

Smart Meters, Big Data, and Customer Engagement: In Pursuit of the Perfect Portal

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ABSTRACT

Nearly 1 in 3 homes now have smart meters collecting data every 5 to 15 minutes instead of the once per month collection we've seen for the past 100 years, yet most people don't even know if they have a smart meter or not, much less how the data can help them save energy and money (Tweed 2012). Presenting this information to customers in a way that allows them to easily take advantage of these savings opportunities is critical for justifying the billions of dollars that utilities have invested in these meters. Without customer engagement in smart meter data, this investment represents little beyond a slightly more accurate and efficient billing system. With customer engagement, however, this data is the key to fulfilling the true promise of the smart grid, enabling behavioral demand response, dynamic pricing, and more.

The key to customer engagement in smart meter data is presenting this information effectively, using website portals that are compelling, actionable, and available to people on the communications channels they prefer to use. With the increasing prevalence of industry-wide standardized formats for data such as the Green Button initiative, creating portals that can easily integrate with smart meter data should be a more streamlined process than ever before (Green Button Initiative, 2014).

While it is still too early in the existence of these portals to definitively determine which elements are most important to drive energy savings, we have created a framework for comparison of the many different components that are currently being used in several "best practice" interfaces designed by third parties, utilities, and NGOs. These elements can include energy use patterns, disaggregated use by appliance, comparisons over a variety of time periods, energy savings goal settings, alerts when energy use is high, comparisons with peers, entry into contests and sweepstakes, and even gaming.

Establishing a Framework for Smart Meter Portals

Based on years of experience researching utilities and energy data, as well as evaluating hundreds of utility websites (E Source, 2013), we have identified nine key elements of successful smart meter data portals and presented them in a framework below starting with the most essential information. In addition to these elements, a key component of success is making this information available to customers across a variety of communication platforms, including online, mobile, and social. Finally, another consideration is whether the data is pulled in or pushed out to the customer, in either an opt-in or opt-out model. This data may be presented in a variety of standardized formats including Green Button.

Table 1. Elements of a successful smart meter data online portal

| Feature | Description | Importance |
|-------------------------|--|-------------------|
| Smart meter information | The most fundamental part of the new energy portals revolves around the smart meter data. Two major factors play into the improvement that smart meters bring to the customer: 1) more granularity, and 2) greater timeliness in getting information. Data can be presented in hourly, daily, weekly or monthly increments, as well as compared to past months or years. Ease of use for switching between different timelines is essential. | High |
| Energy Use Information | This element can include disaggregation of data by appliance or other levels, trends year over year, comparison of days, peak demand information, TOU periods, tiers for rates, and more. | High |
| Budgeting | Portals should allow customers to set a monthly budget goal and send automatic alerts when energy usage trends are no longer on track to achieve the goal. These alerts can be sent by text, email, or both, as the customer prefers. | High |
| Target savings | Customers can receive reminders for specific energy savings actions such as turning down the heat when they're out of the house, turning off the lights, or raising the temperature on the AC. | Medium |
| Incentives | The portal should automatically alert customers to available incentives and rebates for energy efficient equipment and programs when the information is most relevant, such as when the customer is viewing a high monthly bill. | Medium |
| Rate options | Based on the customer's energy usage history, the portal should present analysis of rate options and outcomes that would be most favorable for reducing the customer's bill. | Medium |
| Social gaming | Portals should offer customers a variety of extrinsic and intrinsic motivational opportunities such as peer comparisons, leaderboards, badges, points, virtual prizes and real-world rewards. | Medium |
| Electric vehicle | Portals could present information and a visualization of what impact charging an electric vehicle would have on a customer's electric bill at various times of day. | Low |
| Renewables | Similarly, some customers may wish to see what impact installing a solar system or participating in other renewable energy options offered by the utility would have on their electric bill, as well as the impact on the environment. | Low |

For all of these features, portal designers have the option to decide if data should be pushed to customers in an opt-out model similar to Opower reports which are sent out to the whole target population, or pulled by customers electing to participate in an opt-in system. Using the current version of Green Button data, portals are largely obligated to adopt an opt-in strategy of customers electing to pull data into the application, rather than having the information automatically pushed out to update the platform. However, as the Green Button Connect initiative becomes more robust, customers will hopefully have the option to authorize their

energy data to automatically connect with a variety of third party portals, instantly updating the platforms on a regular basis (Green Button Connect, 2014).

