TOWARD A MORE EFFICIENT ELECTRIC MARKET:
New Frameworks for Advancing Energy Efficiency in Texas

Considerations and Suggestions for Inclusion of Energy Efficiency as a Resource in the ERCOT Market

JUNE 2013

SPEER

The South-central Partnership for Energy Efficiency as a Resource

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

Credits and Acknowledgements

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Contents

Executive Summary

Texas is a clean energy leader on many fronts, although end-use energy efficiency, with notable local exceptions, isn't currently one of them.

Texas investor-owned utilities (IOUs) have spent about $3 billion dollars on an advanced meter-data network of about nine million meters, and have led an effort to build a Green Button compliant, web-based platform, called Smart Meter Texas. Customers can see their daily energy consumption, or allow third parties to provision premise energy management systems linked to real-time meter data and controls, enabling them to respond to real-time prices, demand response signals, or just save energy.

The state already generates more wind power than any other state, and has authorized over $7 billion in transmission line extensions to Competitive Renewable Energy Zones, setting expectations that the wind power generation may nearly double to 18,000 MW.

Texas leadership is completely set on developing a larger market system to capture efficiencies at a higher level. Some would claim the competitive wholesale energy-only market, operated in Texas by the Electric Reliability Council of Texas (ERCOT), is the most efficient organized electric market in the world. The retail market is the only one in the US so completely unbundled that retailers are perceived to be "the power company" now for most customers in competitive areas of ERCOT (76% of the state), and the regulated utility function is reduced to transmission and distribution.

While Texas has made great strides in some areas, others have lagged, including energy efficiency.

In its first scorecard, five years after the implementation of Texas' Energy Efficiency Resource Standard—the first such standard ever adopted in the US—the American Center for an Energy Efficiency Economy (ACEEE) rated Texas 11th among the states for energy efficiency attainment. Only five years later, in 2012, the state was ranked 33rd. Texas' energy efficiency goals lag even states like Indiana, Ohio, and Arkansas.

Why did Texas start out fairly strong on efficiency, and fall backwards?[1] There are many reasons, but an important one is that, while Texas created an organized market for electricity production and retail sales, efficiency was left to be administered by the still fully regulated transmission and distribution utilities. Efficiency was left in a context that may have been more appropriate to the former regulated framework, and was not an integral part of "deregulation." As the competitive market has emerged and evolved, for the most part, stakeholders and the state's leadership view the energy efficiency programs as "out of market" subsidies, mandates that are inappropriate in a truly competitive market.

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[1] In fairness, the legislature increased the Goal for Energy Efficiency from at least 10% of the growth in demand for electric power to at least 20% and the PUCT increased it to 30% of the growth in demand, but during the years after these changes were made, growth was severely reduced by the recessionary periods, and industrial customers were exempted from contributing to or participating in the programs. More recently the legislature codified capping the per customer charge for efficiency funds, and the PUCT opened the exemption to ever smaller businesses further eroding funding for the programs.

The state is now beginning to explore means to integrate a more robust demand response capacity within the market, but not energy efficiency. Efficiency programs are not widely seen as a resource acquisition vehicle of equal importance to the market as energy generation and delivery. **As eroding support for the state's once promising efficiency programs threatens their effectiveness and constrains their impact, we have to ask if there is not another alternative for a more organized energy efficiency market as well, perhaps one more suited to the current culture of competition?**

When the market was restructured and the utilities were unbundled, there was hope that the Retail Electric Providers (REPs) would offer a wide range of services, including energy efficiency, and become truly Energy Service Providers. In fact, the original language in the restructuring bill in 1999 said that the utilities should acquire efficiency through REPs and Energy Service Providers.[2] However, the utility administered program funds are far too modest to be useful to a REP efficiency services program offering in the competitive market. As a result, the competitive efficiency offerings by REPs are extremely modest, at least for all but their very largest customers.

This report argues that the utility programs are an important tool for implementation of market transformation programs, targeted to help overcome market failures and market barriers, introduce new technologies or engage new constituencies in energy transactions. For example, after spending nearly $3 billion on advanced meters, the State should consider using these programs to help stimulate the deployment of a critical mass of home energy controls, such as communicating thermostats. This would empower third parties, including REPs, to offer a wide range of energy management and demand response services competitively, without the threat of stranded investments. Utilities could offer the Texas equivalent of on-bill financing or on-bill repayment programs, or address the barriers to energy improvements for renters. The need for and benefits of these programs are unlikely to ever materialize in the competitive market.

Utility administered efficiency programs could be made compatible with the demands and values of the ERCOT market too. It is possible that the acquisition of efficiency resources, now addressed by the standard-offer programs of the utilities, could be moved to the system operator, ERCOT. In fact, the PUCT asked stakeholders in a recent rulemaking if utility demand response programs should be transferred so there is a precedent for discussing this.

These discussions should continue because utility programs are truly resource acquisition programs that accelerate the uptake of otherwise generally available measures and practices. ERCOT could determine how much efficiency is appropriate at what price, and a mechanism could be developed to assure cost effectiveness, fairness and transparency.

Ultimately, standard offer programs could compete in the market. Programs needed to transform the market could be kept with the utilities until such time as the market is transformed, at which point they would also be transferred to the market, to compete.

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[2] PURA Section 39.905, SB 7 from 1999

This report discusses the rapid adoption of energy efficiency as a competitive resource in the capacity markets, and considers the potential for a similar construct, whether the Texas PUCT sets the state on a path toward its own capacity market, or further enhancements to the current energy-only market. Either way, **energy efficiency should be treated as a resource and allowed, even encouraged, to compete to ensure the market achieves its full potential for competitiveness and efficiency.**

Further, the report addresses the potential for a uniquely Texan "organized efficiency market" to be integrated into the energy-only market. This last objective would be challenging if only because it has never been attempted elsewhere. Creation of an energy-only efficiency market implies the need for one or more layers of structure that doesn't exist today, not only at ERCOT but also within the myriad industries which are necessary to scale energy efficiency (e.g., finance, real estate, engineering, etc.)

