SPEER

The South-central Partnership for Energy Efficiency as a Resource

An Update on Smart Energy in Texas

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About the South-central Partnership for Energy Efficiency as a Resource (SPEER)

SPEER is an Austin, Texas based non-profit organization dedicated to increasing and accelerating the adoption of energy efficient products, technologies, and services. Much of SPEER's work focuses on finding the best market-based approaches to increase energy efficiency and overcoming persistent market barriers. The views expressed in this paper do not necessarily reflect the views of all of SPEER's members, funders, or supporters. For more information about SPEER, please visit: www.eepartnership.org

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Executive Summary

This report is intended for anyone interested in the promise and potential of smart energy in Texas. Texas has rolled out seven million smart meters, but has only begun to use the intelligence latent in the system to enable smarter energy usage, including time of use pricing and demand response.

As of the last update published by the utilities (Smart Meter Texas, 2013), 0.8% of customers have logged in at least once to the Smart Meter Texas (SMT) portal,[1] and less than 0.2%of the smart meters have been connected to a device designed to manage energy usage. Since that publication, the number of connected devices has actually decreased.[2]

There are many reasons for this, some beyond the control of utilities, the Public Utility Commission of Texas (PUCT), or ERCOT. Most notably, the meters were installed between 2009 and 2013, leaving only a few years in most cases since the meters have been installed. But education efforts to help customers capture greater benefits from their smart meters are essentially nonexistent—neither the utilities nor the PUCT spend money on SMT education efforts any longer. And there are still limited incentives—through regulated programs, or market signals like time-of-use pricing or demand response payments—to encourage smarter energy usage.

Still, the positive aspects of Texas' forays into smart energy cannot be overlooked. Texas does have over 7 million smart meters in place. In addition to the smart meter rollout, Texas has developed a portal, Smart Meter Texas, which all the utilities in competitive areas of the state helped design and now use. This is a very rare thing to have utilities collaborate to create a common portal as Texas utilities have done.

SMT is Green Button compliant,[3] meaning the data is in a common format, a huge advantage for third party energy management companies wanting to work throughout the state. Unfortunately, Green Button data can only be downloaded manually by individual customers, and third party access to the data is still not available; though part of the original intention for the smart meter deployment, third party access has taken much longer than anticipated to implement and is currently scheduled to be live in the fourth quarter of 2014. Texas has also enabled Home Area Network (HAN) connectivity to the meter through SMT, though very few customers have actually made the connection (Smart Meter Texas, 2013).

Texas tied for first in the Gridwise Alliance's national scorecard of smart meter implementation (Gridwise Alliance, 2013). Texas is far ahead of most other states at the moment, and its leadership in smart energy should be celebrated. But it is critical that Texas take further steps to maintain that leadership. Much as Texas was once a leader in energy efficiency programs (as the first state to ever

[1] It is possible, however, that energy data from SMT is being used far more than those numbers suggest. Retail Electric Providers in Texas' competitive market feed the data from SMT through their own portals and customers can look at their usage by logging in there. The REPs don't report usage numbers, though, making it impossible to know how many customers are accessing their data.
[2] Down to 10,184 devices connected May 2014 from 11,962 in May 2013. Personal communication with Smart Meter Texas Operations Manager Andrea O'Flaherty.
[3] For more information on Green Button, see here: http://energy.gov/data/green-button

adopt an Energy Efficiency Resource Standard) only to fall to the bottom third of states for energy efficiency attainment (Downs, 2013),[4] Texas' smart energy leadership is also showing signs of abating.

This is the first of a two-step SPEER initiative. This report examines both the achievements and the shortcomings of efforts to increase smarter energy usage. After publishing this paper, SPEER intends to work with a wide range of stakeholders to develop a more detailed "Smart Energy Roadmap for Texas" to be published later this year.