The key to persistent customer engagement in these automatically updated energy portals is to push out information that people care about and present it in a simple, compelling format on communication channels that people are already using. For example, receiving a short text message alert when energy usage or billing trends exceed a customer's selected monthly goal would be valuable information for many people, especially if the message contained a link to automatically decrease energy usage in the home with remote appliance controls.

Below we describe leading examples of portals selected from reviewing over a dozen platforms that effectively promote customer engagement with valuable information presented in a compelling format on appropriate communication channels from three main sources: Green Button data, utilities, and vendors. Finally, we conclude with a description of a portal incorporating recommended elements from all three of these leading examples.

Case Study Examples of Online Energy Portals

Green Button Portals

We first reviewed applications that have been developed using the relatively new Green Button data standard, as there have been several contests sponsored by the Department of Energy (DOE) and other organizations designed to encourage development of platforms using this data. Although the DOE contest received about 60 applications using Green Button data, unfortunately, most of the applications we reviewed did not appear to have been completed to the point where data integration could be successfully accomplished (Apps for Energy Submission Gallery, 2014). However, we did find one portal, [WattzOn](#) that successfully integrated a variety of data including Green Button data and also included several useful elements.

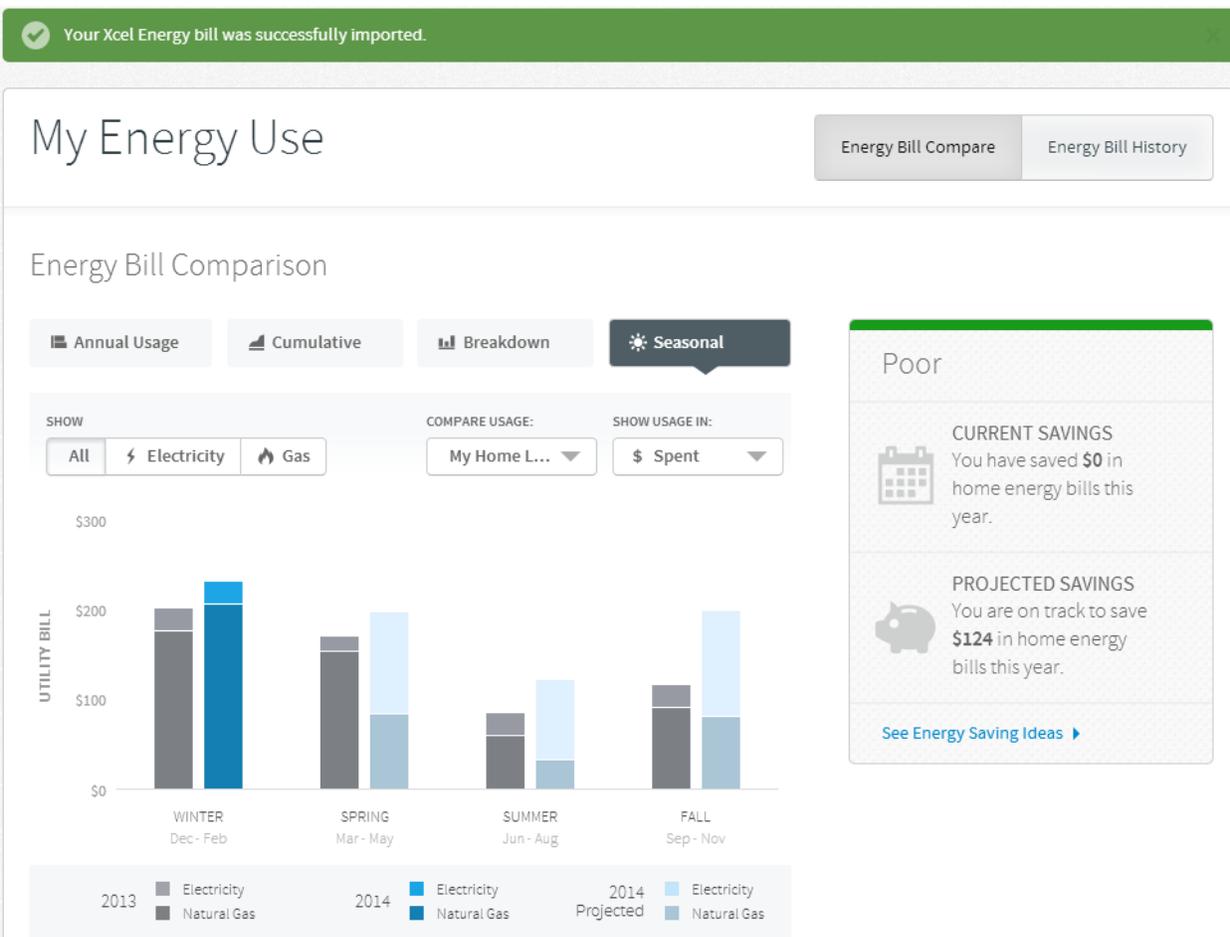


Figure 1. WattzOn Portal displays energy usage data in a variety of intuitive formats. *Source:* WattzOn website.