Finally, in our examination of the role of efficiency and its integration into the electric market, or lack thereof, the report mentions another element of the market overdue for restructuring itself. While this could be the subject of another report, this study highlights the fact that the acquisition of transmission and distribution is also not integrated into the market, or has not matured into a market. ERCOT is the location at which transmission owners plan for expansion of the transmission system, but distributed generation, storage, efficiency, and demand response are all potential alternatives to transmission.

Alternative solutions are rarely considered in this environment. The same can be said for distribution system planning, carried out by the utilities, and only obliquely approved by the PUCT in the periodic adoption of the utility's overall rates. This is a huge issue from the standpoint of the funding it attracts, and the subsidy it represents to centralized generation, yet it is safely insulated from the rigors of competition for the most part, even from independent transmission providers, let alone energy efficiency providers that might very well provide a more cost effective alternative years sooner. Short of the restructuring of the T&D planning and investment process entirely, perhaps it would be possible to recognize the locational value of efficiency in a market setting as well.

Texas is likely to make some changes to its market in the coming months and years. In the past, as Texas' market was re-structured, so has its approach to energy efficiency. **This could be an opportune time, then, to explore new ways to achieve more *market-based* energy efficiency. Given that energy efficiency is often the low-cost resource, and given Texas' predisposition for competition and efficient markets, perhaps efficiency could be a competitor in Texas' market.** This paper explores why that is important, and begins the discussion of how it could work.

Introduction

Texas was the first state to ever adopt an Energy Efficiency Resource Standard (EERS) requiring electric utilities to incentivize energy efficiency and achieve a legislatively created goal for energy savings. It was a small goal but it put Texas in a leadership position for efficiency in the US. In 2007, Texas ranked 11th nationally according to the American Council for an Energy Efficient Economy's (ACEEE) state efficiency scorecard (Eldridge 2007). In the five years since then, Texas has dropped into the bottom third of states for energy efficiency attainment (Foster 2012) as spending on energy efficiency programs has remained flat while the rest of the country ramped up their efforts.

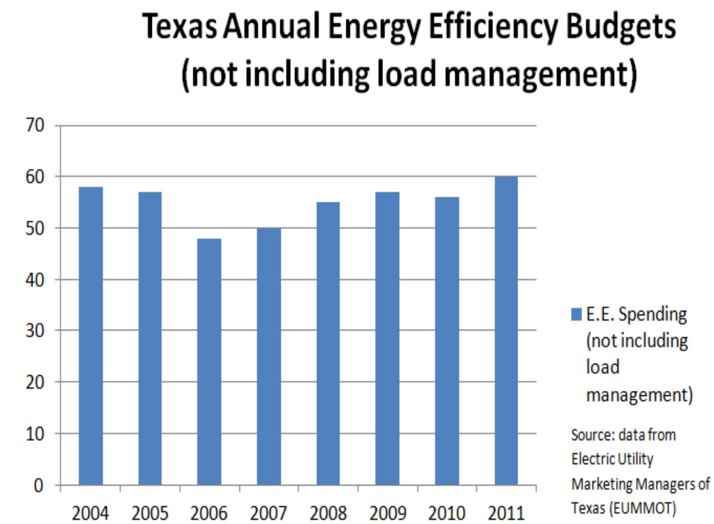

Figure 1 Texas spends roughly the same amount on energy efficiency now as it did in 2004. (Source: EUMMOT)

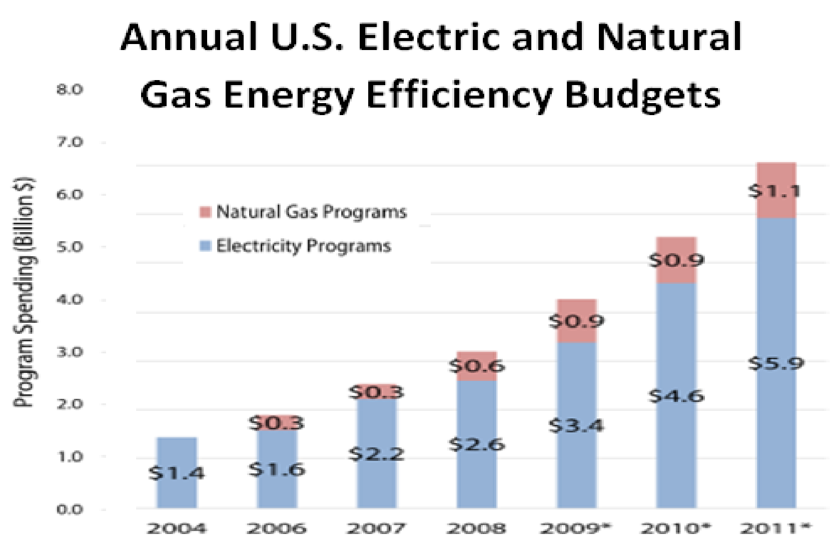

Figure 2 While Texas' spending remained flat, the US as a whole has quintupled spending on energy efficiency (Foster 2012).

Texas' initial leadership in efficiency has all but completely eroded to the point that of all the states with Energy Efficiency Resource Standards, Texas ranks dead last for energy efficiency spending per capita (Foster 2012).

This is unfortunate for many reasons. Despite the small state goal and eroding position nationally, Texas investor owned utility programs have yielded significant results[3]. From 2003-2011, these utility energy efficiency programs helped the state avoid building generation that would have cost three times as much as the programs did, yielding a net benefit of $1.5 billion. Over the same time period, Texas consumers have realized over $3 billion in utility bill savings. Texas energy savings pale in comparison to what other states are doing:

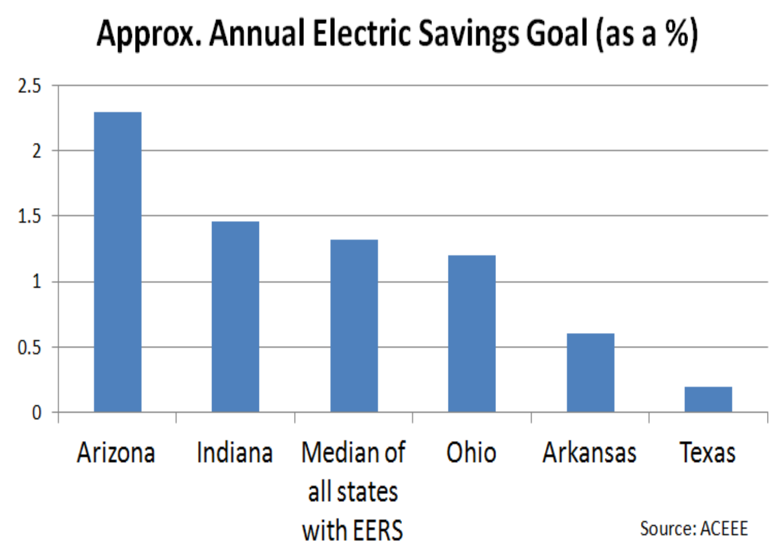

Figure 3 Even Arkansas has a goal three times that of Texas. Indiana's is 7x as large.