Key Findings

- Texas has nearly seven million smart meters deployed, but according to the most recently available published data:
    - Only 30,000 customers log in each month to Smart Meter Texas to obtain consumption information. That's less than ½ of one percent.
    - Only 60,000 customers have ever logged in to Smart Meter Texas, or less than 1% (Smart Meter Texas, 2013).
- It is reported anecdotally that many more are viewing their energy data through their Retail Electric Provider (REP)'s portal, but the REPs do not report these viewership statistics.
- As of the last public report about Smart Meter Texas, there are only 12,000 HAN devices[5] connected to Smart Meter Texas, or less than 1 for every 540 smart meters deployed (Smart Meter Texas, 2013). According to an anecdotal report from the Smart Meter Texas Operations Manager, that number has fallen by over 15% in the year since the report was issued. Real-time access to energy usage data from the meter is only available by connecting a HAN device through SMT.
- The Texas utilities are developing functionality within Smart Meter Texas which will allow third-party access to energy data with customer consent. The date on which this functionality will be available has been postponed many times. When and if it is finally completed, it will be a major step forward to increase the potential for a robust market of third-party energy service providers and may greatly increase usage of SMT, HAN devices, and smart energy services.
- Very few intelligent efficiency or smart energy companies are involved in relevant working groups and committees at ERCOT. The lack of involvement has likely slowed down development and implementation of key functionalities, such as third party access.
- Several Texas utilities and retail electric providers implement Green Button, allowing their customers to download their energy data in a format consistent with a national standard used by utilities throughout the country. This is a big advantage for third-party energy management companies awaiting the rollout of third-party access later this year.
- Texas utilities spent tens of millions of dollars on smart grid education campaigns in the past five years (PUCT, 2010). Some of this spending was just to overcome negative perceptions of smart meters raised by a small but vociferous faction of utility customers concerned about health and

[4] In ACEEE's first energy efficiency scorecard released in 2007, Texas ranked 11th. In last year's scorecard, Texas ranked 33rd.
[5] HAN is a home area network, in this case used to manage energy consumption.

privacy implications of advanced digital metering. Such education spending ended in 2012, and the major investor owned utilities no longer spending anything on education. The PUCT also spends nothing on customer education.

- Oncor, the transmission and distribution utility (TDU) for the Dallas-Fort Worth area and much of the north and west of Texas, estimated it would spend $1 million on the Smart Meter Texas portal in 2013. Instead, it spent $4.68 million. CenterPoint, the TDU for the Greater Houston area, estimated it would spend $2.7 million and instead spent $5.1 million. When AEP and TNMP are factored in, the joint utilities spent more than $10 million on Smart Meter Texas in 2013 alone.
- In the utilities' deployment plans, funds were set aside for in-home display devices for low-income households. Oncor, for example, allocated $10 million and CenterPoint allocated $7.5 million (PUCT, 2010). Though the utilities were supposed to deploy these devices from 2009-12, these programs have yet to be implemented (Oncor, 2014). Even if the utilities spent $500 per home to install the devices, they could more than quadruple the amount of HAN devices connected to SMT with these programs alone.
- Utilities are authorized by the PUCT to spend efficiency incentive dollars to reduce the cost of getting HAN devices such as connected thermostats into homes. They spend a small amount on rebate programs. Retail Electric Providers do incent HAN devices in some cases, but often the up-front cost coupled with a 2-year contract for a consumer presents too large a barrier. Larger utility efficiency programs would help to lower this barrier.
- Retailer reporting to ERCOT showed 157,000 customers on some form of time of use rate and/or participating in some kind of price response program in 2013, including larger customers with block and index plans (Frontier Associates, 2014).[6] The most popular offerings are targeted at residential customers and have simple rates with free or half-price nights or weekends; these account for 117,000 of the 157,000 customers using time of use. One major retailer has begun offering bill credits of 60 cents per kWh for reduced usage at peak times.[7] Retail innovation using energy data is nascent but is showing signs of picking up momentum.
- Market enhancements such as those described below, would allow load to participate in the ERCOT electric market. Demand response payments received in the ERCOT market could provide financial incentive for customers to be more energy efficient and reduce their usage away from peak.
    - Loads in SCED[8] v.1.0, went live on June 1, 2014, and so far one entity[9] has brought an aggregation consisting of thousands of residential customers' loads into the market.
    - ERCOT is in the process of revamping the ancillary services it buys to ensure near-term reliability. There is stakeholder and staff interest in short duration ancillary services which

[6] Some base portion or "block" of their rate is purchased at a fixed price, and some marginal portion at a rate "indexed" to the real market price. There are more than 20,000 customers with this kind of rate configuration.

[7] https://www.reliant.com/en/residential/my-reliant/save-energy/smart-energy-solutions/degrees-of-difference/degrees-of-difference.jsp

[8] SCED stands for Security Constrained Economic Dispatch; Loads in SCED is the short-hand for the programming that allows qualified loads to now offer to reduce their usage at a defined trigger point, in the same auction in which other generation offers energy.

[9] The entity has not yet publicly announced but has been discussed in Loads in SCED Subgroup of the Demand Side Working Group at ERCOT.

could include demand side resources, including load shifting, the accounting for which would be made possible by access to smart meter data.

  - There is also potential for demand-side resources to be compensated within an energy market pricing enhancement recently adopted by ERCOT, the Operating Reserve Demand Curve (ORDC).[10]

- The Legislature directed the PUCT to "study the efforts of electric utilities to benefit from the use of advanced metering and metering information networks… and present to the legislature on or before September 30 of each even-numbered year a report detailing those efforts and identifying changes in this state's policies that may be necessary to remove barriers to the use of advanced metering and metering information networks…"[11] The PUCT did not produce such a report in 2012.