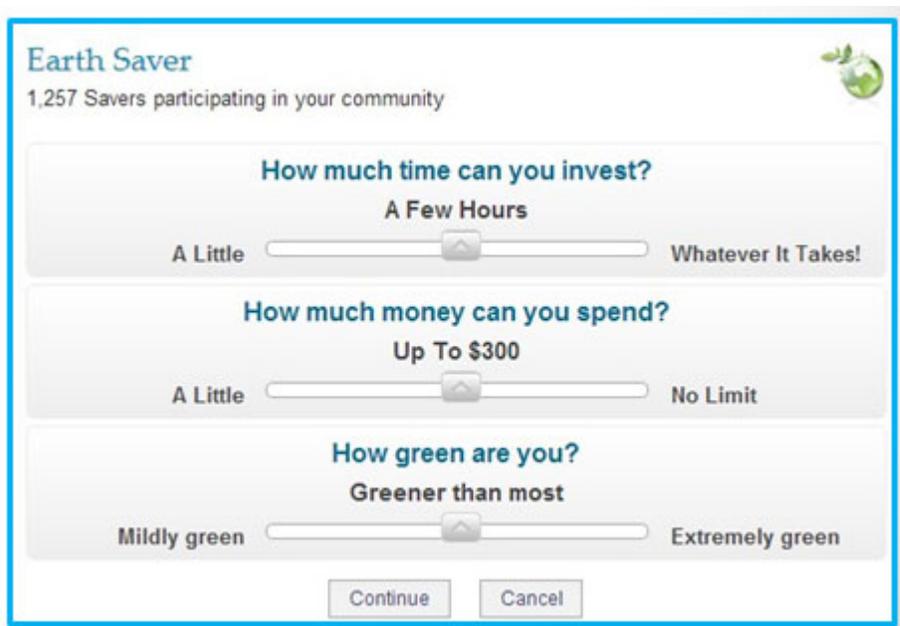
Integrating utility billing data with the WattzOn portal is a relatively simple process in which a user simply enters their online utility account username and password. After just a minute or two of retrieving the data, the portal then allows users to view the information in a variety of useful ways, such as by comparing seasonal billing information for both electricity and gas from different years. In the example above for a single family home with solar panels in Colorado, the vast majority of the impact comes from the natural gas portion of the bill as the electric needs of the house are largely met by the solar panels. The projected energy bills for 2014 are most likely inaccurate as the portal currently only includes functionality to get more information about installing solar panels, rather than allowing a user to indicate that panels have already been installed.

Along with this intuitive display of energy usage information, another useful element of the WattzOn portal is the simple presentation of recommended actions for energy savings. Suggestions such as washing clothes in cold water and reducing outdoor lighting are simple, no-cost ideas that will have minimal impact on the customer’s comfort. Other ideas such as installing CFL bulbs, occupancy sensors and dimmer switches are low cost actions that many customers simply may not have considered before. Finally, WattzOn offers a list of available rebates and tips on how customers can save money by switching to a more fuel efficient car.

Utility Portals

Portland General Electric (PGE) and Reliant both offer customized, robust portals available to customers across several communication channels and presenting a variety of information in a compelling format. Of the over a dozen portals we reviewed, the one from PGE appears to be the most comprehensive and appealing when compared against our key criteria. This portal also offers energy savings tips, based not only on cost preferences and time but also a customer's selection of an overall energy usage profile or persona, such as the "Earth Saver" or the "Weekend Warrior."

The PGE portal also allows customers to view energy usage over time, compare usage to similar homes, and set a savings goal to reduce usage by a certain percentage compared to the year before, automatically translating the percentage to a dollar amount. There is also a short home energy assessment survey to help people learn more about what appliances use the most energy, and links to rebates. Overall the graphics are very clear and easy to use.