This erosion in the strength of Texas' efficiency programs relative to other states is partly a problem of perception. Over the last several years in Texas, Texas policymakers, regulators, and even some stakeholders focused on holding down short-term rates, viewing the investment in higher efficiency as inappropriate "subsidies," the result of unwelcome mandates by the legislature. But this perspective is a limited one, seeing the electric utility regulatory process as restricted to recovering the cost of power generation and delivery, not broad enough to encompass the potential to cost effectively influence demand. Efficiency can be bought in the broader marketplace, and consumers can in theory react to price signals in the form of electric power rates to change their consumption patterns in the long run. But there are significant structural barriers to attaining the optimum efficiency adoption levels both from an individual and from a systems point of view.

[3] Texas utility programs refer to the programs run by the Transmission & Distribution Utilities (TDU's, also called Transmission and Distribution Service Providers) which include 76% of the state's population. Of the roughly 150 municipal and cooperative electric utilities in the state, only a handful treat efficiency on the same plane with generation, notably Austin Energy, CPS-San Antonio, Denton Utilities, and Bluebonnet Electric Co-op, and what incentive programs exist at this level are more oriented toward providing member benefits than a real resource.

A public compact was reached about a century ago in which monopolies were granted for the production and delivery of electric power, because it was the prudent and efficient way to deliver power. The electrification of the country that resulted was named by the National Academy of Engineering as the greatest engineering achievement of the 20^{th} Century (NAE 2003). Many states have now adopted and accepted a similar compact by which they recognize that consumers collectively will not invest optimally in efficiency, and that all customers will benefit from the adoption of efficiency which is more cost effective than constructing new power plants and more robust distribution systems when evaluated at an aggregate level. This assumption is based on the calculation of savings from efficiency technologies and techniques, and is made more conservative by the general exclusion from consideration of societal benefits such as cleaner air and water.

Many states have delegated to regulated utilities the responsibility for achieving greater efficiency; in other states an agency or non-governmental organization has been delegated the responsibility (IIP 2012)[4]. These programs help create, or strengthen the system for efficiency services delivery, not unlike the way the regulated utility systems today organize the delivery of electric power, and not unlike the organized markets states have created for the purpose of more efficiently buying and selling power.

But Texas' political leadership has largely, until recently, seen demand-side and supply-side resources associated with delivery of reliable electricity as completely separate. Electricity markets are more efficient when loads can freely and fairly bid into organized wholesale markets. When customers (individually or through managed aggregations) can send a signal indicating prices at which they will purchase less electricity, they balance the market power of generators, and contribute to efficient price formation.

While there are many changes that need to be made to allow loads to participate in short-term price interactions in the energy and ancillary services markets in ERCOT, demand response[5] is receiving more attention. Rather than establishing separate markets for demand response (even temporarily) the leadership and traditional stakeholders in Texas seem determined that load participation will be fully integrated into the market design. The Texas PUCT Chair has said on more than one occasion, that a market that excludes any resource will have higher prices than one that includes all options.[6] If demand response is integrated into the market design it will be a positive step forward for the Lone Star State. Energy efficiency, however, continues to be a blind spot for the State.

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[4] For a greater explanation of various models used to achieve higher levels of cost effective energy efficiency, see "Energy Efficiency Resource Acquisition Program Models in North America" by the Institute for Industrial Productivity (IIP 2012).
[5] According to the Federal Energy Regulatory Commission (FERC), the definition of demand response is as follows: Changes in electric usage by demand-side resources from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized.
[6] Paraphrased from statements in the March 14 hearing on Demand Response Project 41061 and testimony to the Texas Senate Committee on Business and Commerce, to mention two.

We agree that excluding any option from the market may result in higher prices for consumers than a more inclusive market design. And, given that the leadership views efficiency incentive programs as "out of market" subsidies only supported by mandates, we are inclined to search for a means to move energy efficiency directly into the market, because we know that many efficiency measures can compete effectively with central power solutions, even given that wind and gas have driven power costs lower than they have been in some years.

ISO New England and PJM, for example, include energy efficiency as a resource in their market design, allowing it to compete directly against generation. Though only implemented in the last 4-6 years in those markets, the contribution of energy efficiency to capacity markets there has risen sharply to over 1,100 megawatts in PJM and over 1,5000 megawatts in ISO-NE. In the Pacific Northwest, energy efficiency will provide 85% of new electric demand over the next 20 years (IIP 2012). Perhaps the inclusion of efficiency in the ERCOT market would be a topic of discussion as well, if the ERCOT market design included a capacity market. But, as the only energy-only market in the US, it is our unique challenge to consider how efficiency might be allowed to compete openly and fairly in the Lone Star State.

Efficiency as a Resource

It is not common in Texas to think of energy efficiency as a resource, but long experience in many states has proved that efficiency can be counted on to meet system-wide demands. As a low-cost resource, energy efficiency can help keep prices in check for consumers and help system planners meet the challenge of future growth in demand in a cost-effective way. As the graphic below shows, energy efficiency is at least competitive and almost always cheaper than other forms of generation.