The availability of energy data in 15 minute increments gives a major boost to demand-side resources. SMT allows for price signals to be sent directly to the meter,[12] allows for third parties to manage energy usage by provisioning on-site equipment to respond to price signals and save consumers money, and also provides a foundation for measurement and verification of savings. There are numerous additional benefits of smart meters, including (to name just a few) faster outage detection and restoration of service, fewer truck rolls, and easier customer switching which supports retail competition.[13]

SmartMeterTexas.com is a major step in the right direction and has enormous potential as one of the few web portals spanning multiple utilities and seven million meters. But much work needs to be done if the potential for smart energy in Texas is to be realized. It is still early in the process as the smart meter rollout was only complete in the last year or two, but banking on the inevitability of market penetration for new technologies is not a good strategy to ensure the major investment in smart meter infrastructure made by Texans pays off.

Background

A major transformation is underway. Intelligence is embedded in many of the things we use every day, providing feedback, data, advice, and even automated improved performance. Electricity is not immune to this trend, but is moving slower than many other spheres of economic activity. As with any transformation, 'big data' will change electric markets and the electric industry in unpredictable ways and over a long time frame. While the end result of the transformation may seem inevitable, the pace of change is by no means predetermined.

In 2005, the Texas Legislature passed HB 2129, which encouraged and incented utilities to begin a mass rollout of smart meters to serve the majority of Texas' residents. The intent was clear:

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[10] ERCOT has adopted this administrative tool to reflect approaching resource shortages in the clearing price of energy on a daily basis.

[11] HB 2129, 79th Legislature, 2005. http://www.legis.state.tx.us/tlodocs/79R/billtext/pdf/HB02129F.pdf#navpanes=0

[12] At the time of publication, it appears that not a single REP uses this capability.

[13] For a fuller explanation of benefits see http://www.edisonfoundation.net/iei/Documents/IEE_BenefitsofSmartMeters_Final.pdf

> In recognition that advances in digital and communications equipment and technologies, including new metering and meter information technologies, have the potential to increase the reliability of the regional electrical network, encourage dynamic pricing and demand response, make better use of generation assets and transmission and generation assets, and provide more choices for consumers, the legislature encourages the adoption of these technologies by electric utilities in this state.

In the intervening years, at the direction of the Public Utility Commission of Texas (PUCT), the electric utilities hired IBM to build the Smart Meter Texas portal, through which customers in the competitive portions of the state can access their energy data today. Thus, most of Texas can utilize Green Button "Download My Data"; that is, most customers can access their data in a standardized format.

The real value of the advanced meter network adopted as a result of HB 2129 and the subsequent rulemakings at the PUCT, was to allow customers to access and use their data in ways that would reduce their spending on electricity and contribute to a more economically efficient electric system. The PUCT, in one of its required reports to the Legislature providing an update on smart metering, wrote this:

> AMI provides customers with the real-time feedback allowing them to better understand their energy consumption, make more informed choices about energy use and conservation and participate in demand response programs. Two-way communication gives AMI the capability to transmit real-time prices and consumption data between the customer, the REP, and the utility, and provides information that the customer can act on, if he chooses. **To deliver AMI's full benefits to Texans, economic signals must be delivered to the retail customer in the form of prices that are differentiated by time of day**, either as time-of-use prices that are based on price trends in the wholesale market or as real-time prices that are based on real-time wholesale prices. [Emphasis added] (PUCT, 2010)

To date, much progress has been with time-of-use pricing. At least 117,000 customers have signed up for a free or reduced price nights or weekends plan. This could represent a very important first step for customers who previously didn't think about the variable cost of electricity based on time of day and variation in demand. These retail offerings are innovative and potentially game changing, but they still do not value energy beyond the two categories (night and day). It's a first step but should not be confused as the destination. The PUCT report also noted:

> Today's flat rates are average rates that do not directly reflect the time varying change in demand and real cost to serve customers. In other words, these rates mask the real cost to serve a customer at a particular time. As a result, there is no incentive on the customer's part to reduce or shift consumption during peak demand, since the customers are not directly charged for the high cost of electricity during these hours…
>
> [Customers in] dynamic pricing (either time-of-use or real-time pricing) … have an incentive to reduce their consumption during peak periods, when prices are expected to be high. Customers may reduce demand by installing more efficient equipment, or participating in a demand

response program or simply by deciding to turn off appliances when retail prices are high. Demand flattens over time as customers reduce consumption or shift it to off-peak hours, thereby reducing the need for investments in peaking generators. This demand response behavior is expected to lead to a lower clearing price for electricity.