The image shows a screenshot of the "Earth Saver" portal interface. At the top left, it says "Earth Saver" and "1,257 Savers participating in your community". There is a small globe icon at the top right. The interface consists of three horizontal sliders, each with a title and two end labels. The first slider is titled "How much time can you invest?" with "A Few Hours" in the center, "A Little" on the left, and "Whatever It Takes!" on the right. The second slider is titled "How much money can you spend?" with "Up To \$300" in the center, "A Little" on the left, and "No Limit" on the right. The third slider is titled "How green are you?" with "Greener than most" in the center, "Mildly green" on the left, and "Extremely green" on the right. At the bottom of the sliders are two buttons: "Continue" and "Cancel".

Figure 2. The PGE Portal allows customers to set savings goals based on personal preferences. *Source:* PGE

Although the Reliant Energy portal graphics are not quite as clear, in our opinion, as the PGE platform, the system is available across a variety of communication channels including email, online and text message alerts. This robust set of communication offerings was developed with the goal of engaging half a million customers on the utility's Smart Energy products and services (Reliant Press Release, 2012). The text messaging system is particularly useful, as it allows customers to text on-demand and set alerts for when their projected bill exceeds their budget, daily usage exceeds a certain threshold, or usage spikes by 25% or more.

Reliant Energy
an NRG Energy Company

Reliant Energy e-Sense™ Alerts

Preset Alerts

- Bill Due
- Cost Exceeds Budget *
- Projected Bill Exceeds Budget *
- Daily Usage Exceeds Threshold *
- Usage Spiked By 25% *

Text On-Demand

- "BILL" – bill amount and due date
- "EST BILL" – estimated bill amount *
- "COST" – cost to date *
- "USAGE" – usage to date *

* Enabled by Smart Meter Interval Level Data retrieved from Smart Meter Texas Portal

Figure 3. The Reliant portal allows customers to receive alerts on usage, bills, and more. *Source:* Reliant.

Third Party Vendor Portals

Finally, Apogee and OPower both provide third party vendor applications that can be easily integrated into a utility’s offerings. The primary strength of the Apogee portal is the disaggregation of energy usage data to show customers how heating, cooling and other activities within the home contribute to bill totals. The platform also offers both no- and low-cost recommendations to lower energy usage, as well as larger investment opportunities.

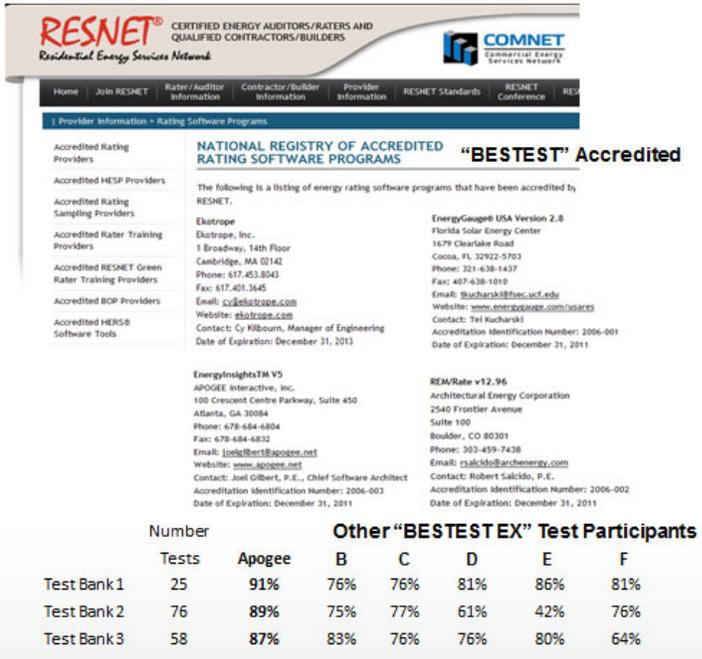


Figure 4. Reliability of Apogee disaggregated data as certified by RESNET. *Source:* RESNET.