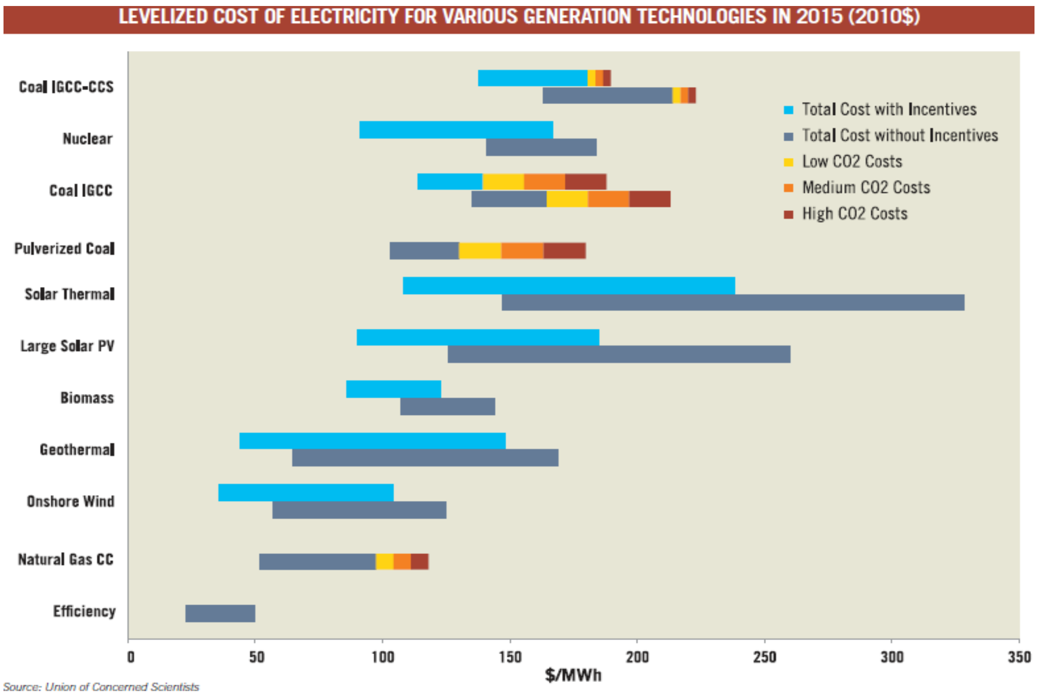


Figure 4. This graph shows efficiency to be competitive with even the very lowest costs of electric generation and a fraction of the cost of more expensive technologies. Graphic from Union of Concerned Scientists using Lazard data (Ceres 2012).

Energy efficiency incentive or rebate programs have been established in Texas, as in most states, to both obtain the value of energy efficiency, and recognize the market failures or imperfections which lead to the undersupply of energy efficiency. These programs, often administered by utilities under state or local laws, transfer some of the public benefit of new efficiency measures to the individuals making the investment. For the past 20 years or so, these programs have essentially provided energy efficiency programs, selected via administrated request for proposal processes, that have relied upon the benefits being measured or calculated by a central authority.

Texas utility programs, though small when compared on a per capita basis to every other state with an Energy Efficiency Resource Standard like Texas's, have been incredibly successful. The utility programs accounted for a total of $832 million in efficiency spending from 2003-2011, resulting in avoided cost of generation of nearly three times that amount: $2.3 bilion. Participant bill savings were even larger, estimated at $3.3 billion.

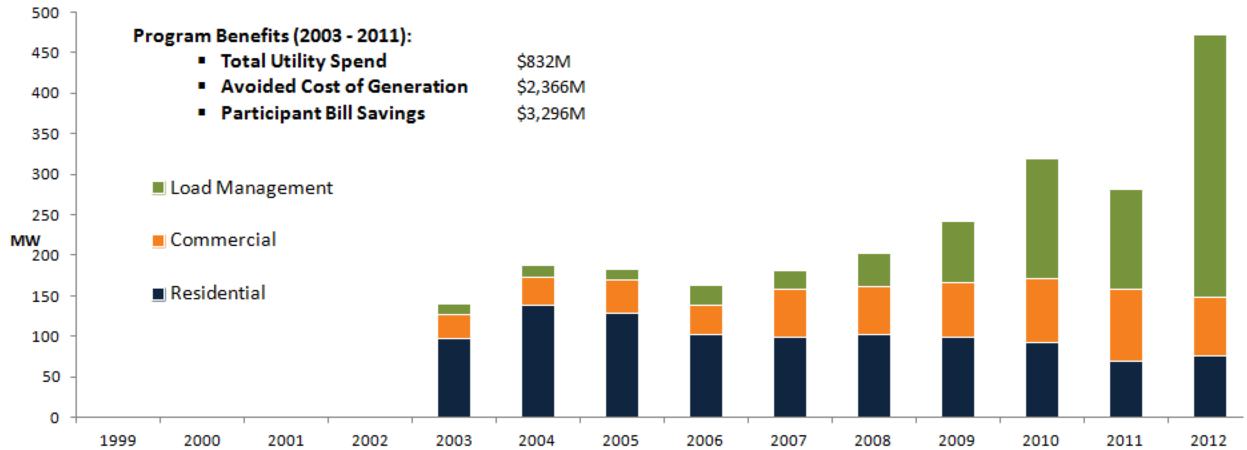


Figure 5: From the beginning of the utility energy efficiency programs required by the Legislature in the deregulated market, efficiency has proved its worth. A little over $800 million in spending has avoided $2.3 billion worth of generation and $3.2 billion in bill savings. Source: CleaResult

The success hides the fact that Texas is leaving billions of savings on the table. And while there is little to no regulatory or legislative appetite for increasing the utility programs, it is possible that energy efficiency in Texas could compete directly with generation in either an energy-only or capacity market structure. In so doing, energy efficiency could help solve one of the biggest problems facing Texas right now: resource adequacy.

The Resource Adequacy Challenge: Peak Demand and the Current Market Structure

Texas' current resource adequacy challenge is characterized by a shortage of resources to meet peak demand. That is, the problem occurs:

- Those 50-100 hours when demand is 2-2.5 times higher than during off-peak hours, and
- When all available generation resources are being used, and
- The grid falls near or below the reserve margin goal in place at that time, increasing the risk of rolling outages.

The table below shows just how rare scarcity pricing is in Texas, occurring less than 1% of hours even in a year of extreme temperatures like 2011.