Demand response through dynamic pricing is expected to be more effective when customers have ready access to price and consumption information through a mobile communications device, or an in home display (IHD) that communicates with the meter through a home area network (HAN). These small household devices provide real time energy consumption and can relay price signals based on the pricing plan the customer has elected. When used in conjunction with smart appliances, the demand response benefits are magnified even further. Customers can easily set preferences to control a smart appliance, such as a programmable thermostat, to respond to price signals and other electric power system conditions. AMI enables customers to better understand their energy consumption and provides the visibility customers need to make a demand response decision. It is up to the customer or the customer's agent, however, to make time-differentiated pricing plans and demand response programs available that will give customers the tools to act on the information received. The customer's agent could be the REP offering an innovative rate plan or demand response program or a third party offering a demand response program.[Emphasis added]

The lack of HAN adoption and the low number of HAN devices connected to SMT (10,000 for 7 million meters) has hampered the development of intelligent efficiency in Texas. Competitive REPs are beginning to offer some innovative rate plans for smaller commercial and residential customers, but nothing that approaches capturing real-time price signals. More REPs are offering other demand-response related options, including simple voluntary reduction programs based on emails and advanced meter data monitoring alone. These programs could proliferate as the System Wide Offer Cap (SWOC) in the ERCOT energy market rises to $9,000/MWh next summer. In the ERCOT market, REPs load obligations are settled based on their customers' actual 15-minute usage, assuring that demand reductions made by customers at peak directly benefit their REP. Thus, there is a direct incentive for REPs to offer more time-of-use plans, more demand response products and services, and more education for their customers, particularly if the risk for high prices in the wholesale market increases.

About 2500 MW of demand from very large customers[14] now participates regularly in the Responsive Reserve Service market, but participation is capped at 1400 MW per hour. About 700 MW of customer loads participate in ERCOT's Emergency Response Service, much of it facilitated by competitive Retail Electric Providers (REPs) or third-party service providers. Another 200 MW or so of aggregated commercial loads participate in load management programs of utilities. Third-party providers offering aggregation services must install their own sensors or sub-meters, however, to have direct access to consumption data, or rely upon the verification of ERCOT or the utility that the load responded to

[14] This demand resource is a legacy of what were once called "interruptible rate" programs. Large customers were given a reduced rate in order to be available to shed load (or, put differently, have operations "interrupted"). Today's programs are similar and offer payments to large users of electricity who will shut down operations on short notice to stabilize the grid to prevent rolling blackouts.

programmed instructions as planned. Also, most of this participation is limited to relatively large customers, while the language of the PUCT report above seems to address a vision that encompasses the average residential customer. Third parties offering demand response or meter-enabled energy management products to customers with small loads are still scarce.

After a long process dating back to early meetings of the Advanced Metering Implementation Team (AMIT) at ERCOT over five years ago, third party access will reportedly be available in the fourth quarter of 2014. Third party access, once available, will likely be a game-changer, but will also likely need improvements. The utilities that own Smart Meter Texas have been testing third party access using only four "third party testers." Additional testers beyond the four have not been allowed. Changes very likely will be needed once a broader set of third parties begin using the system.

Companies interested in understanding how third party access will be requested, initiated, and managed can find that information on the PUC website.[15] In addition to the information there, the PUCT will do face-to-face training in several cities this fall and users can always contact the help desk for one-on-one help.[16] Improvements to third party access will take the form of Change Requests, which will go through ERCOT's Advanced Metering Working Group, a group that has very little involvement from third party energy management companies at the present time. Increased involvement from potential market participants and advocates could help make third party access successful. Interested parties can sign up for regular updates from AMWG and/or other ERCOT working groups by visiting the ERCOT website.[17]

Texas has done more than most states to create the conditions needed for a robust market of third party energy providers and to prepare the way for widespread access to energy data for customers and third parties in the competitive areas of the State. Yet, at this point, though the groundwork is laid, there has been little progress toward, as the PUCT put it, delivering "the full benefits of AMI to consumers" by providing them with the ability to more intelligently manage their energy usage to save money and increase the economic efficiency of the Texas electric system.

Where Texas Leads

While there is much work left to be done to realize the benefits of a truly smart grid, it is important to recognize the tremendous progress in Texas, which puts the state in the upper echelon of states in most metrics about smart grid attainment.

First of all, the aforementioned meter deployment is a tremendous success story in and of itself. Many states are struggling with getting this basic, foundational layer of infrastructure deployed. They are held back because of the lack of advanced metering infrastructure; Texas has no such limitations, largely thanks to the Legislature (HB 2129 in 2005 and HB 3693 in 2007) and thanks to the actions of the PUCT.

