuously refining its web portal offerings and boosting the site's capabilities for attracting new and retaining existing customers. A major aim is simplicity and ease-of-use, which is what customers say they want. Figure 6 shows Reliant's web portal.

ENO's SmartView pilot used web portals to inform participants about how they can reduce electricity consumption during critical peak events. In this application, 82% of customers said they were "very" or "somewhat" satisfied with the
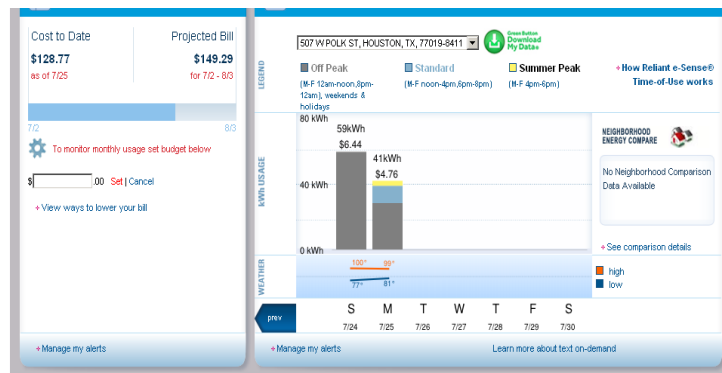

Figure 6. Screen Shot from Reliant's "e-Sense" Web Portal.

web portal's usefulness as a decision-making tool, compared to 94% for IHDs and 90% for PCTs.

About 22% to 28% of CMP customers surveyed said they visited the web portal, though high-usage customers and payment-troubled customers visited slightly more. The majority of those that visited the website only did so one to three times. In follow-up questions, customers indicated that tracking historical progress relative to goals was not a useful feature of the website. **SVE** offers its customers web portal access, information, and tools, but did not assess their usefulness in the EmPOWER program.

5.3   Customer Devices

IHDs, PCTs, and load management equipment are prevalent customer devices utilities are now piloting. Others include home area networks and smart appliances; subsequent DOE reports and case studies will address customer reactions to these. **In almost all cases where customer devices were used, they strengthened customer acceptance and responses, particularly in the case of time-based rate programs**.

Reliant evaluated several different PCTs before settling on a preferred option, based on customer feedback. Its customers liked the ability that PCTs gave them to remotely control their air conditioners, as much as or more than the ability to use the PCT to reduce consumption and lower their bills. **Reliant has also discovered that its customers do not express a high level of interest in their load control devices or concepts like load management or demand response, but do participate and reduce demand when incentives are financially attractive**.

ENO and **SVE** customers appreciated the PCTs and IHDs, and these devices strengthened customer engagement. **CMP** has not deployed these customer systems in great enough numbers yet to report on their effectiveness.

6.   Future Outlook

Customer communications will continue to be a critical ingredient for successful grid modernization as utilities roll out new load management and rate programs that require active customer participation and decision-making. Utilities and other entities continue to explore innovative mechanisms and media to communicate more efficiently and increase customer understanding and engagement. As these technologies and programs are deployed in greater numbers, continued efforts to advance interoperability standards and cybersecurity protections will be a top-priority need. Further progress is also needed to address public concerns about data privacy.

Challenges also remain in designing smart metering and customer system programs that have favorable impacts on "vulnerable" customer populations such as those with lower incomes and the elderly. Results from ENO's SGIG project show successful outcomes when utilities partner closely with groups that have experience in serving vulnerable customers.

Over the next several years, new technologies and tools will increasingly make detailed smart meter data available to customers in ways they can value and act on. For example, the industry-led Green Button Initiative, (in collaboration with the Smart Grid Interoperability Panel) developed a common technical standard for the format of smart meter data, which app developers can then use to develop new customers platforms to access data. More than 25 million customers are now served by utilities using Green Button—double the number of customers served last year and growing.

Competitive retail electricity providers like Reliant are demonstrating innovative customer communication strategies that offer lessons learned for educating even hard-to-reach segments, like young adults. Harnessing the nation's IT capabilities and focusing them on smart grid applications will enable further innovations in technologies for customers to participate in programs. DOE efforts such as the American Energy Data Challenge, and other similar contests, raise awareness about new opportunities for innovation with energy data for customer applications. Chattanooga, Tennessee, for example, is leveraging investments it made under SGIG in smart grid and related technologies and is implementing innovative programs like GIGTANK to attract smart grid entrepreneurs to their city and "incubate" new concepts for customer and smart grid programs that boost local economic development and jobs creation.

Most utilities are proceeding at a deliberate pace with smart grid deployments. Focus now is on identifying cost-effective applications, educating utility executives and state policymakers about grid impacts and benefits, and sharing lessons learned to identify best practices for smart grid projects and customer communications. DOE looks forward to continuing ongoing efforts with

the Recovery Act smart grid projects, other utilities, state and local regulators, manufacturers, vendors, developers, entrepreneurs and innovators, and consumers in advancing customer communications for smart meters and customer-based applications.

7.   Where to Find Additional Information

To learn more about national efforts to modernize the electric grid, visit the Office of Electricity Delivery and Energy Reliability's website and www.smartgrid.gov. DOE has published several reports that contain findings on topics similar to those addressed in the four featured projects and this report. Web links to these reports are listed in Table 5.

Table 5. Web Links to Related DOE Reports		
SGIG Program, Progress, and Results	i. ii. iii.	Progress Report II, October 2013 Progress Report I, October 2012 SGIG Case Studies
Customer Communications and Demand Response	iv. v.	Voices of Experience, Insights into Smart Grid Customer Engagement, July 2013 Demand Reduction from the Application of AMI, Pricing Programs, and Customer Based Systems – Initial Results, December, 2012
Consumer Behavior Studies	vi. vii. viii.	Lessons Learned: Customer Engagement, Updated January, 2014 Analysis of Enrollment Patterns In Time-Based rate Programs, July, 2013 Quantifying the Impacts of Time-based Rates, Enabling Technologies, and Other Treatments in Consumer Behavior Studies: Protocols and Guidelines, July 2013
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