SCARCITY PRICING INCIDENTS[7]		
$/MWh	**% Hrs. 2011**	**% Hrs. 2012**
$<0 - $50	91.7%	97.7%
$50 - $100	5.9%	1.4%
$100 - $1,000	2.0%	0.9%
$1,000 - $2,000	0.1%	0.03%
$>2,000	0.3%	0.01%

The chart below shows the price duration curve, the wholesale price of electricity on the spot market at its peak. Even in the extreme heat wave of 2011 (90+ days of 100 degrees in Austin, for example), the system wide offer cap was only reached for a total of 28 hours. Though it is not on the chart below, in 2012 the cap was reached for only 1.5 hours.

[7] From the presentation of Paul Wattle of ERCOT to the Gulf Coast Power Association, April 2013.

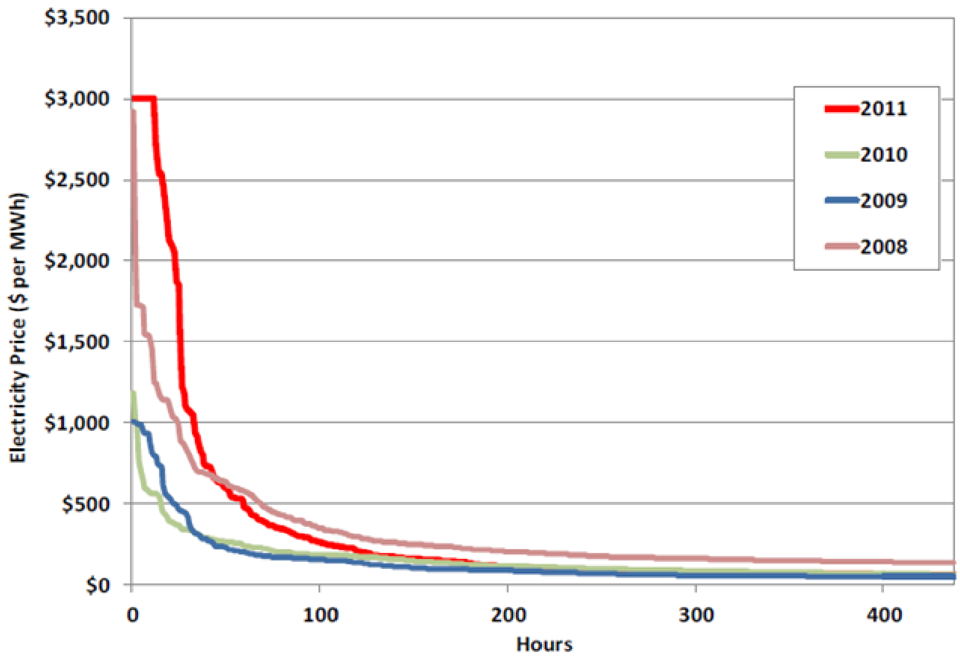
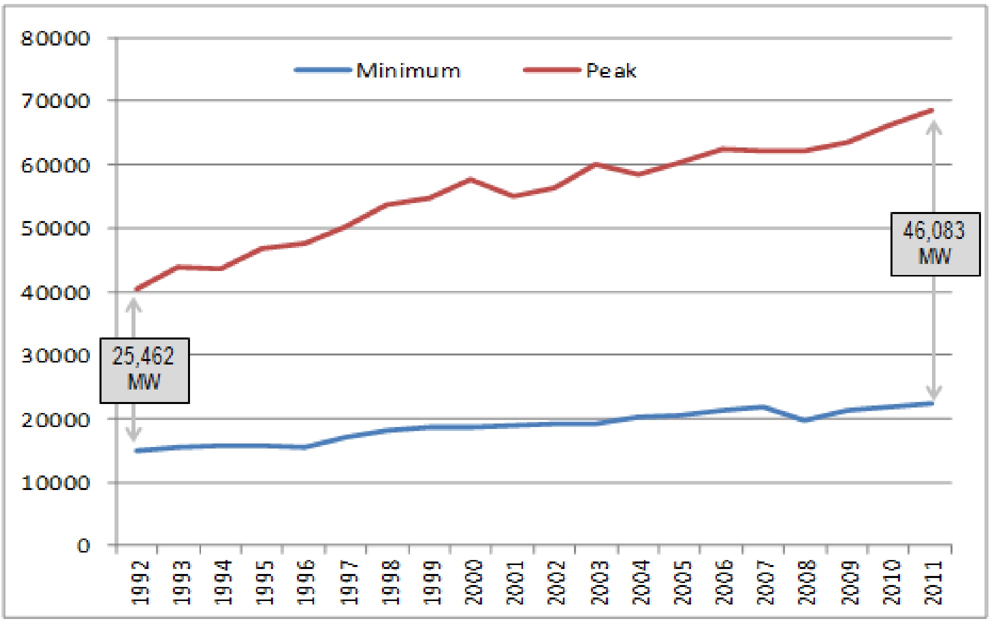


Figure 6. Texas' problem with meeting peak is a problem for very few hours during a year.

The above graph highlights why there is such a focus on demand response in ERCOT. While the discussion concerning ERCOT market design has focused on stimulating the construction of additional power plants, it is apparent to the most casual observer that meeting peak demand for a few hours a year could be addressed at lower cost with demand response resources.

The graphic below demonstrates that the peak issue is only growing more acute as the state continues to grow and consumption patterns (particularly including the adoption of an increasing array of electronic appliances) continue to increase peak demand at a faster rate than average consumption. Peak growth has outpaced that of minimum load significantly over the last 20 years, and the trend is not abating.



Annual system peak hours vs. lowest load hours

Figure 7. The gap between peak and baseload demand has grown by over 20,000 MW over the past 20 years. Source: ERCOT

We need to understand the source of peak demand, however, to address it fully. Another graphic from ERCOT provides the answer. On the left side (Figure 8, below) is a typical spring day in Texas, and on the right was a very hot one the day when ERCOT set its all time peak to that point.