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[15] For more on how third party access is expected to work, see here: http://www.puc.texas.gov/industry/projects/electric/41172/3rdPartyNavigationDeckversion2.pdf

[16] For how to contact the help desk, see: https://www.smartmetertexas.com/CAP/public/home/home_contact_us.html

[17] ERCOT list serves: http://lists.ercot.com/scripts/wa-ERCOT.exe?INDEX

Secondly, all of the data in Smart Meter Texas is available for customers to download in the Green Button format; that is, all the utilities (Oncor, CenterPoint, AEP, and TNMP) use a national standard for data created by industry and ratified by the ANSI-accredited North American Energy Standards Board. Austin Energy, Reliant, and TXU also implement Green Button for download by customers. This means that third parties operating in other states or regions can work with customers and/or REPs in Texas using the same data format they use elsewhere. Until third party access is available however, the customer wishing to provide information to a third party must log in to SMT, download the data, and transmit the data to the third party themselves.

Third, the development of SmartMeterTexas.com provides a single portal which accommodates the meter data from all of the largest investor-owned, transmission and distribution utilities in the state (Oncor, CenterPoint, AEP, and TNMP). This is tremendously significant as it will allow retail electric providers and third parties to access data for customers across various utility service areas in the same format and through the same portal. Furthermore, SmartMeterTexas.com is a platform that could be opened to the near 150 municipal and cooperative utilities in Texas for their use as well, further facilitating the growth of innovative third-party services in the market.

Reliant Energy's Vice President for Mass Markets and Product Innovation summarized this benefit nicely (Delurey, 2013):

> [The] Smart Grid here in Texas… was implemented with a standard set of rules and interactions that work across all five transmission and distribution markets. What that means to us as a retailer is, I effectively only have to implement one set of rules, systems, and policies across the state of Texas, and I can be relatively assured that whether I'm serving a customer in Houston or Dallas, that even have different smart meter manufacturers, that the same set of functionality and rules exist between those… Naturally that creates …the ability to serve our customers very efficiently and provide Smart Grid enabled programs across the competitive regions of the entire state.

There is increasing innovation happening among large REPs like Direct Energy, TXU, and Reliant, owned by NRG Energy. Reliant, as one example, now offers a free Nest thermostat to customers who sign up for their "Learn and Conserve" plan. But, even TriEagle Energy, with only about 60,000 customers, similarly offers an Ecobee thermostat and WeatherBug Home energy management optimization service and uses the aggregate demand response capacity it offers as a physical hedge against market price swings. REPs who can figure out how to aggregate demand from in-home devices like learning thermostats or by connecting a home area network to the meter, can offer customers increased savings while hedging their own exposure to peak wholesale prices which could rise as high as $9 per kWh or more when demand is high and supply is low or constrained. The ability of REPs to bid load into the energy market potentially makes these kinds of plans even more interesting for REPs, and the customers they serve. This is being facilitated through the 'Loads in SCED' protocols, mentioned earlier, and could also contribute as ancillary services.

Reliant offers customers a credit of 60 cents per kWh of consumption avoided on days when reserves are low. They call this program "Degrees of Difference." If the market could accommodate third-party offerings more fully—i.e., if there were payments for non-emergency demand response—there would likely be programs like this offered by many more providers. This would benefit far more consumers who would have access to these kind of programs, while also strengthening grid reliability and lowering peak prices for all consumers, regardless of whether they participated or not.

A nationwide survey of nearly 2,500 electric customers done by Parago Energy revealed that "87% of customers would participate in a demand response programs for the right incentives, including lower energy bills, prepaid card cash-back rewards, and more" (Parago Energy, 2014). The potential for this kind of participation is high and the ability for customers to connect devices to the Smart Meter Texas portal to see their energy usage in real time is there now. The ability for third parties to connect will be live later this year.

Finally, Texas took a very early lead in allowing HAN devices to connect to the customer's meter through the SMT portal. The lack of consumer education and lack of financial motivation (either in utility incentives or more precise time-of-use pricing) has contributed to very few devices actually getting connected, but the ability to do so is already built into the system. Very few states have that capability at this point in time, while Texas has had it for several years. Southwest Energy Smarts, a company active in the development of smart energy in Texas, has published a "Smart Meter Texas Registration & Provisioning Guide" (Southwest Energy Smarts, 2013)that outlines clearly how to both set up an SMT account and provision a HAN device through the SMT portal.

A perfect storm for demand response, dynamic pricing, and peak shifting could be brewing in Texas. With the right mix of financial motivation and regulatory leadership, Texas could hold or even increase its leadership position on smart energy and demand response.