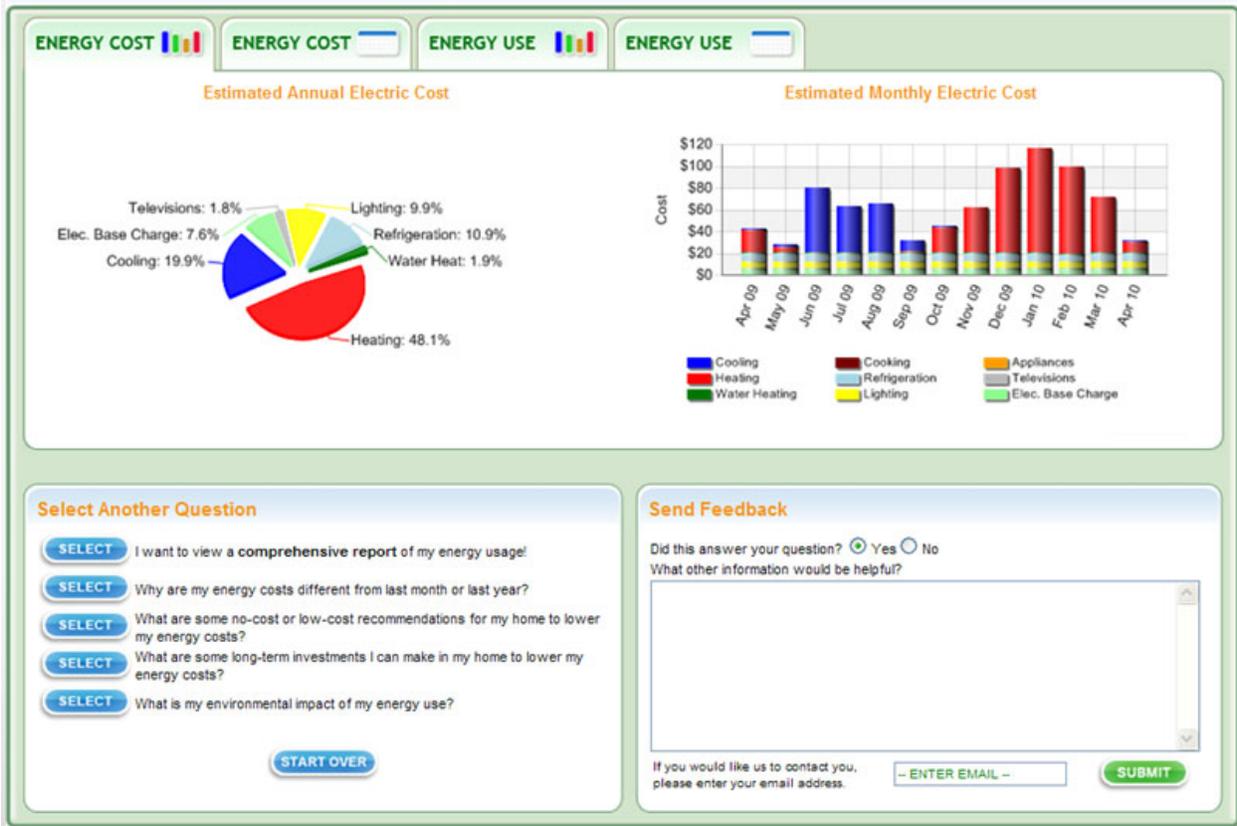


Figure 5. The Apogee portal shows how heating, cooling and more contributes to the bill. *Source:* Apogee

The obvious strength of the Opower platform is the peer comparisons that the company originally pioneered with paper reports based on behavioral science research. More recently, the company has also partnered with Honeywell to link the thermostat with smartphone control and applications. Finally, they also launched a Facebook application to encourage online social gaming and competition.

This type of digital social approach to behavior change programs for energy efficiency and demand response is one of the newest elements being incorporated into certain energy platforms. For example, Opower is piloting a behavioral demand response program with Baltimore Gas & Electric (BGE) (Howland, 2014), and a software startup called Simple Energy ran a similar program with San Diego Gas & Electric (SDG&E) during the summer of 2012 (SDG&E press release, 2012). “Through the San Diego Energy Challenge, San Diego Unified School District (SDUSD) area residents are eligible to earn their Reduce Your Use day rewards by saving energy, while also earning points for the SDUSD middle school of their choice by signing up at sdenergychallenge.com. This innovative program recently earned backing from the Department of Energy (DOE), with an announcement that SDG&E was awarded a prestigious DOE funding opportunity to run the program.”

While it is still too early to tell if the results from these programs will be significant or persistent, there are large potential savings that could be captured from effectively leveraging social networks for behavioral programs.



Figure 6. The Opower platform allows for peer comparisons, alerts and more. *Source:* Opower.