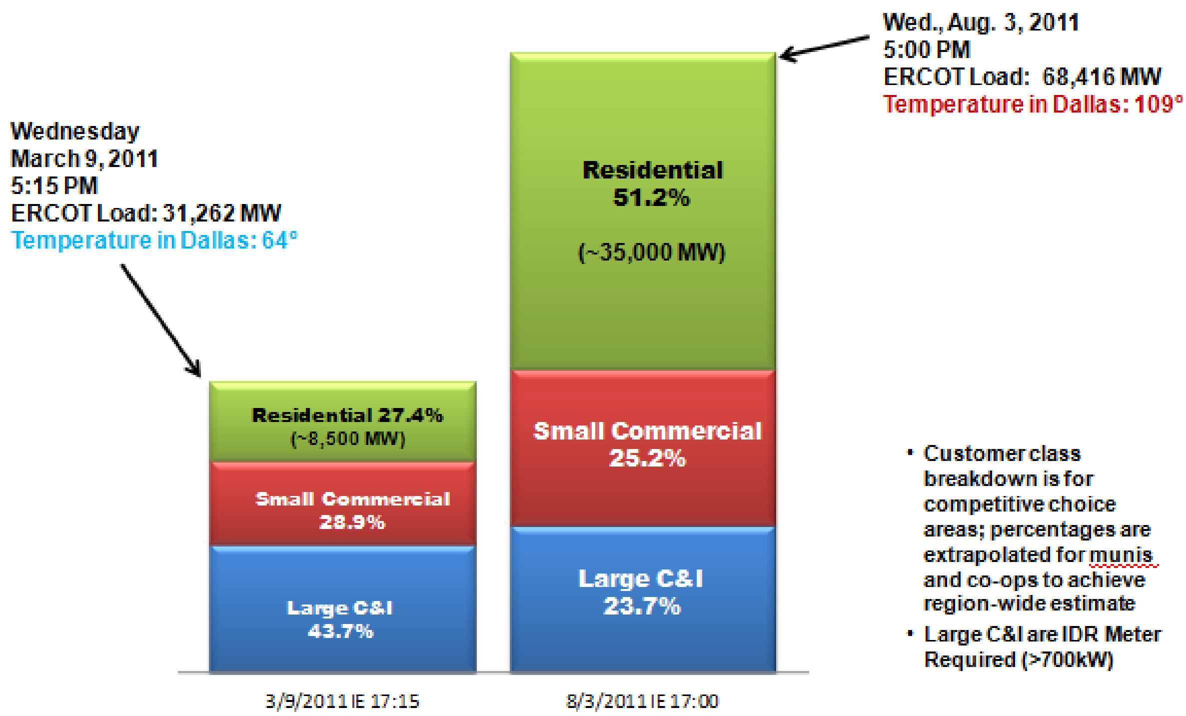


Figure 8: Residential demand quadruples, and small commercial nearly doubles, in the summertime, driven by air conditioning load on hot days. Yet, demand response programs largely ignore these segments, and energy efficiency programs reduce only a small amount of what is economically achievable. Source: ERCOT

Large commercial and industrial (C&I) loads rose by 16% in the comparison between the mild March day and the all-time peak set in August 2011. Small commercial loads increased by 91%. **Residential loads increased by 300%.** Outages were avoided that day, but only barely. Emergency Response Service (then called Emergency Interruptible Load Service) was put into place and the lights – and far more importantly, the air conditioning – stayed on. But how do we make sure it will then next time, when that load may push even higher than 68,416 MW?

The usual solution is to build more generation. The PUCT hoped to incent generators to build new capacity by tripling the system wide offer cap to $9,000/MWh during times of scarcity. It is uncertain as to what the cost to the system will be from market design changes adopted for the coming years, much less for additional changes under consideration. According to the Texas Industrial Energy Consumers, the $9,000 offer cap would have cost Texans over $13 billion had it been in effect in 2011 (TIEC 2012). The Brattle Group predicted a smaller impact, using a different set of assumptions.

Looking at the chart above, however, it is critical that the PUCT and ERCOT encourage demand response programs which will be available to the residential and small commercial segments. Demand response in Texas has been tailored to industrial and some large commercial (C&I) customers with very little focus on small commercial or residential sectors. Yet, more than 75% of the summer peak is comprised of those small commercial and residential customers. DR programs designed and tailor-made for large industrial customers will not by themselves solve the peak problem.

Demand response needs to evolve to include a focus on small users, but it will only do so if markets are designed to provide suitable incentives for participation by those customers. Currently, eligible demand response products are tailored to the capabilities of large customers, and ensure that demand response providers will stay firmly focused on large commercial and industrial customers. Payments are made based on taking large chunks of power demand off-line on short notice, something most small commercial and residential customers cannot offer. This market design limits the amount of demand response available to mitigate peak demand. ERCOT recently implemented and then extended a pilot with a 30-minute response time instead of the usual 10-minute response time, to make it easier for smaller customers to participate, but that did not address the source of the peak load: air conditioning.

Industrial users' load is typically not very weather sensitive. That is, a manufacturing line will use 5 MW whether it's hot or mild outside. Commercial buildings, apartments, shopping malls, homes, hotels, and restaurants will use vastly different amounts of power depending on the weather. ERCOT recently launched a "weather sensitive" loads pilot within the Emergency Response Service market to address this issue. The way Texas' DR programs have been structured to this point, a would-be DR participant has to bid the same amount of load for a four month period. Weather sensitive loads are higher during higher temperature periods, which are strongly correlated with summer peak loads, and therefore have the ability to offer more load reduction in August than in June. The Weather Sensitive Loads Pilot allows such loads to participate. It is the first real attempt by ERCOT to create a market for peak demand response, as opposed to the emergency operating demand response market initially created.

Because this initial pilot was approved very late in the spring, not long before applications were due to participate, participation will likely be limited in this first attempt. With more lead time and better communications, residential and small commercial DR may contribute significantly to meeting the state's peak electricity demand. There is a crucial tie to energy efficiency here, though. Homes and businesses that are not energy efficient will likely not be able to participate effectively in demand response programs. If the air conditioner is cycled off in a house without a tight building envelope, cool air will quickly leak, requiring the HVAC system to cycle on quickly.

Energy efficiency supports, and is a critical enabler of, demand response.