Where Texas Lags

While Texas is very much at the head of the pack for smart energy in the US, it is very much in danger of losing that leadership position. The work of building a system to allow for the more efficient and intelligent use of energy is far from complete. Unfortunately, very few consumers actually use the Smart Meter Texas portal. Less than 1% has ever logged in even one time. It is possible that many more are logging in through their REP's portal, but those numbers are not reported. Despite the low participation, education spending by the utilities has completely ceased. The PUCT has not spent any money to tell consumers about SMT and has no plans to do so.

As an example, Oncor spent over $12 million related to customer education for Advanced Metering Systems through 2012, but spent nothing in 2013—according to its regulatory filing on AMS: "No customer education activities occurred in 2013" (Oncor, 2014). There are none planned for 2014 or beyond either.

One would expect the anemic rates of usage to continue with no concerted, organized education efforts to help consumers understand the possibilities and potential of Smart Meter Texas and smart energy in general, and the remaining barriers to third-party service providers. Several organizations provide excellent educational materials for consumers. The Smart Grid Consumer Collaborative is one of them. Their fact sheet for consumers helps explain the advantages of using energy data in straightforward language, free of industry jargon[18]. Moving to distribute these types of materials to customers could be a major step forward in Texas.

And not only consumers require education: architects, builders, and building managers, owners, and operators should also be educated about the potential and value that smart energy devices can provide. Some buildings now are constructed with DR capabilities built in. Building codes like the International Green Construction Code (IGCC) now contain sections requiring demand response capabilities be included in buildings to comply (International Code Council, 2010):

> Section 605 contains requirements for automated demand response (Auto-DR) infrastructure. It applied to all buildings that contain HVAC or lighting systems. It requires that building energy, HVAC and lighting systems and specific building energy-using components be provided with controls which facilitate a response to changes in energy demand by means of automated preprogrammed strategies. Software clients must be provided with the capability to communicate with a demand response automation server (DRAS).
>
> In addition to building energy, HVAC and lighting systems, building component-specific Auto-DR strategies are required to be implemented for:
>
> • Ornamental fountain pumps,
> • Supermarket refrigerated and freezer display cases,
> • Electric vehicle chargers,
> • Commercial, manufacturing and industrial process loads,
> • Elevator and escalator cycling and
> • Irrigation water pumps.

The 2015 IGCC is expected to have further DR requirements, though it is not finalized yet (New Buildings Institute, 2014). As new building codes are adopted, some new buildings will receive equipment but it will always be difficult to get smart energy devices into existing homes and buildings. Texas has instituted energy efficiency incentive programs that could be used to encourage the installation of smart energy devices like connected thermostats. These devices are necessary to sync homes and businesses with the smart grid. Utility incentives would reduce the up-front cost barrier to building owners and occupants participating in rate or service offerings as well. Unfortunately, the state PUCT has not yet fully used this tool in a coordinated fashion to help achieve the state's smart grid vision. TXU supported a smart home pilot project two years ago (since discontinued), and CenterPoint has recently expanded a

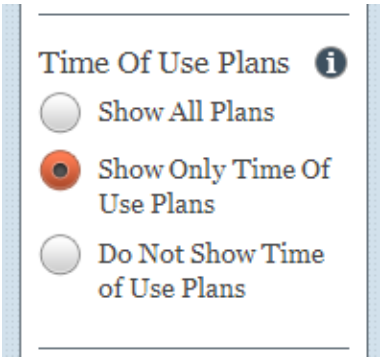
[18] For example, see SGCC's Pricing Fact Sheet here: http://smartgridcc.org/research/sgcc-research/sgccs-pricing-fact-sheet

smart home pilot to a program for 5000 homes, but no coordinated push has arisen from the IOU administered efficiency programs.

Progressive utilities have traditionally provided educational support or incentives to consumers in vertically integrated markets. In Texas, CPS Energy is providing in-home equipment enabling control of air conditioning and water heaters or pool pumps for free, and is selling demand response capacity it creates by doing so to ERCOT, or using it to avoid its own service obligations at times of high wholesale prices. Austin Energy provides customers a rebate of $85 for any number of thermostats, in return for access to associated demand response capacity, aggregated by competing service providers[19]. Few of the near 150 remaining municipal and cooperative utilities in Texas offer similarly forward looking programs that benefit both the customer and the utility and build on the added value of smart meter infrastructure.