Recommended Portal

Our recommended energy portal incorporates elements from all three categories of existing portals: Green Button applications, utility solutions, and third party vendors. First, integrating with Green Button data or another smart meter data standard that becomes industry-wide is best practice for all portals that hope to be easily adopted by a variety of utilities. Next, this smart meter data should be presented in a simple and visually compelling format that allows

customers to view and easily compare usage over time, the most essential and basic function of an energy portal (Burke and Spalding, 2011). Disaggregated data such as that presented by Apogee can be included to help customers better understand where energy usage occurs in the home.

Related to understanding where energy usage occurs in the home is the idea of effectively helping customers to reduce that usage and save money. Although presenting energy usage data is the most basic function of these portals, the primary motivation for customers to care about usage data is billing and lowering energy costs, for customers across a variety of demographics including from opposite ends of the political spectrum (Ruiz, BECC 2013). For this reason, rather than a focus on primarily displaying usage charts and graphs, the design of the portal should most prominently feature all elements related to budgeting, including the ability to set goals and receive alerts.

For example, the portal landing page could include a smaller energy usage graph in the upper left quarter of the screen and options to expand for more information, with the remaining three quarters of the landing page dedicated to budgeting features. These features should be presented in an almost impossibly simple format, using large colorful buttons and terminology that absolutely avoids any industry jargon. Finally, customers should be able to select what communication channel they want to use for these budgeting alerts, including email, text, or both. The Reliant Energy portal alerts are a good example of offering this functionality, although the design and layout of the platform could be simplified to be more colorful and include larger calls to action.

Related to budgeting, an effective portal should include features such as energy savings tips and links to incentives, rebates and rate options that would be financially advantageous based on a customer's energy usage and billing history. These features should of course also be presented as simply as possible, such as those in the WattzOn application or the PGE portal, but featured less prominently than the budgeting goals and alerts section of the platform. For example, one of the calls to action in the main budgeting section of the portal landing page could invite customers to "learn how to save more money" and then link to a second tabbed page in the portal with "strategies to save based on your style" modeled after the PGE portal example highlighted above.

Finally, the last layer of functionality that should be included in a best practice energy portal includes more "optional" features such as social gaming, smart thermostat mobile apps, solar panel options, and electric vehicle visualization. While these features may appeal to a smaller segment of customers, these customers are the early adopters using more cutting edge technologies that can help drive the utility towards competitive emerging markets. While these features may appear "optional" now, in just a few years they will be much more mainstream, as the market for home energy automation is projected to grow exponentially (Munsell, 2013). Any energy portal that fails to include these features will be quickly outpaced by offerings from companies such as Google, Comcast, Lowe's and other large, competitive players.

In addition to these functionality considerations, making the portal available on a variety of communication channels including smart phone applications is essential. For these applications, ensuring that the portal is designed with mobile functionality and features is critical, so that customers can easily use the app on the go, as research shows that mobile consumption of content is increasing dramatically across all demographics (Bryant, 2013). "More than half of all time spent on the Internet is now through a mobile device — 12% on tablets and 39% on smartphones," explains Bryant.

The last consideration for a best practice portal, in addition to including essential functionality and making the information available across a variety of communication channels, is finding a reason to push data to customers rather than expecting them to log in to view this information spontaneously. Research shows that most customers spend less than 6 minutes per year thinking about energy, making it unlikely that the majority of customers will log into energy usage portals without a compelling reason (Collier, 2013). For example, billing and usage alerts are a great reason to push updates to customers, and weather-related information could be another item of interest.

Apogee's new Weather Insights App is an excellent example of engaging customers with information they are already seeking. "The newly released website application not only shows the weather forecast for any area but also the estimated daily energy use and costs to heat or cool a home in that area." (Apogee, 2013)

Conclusion

Following the massive investment that utilities have made in smart meters, engaging customers in the data with effective energy usage portals is essential. Without customer engagement in smart meter data, this investment represents little beyond a slightly more accurate and efficient billing system. With customer engagement, however, this data is the key to fulfilling the true promise of the smart grid, enabling behavioral demand response, dynamic pricing, and more.

The key to customer engagement in smart meter data is presenting this information effectively, using portals that are compelling, actionable, and available to people on the communications channels they prefer to use. As the examples highlighted in this paper illustrate, the industry is moving towards the development of effective portals, but still has a ways to go in terms of creating platforms that incorporate all of the elements we consider to be essential for a best-practice portal. In addition to these elements, making the portals available on increasingly popular communications channels such as mobile applications and finding reasons to push data out to customers are both essential.

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