The Importance of Efficiency

Texas' dramatic peak demand for energy is driven both by the fact the weather can be brutal, and that the energy usage in older buildings particularly are very sensitive to the climate. Newer homes and commercial buildings are much more efficient that older buildings, thus their energy demand during the state's temperature extremes is significantly reduced. Since governmental entities are adopting increasingly efficient building codes[8], this trend should continue. The latest building code (the 2012 International Energy Conservation Code), for instance, reduces peak load by 29% for an equivalent

[8] Texas adopted the energy chapter of the 2009 International Residential Code in 2010, effective January 1, 2012. At least 19 cities have adopted codes higher than the 2009, including many of the fastest growing cities in the state (Houston, Round Rock, Richardson, to name a few). Enforcement and compliance is inconsistent however, and there is little clarity as to how many new homes are actually being built to these energy codes.

structure in the Dallas-Fort Worth area, compared to the 2009 code (Kim 2012).

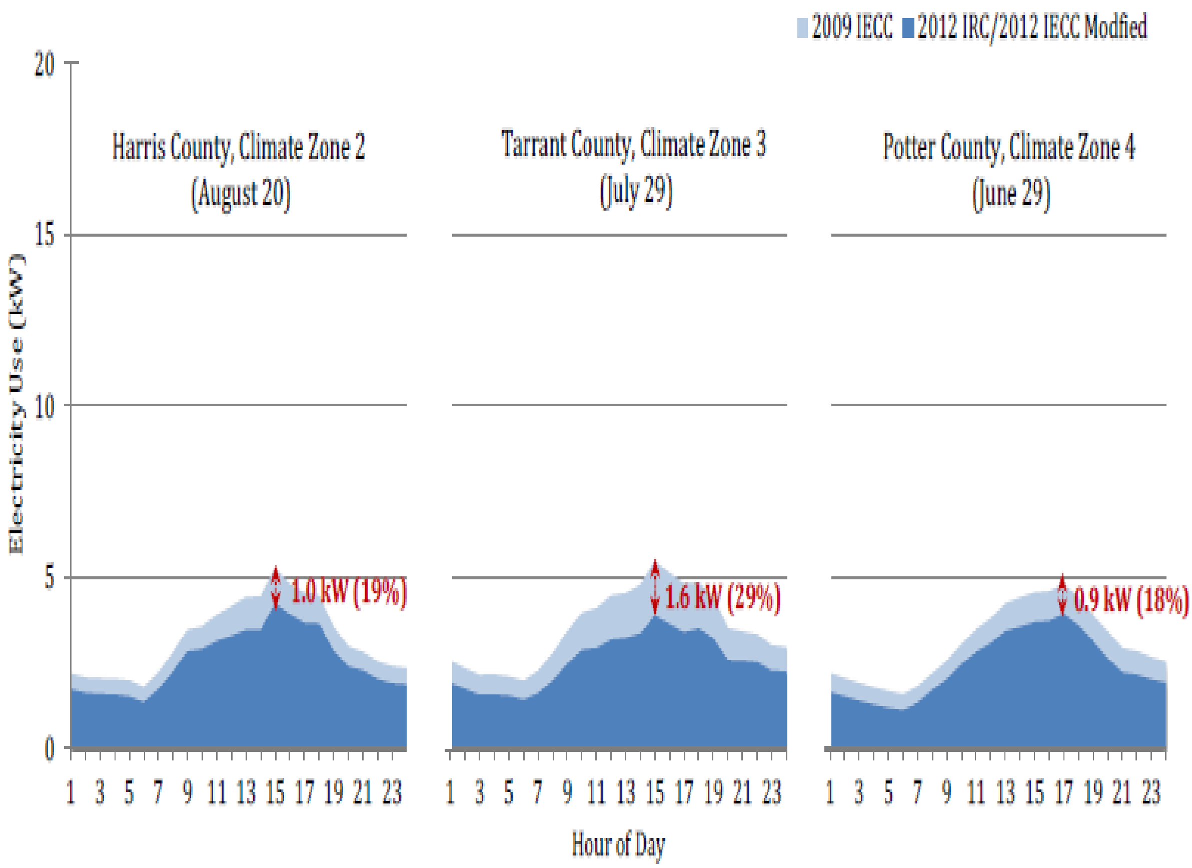


Figure 9: Peak Summer Day Hourly Electricity Use and Demand Savings for the 2009 IECC and the Modified 2012 IRC/2012 Performance Path Code-Compliant, Electric/Gas House (Kim 2012).

Particularly given the extreme weather demands of the Texas climate, a strategy to upgrade the climate resistance of the existing building stock could be a very cost-effective way to reduce the requirements—and costs—for new power and associated power infrastructure (like transmission and distribution system upgrades) for all customers.

The infrared picture of the older home below highlights the energy draining from the roof and windows. More than two-thirds of Texas' homes are more than 20 years old, thus pre-dating the statewide building code adopted in 2001; the vast majority of homes in Texas, if examined through an infrared camera, would look something like the house below.

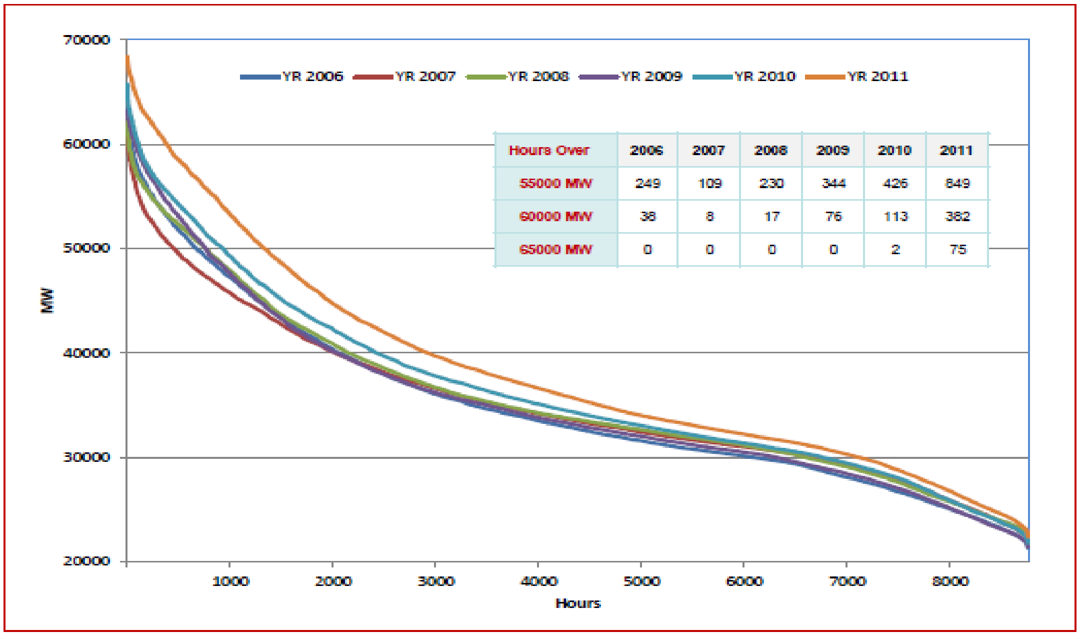
Figure 10: Most homes and buildings waste significant amounts of energy through air leakage. This waste causes acute problems for the electric grid on the hottest days when conditioned air is escaping through the leaky envelope.