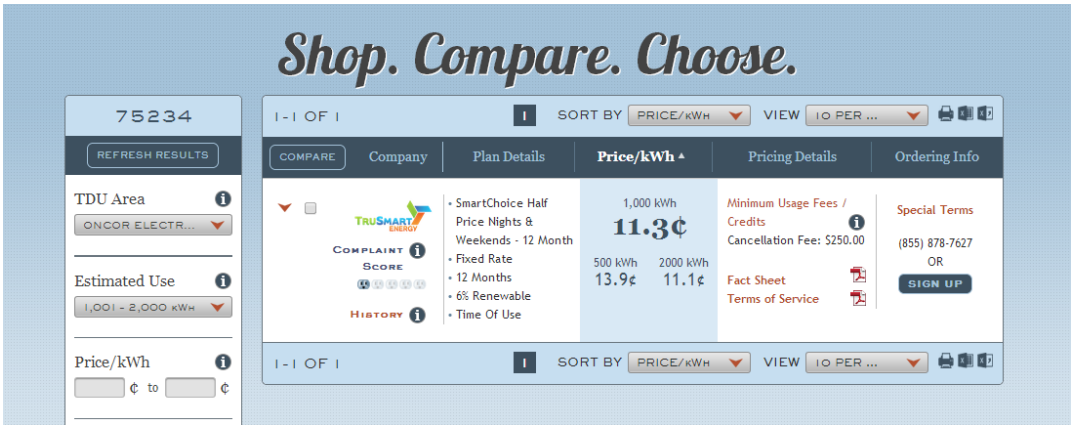
Oklahoma Gas & Electric, through its Smart Hours[20] program, varies from 9 cents all the way to 27 cents The utility guarantees that consumers will not pay more in the first year while they get adjusted (The Edison Foundation Institute for Electric Innovation, 2013). This kind of innovative pricing plan was expected to be available in Texas, too, once smart meters were widely available, as they are now. Oncor says on its website: "The Oncor AMS will also ultimately enable Retail Electric Providers to develop and offer new, innovative rate plans that will provide additional ways for consumers to lower their bills" (Oncor, 2014). But, in Texas, where we have unbundled the retail electric service function completely from the utility, unlike any other market, we rely completely on competition to bring innovation to the market.

Many states require time-of-use rates; Texas preferred to allow the market to provide innovation. The state run consumer electric choice website, Power To Choose, even allows consumers to filter by time-of-use rates:



[19] http://goo.gl/hvN5nB
[20] https://smarthours.com/

But, at the time of publication, according to Power to Choose, a consumer in the Dallas or Houston areas had but one choice for time-of-use rates[21]:



The single "choice" on the PUCT's official website did not involve using intelligence embedded in a home area network, or advanced diagnostics and automated demand response to reduce prices. It provided instead half price power after 10pm and on the weekends. Interesting, but using none of the latent potential available through the smart grid.

TXU, one of the largest retailers in the state, signed up 100,000 customers on its Free Nights or Weekends plan.[22] Under this plan, TXU charged 50-100% more for power during the day (Lieber, 2013) and gives it away free after 10pm or on the weekends. It was an interesting and innovative offering, attracted copy cats, and is probably an important first step in the evolution of competitive market pricing of electricity based on time variant costs.

Still, free nights or weekends plans do not track use real time energy information or real time prices to shift peak demand. That is, customers signed up for these plans are not responding to price signals or information provided by smart meters or connected devices to shift usage.

In a recently released report, the Brattle Group modeled that a Critical Peak Pricing Plan that customers could opt in to would likely generate 1,074 MW of responsive demand reduction (Brattle Group, 2014). That's equal to about 40% of the entire demand response portfolio in the state currently. Brattle notes:

> Advanced metering infrastructure (AMI) has been fully deployed across the ERCOT footprint. This means that the necessary metering capability is now in place to offer any customer a time-varying rate. More than 200 tests of time-varying rates conducted in the U.S. and internationally have shown that customers will reduce peak demand in response to time-varying rates…
>
> The residential class is relatively untapped currently, with very few DR options available to it, but with a significant portion of the summer peak being driven by its air-conditioning load. The

[21] www.powertochoose.com, Accessed on May 27, 2014.
[22] It is unclear why TXU's offering does not appear on the Power to Choose website.

medium C&I segment is similarly untapped through current programs. The potential impact of the CPP rate is large in part because it is applicable to all customer classes and has no eligibility restrictions (since virtually all customers now have a smart meter).

Smart meters can enable more intelligent use of energy but they don't guarantee it. More needs to be done to increase the use of smart energy devices behind the meter, and to thereby encourage adoption of time of use rates. Texas' approach to smart energy, DR, time-of-use, etc. seems to be "If you build it, they will come." Roll out smart meters, build the Smart Meter Texas portal, include time-of-use rates as an option on the state's consumer choice website, hope that REPs will provide dynamic pricing products, etc. And, to be fair, *some* of the potential is beginning to be realized, but education, incentives, HAN devices, and open market mechanisms to pay for the value smart energy brings are all important to ensure customers receive the full value of the AMI they have helped pay for.

Conclusion

Texas is a leader in smart grid deployment. But Texas has only begun to realize the potential value of smart energy, at least in part because we seem to lack a shared vision for the next steps required. Texas policymakers and utilities undertook and completed the smart meter deployment in record time. But, the next steps could prove more challenging. They require the education, collaboration, and participation of competitive retailers, utilities, builders, software developers, manufacturers, building owners, and occupants.

Smart energy education efforts in Texas are nowhere to be found. If you're a consumer wanting to know more about how to use your energy data, it won't be easy. Consumer education funds from the utilities have been expended and no additional funds have been allocated. Utility spending on energy efficiency related programs are declining overall, and none of the current efforts are focused on helping third-party providers or building owners or occupants capitalize on the potential of our new smart grid. Current law would certainly support the roll out of utility market transformation programs to stimulate the installation of more in-home devices that connect home and business owners to their meters, inform them about their energy use, or help optimize their consumption patterns. Only smart buildings can take full advantage of the smart grid.

Customers also need to have a reason to access their data and manage their energy usage more efficiently. Incentives do not necessarily need to be direct payments or rebates for equipment, though this is the most straightforward way to incentivize customers. Time-of-use rates, bill credits or other market-based price signals, could also provide sufficient incentive for customers to change their usage patterns and increase their efficiency. REPs sell customers what customers seem to want, by and large, and mandating time of use rates would not fit the market model Texas has chosen. Still, a coordinated, statewide education initiative endorsed by the State's leadership and supported by the utilities could help create the awareness and interest to expand smart energy interactions in the market.

In addition, there are things that could be done that would incent third-party providers to expand their own education and marketing efforts in Texas. Third-party providers should be able to continuously

access data from SMT (with customer consent) through an Application Programming Interface (API) such as Green Button Connect. Third parties, and not the utilities or REPs, are best positioned to offer innovative energy management products, market them widely, and take advantage of the available data to manage their customers' load appropriately and respond to time varying rates. This functionality is coming in Q4 2014. Its successful rollout could provide significant momentum for the market for intelligent efficiency services. It is very unlikely, however, that the rollout will be perfect. Improvements will need to be made, so plans should be made as to how the industry can interact effectively and efficiently with the utility-created and operated system when that day arrives.

Furthermore, it needs to be made clear to innovators and entrepreneurs that Texas is "open for business" with respect to energy innovation, once third party access is complete. Educating, incenting and encouraging entrepreneurs and innovators to enter the Texas market will be critical. A quick look at innovations in intelligent efficiency illustrates many possibilities. Time Warner Cable, AT&T, Comcast, Alarm.com, Vivint, and Google have all made major moves into home energy management. "The battleground over the next five years in electricity will be at the house," according to David Crane, CEO of NRG Energy, one of the largest electric generators in Texas (Grossens, 2014). But any company offering smart thermostats or other intelligent efficiency services have limited revenue opportunities in the wholesale market. They can participate in either the ERCOT ERS or utility programs but not in the ERCOT real time energy market. And until third parties have direct access to SMT, they do not have access to information necessary to measure a customer's performance in demand reduction programs.

Market mechanisms and/or incentives may need to be created or strengthened to bring such innovations and demand side resources into the market in a significant way. Market Transformation Programs aimed at this goal would be a worthwhile investment, and are already permissible under the State's energy efficiency standard administered by the investor-owned utilities. The infrastructure is built and paid for, but the innovation and efficiency that can be achieved by using that infrastructure to its fullest extent is still in the formative stages. Finding a way to allow customers or aggregations of customers through third-party service providers to participate directly in the day-ahead and real-time energy market (loads in SCED) or restructured ancillary services may also open important potential revenue streams to drive such innovations.

Finally, we observe that there doesn't seem to be a clearly articulated vision for where smart energy is heading in Texas, and how Texas can deliver the promise of the smart grid to consumers, or attract the private investors required to do so. This is evidenced by the fact that PUCT did not produce a report required by the Legislature in 2012 to provide information on how advanced metering is being used and what barriers remain to accessing and using energy data. In 2010, the required report was very informative, providing policy recommendations to the Legislature. The three Commissioners, in their jointly signed letter to the Legislature, stated:

> The Commission believes that the deployment of advanced metering is a critical component of the evolving Texas electric market and over time will help to balance the dynamics of supply and demand. As deployment occurs, it will enhance reliability and facilitate grid restoration, give customers more choice and control over their electric bill, enable market-based demand

response, help the market to mature, yield savings for utilities, and create efficiencies in market processes for REPs and ERCOT.

Most importantly, AMI has the potential to provide enhancements in service to retail customers, and also give customers the tools to help manage energy costs (PUCT, 2010).

Four years later, few customers use the "tools to help manage energy costs." Though the foundation is in place and Texas is a leader in smart energy, AMI's benefits have yet to be fully utilized.

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