In a thermostat management program piloted by Earth Networks (parent company of WeatherBug) with support of CenterPoint Energy, nearly 14 percent of participating homes couldn't even maintain the temperature in the home at the set-point on the hotter days, forcing their air conditioning to run constantly. And these voluntary participants in a new technology demonstration using in-home wireless service, two-way communicating thermostats, and real-time monitoring and controls were likely to represent a higher-valued sample of homes.

This weather sensitivity simply means these buildings are not well insulated, for example, or have inefficient windows and doors, or high rates of air infiltration. The inefficiency of most Texas homes are directly contributing to high peaks and high prices. Texas' market needs to address this major contributor to peak demand.

The load duration curves shown below, taken from an ERCOT staff presentation, show the more gradual slope associated with the impact of weather in Texas.

Load Duration Curves – 2006 to 2011



Hours Over	2006	2007	2008	2009	2010	2011
55000 MW	249	109	230	344	426	849
60000 MW	38	8	17	76	113	382
65000 MW	0	0	0	0	2	75

Figure 11: The Load Duration Curve shows the actual demand for power rises more gradually than price, so although demand response can address system peak costs, efficiency measures and permanent peak shift strategies are required to achieve system wide efficiencies that encompass the costs associated with designing T&D systems for peak demand as well.

This curve raises another point not highlighted by the price duration curve, and that is the impact of this demand pattern on other costs. Despite our oft stated inclination to include all resources in any market mechanism, to drive efficient resource allocation, the *implied* cost of transmission and distribution (T&D) is not addressed in the ERCOT market design. It is a hidden and growing cost, and an invisible subsidy to generation. This has led to a system that is over-designed for average loads and very expensive.

ERCOT has a transmission planning process aimed at reducing congestion and designed to provide the capability of delivering power from generators on the highest peak days. Texas transmission providers have been spending over $500 million a year for the first decade of this century, and then more than $1 billion per year in the last several years. The result of this myopia is that the billions of dollars invested in transmission and distribution assets are utilized on average only about 50% of the time.

Demand response is a cost effective means to avoid the highest market prices for wholesale power, addressing the needle peaks, but energy efficiency and permanent load shifting, investments to permanently reduce total demand or reshape the demand profile, are required to reduce this systemic inefficiency.

Ideally, Texas' electric market would allow for, and even encourage, a blending of energy efficiency and demand response, including participation by small commercial and residential customers. With an organized market that generated payments to energy efficiency resources that could meet system demand in competition with new generation, participation by smaller, weather sensitive loads would be encouraged. A more robust energy efficiency sector would end up stimulating local economies, improving both comfort and cash flow for residential and small commercial customers, while cost-effectively contributing to solving the resource adequacy problem in Texas.

The Search for Energy Efficiency Mechanisms

Over the years, as Texas' electric market changed and evolved, so has its approach to designing energy efficiency programs. Utility efficiency activities generally began in the 1970s, when utilities around the country began to adopt programs to assist their customers in saving energy, often intermixed with earlier marketing programs to encourage customers to adopt new "all-electric" homes and appliances. The current organization of utility efficiency program managers is still called the Electric Utility Marketing Managers of Texas, as a legacy of those older programs from half a century ago.

A set of criteria began to evolve through the regulatory process in the states, as to what constituted appropriate activities for utilities. Regulators stopped allowing rate recovery for marketing various electricity consuming appliances. Methodologies were developed to calculate the cost effectiveness of investments by the utility or its customers (or both together) in energy efficiency to guide the design of these programs.

By the late 1970s and early 1980s, the regulatory community was still developing processes to determine the optimal level of investment in energy efficiency. In economic theory, one would stop purchasing efficiency when the cost of the last watt saved was equal to the cost of the last watt produced.

If the benefits from efficiency were simply equal to the cost of electricity saved, and consumers had the information and analytical skills to optimally reduce their consumption, the market would provide the optimal level of investment in energy efficiency. However, in the real world consumers rarely make rational decisions with regard to energy consumption, and the social benefits of lower consumption can't be captured by consumers.

In a regulated electricity system, a vertically integrated utility is required to maintain a level of capacity that exceeded peak demand by a set percentage, usually referred to as the reserve margin. Because the quantity of excess capacity is determined by the level of peak demand, a reduction in peak demand also meant a reduction in investment in excess generation capacity. In the 1980s, regulators began to realize that reducing demand could be less expensive than investing in additional generation capacity, and incorporated "Demand Side Management" (DSM) into "Integrated Resource Planning," (IRP). The goal behind IRP was to include all potential resources, including DSM resources, into the utility planning process that determined the level of investment in generation capacity. Texas, among other states, adopted IRP for use by the investor-owned utilities.[9] Texas, among other states, adopted IRP for use by the investor-owned utilities.[10]

This was an approach that made sense when the Texas electricity industry was dominated by vertically-integrated regulated utilities, prior to unbundling the generation and retail functions in a competitive market. Each utility developed plans in which energy efficiency was weighed against a pure power generation approach to meeting electricity demand. Utilities submitted requests for proposals for both power and efficiency and ranked each according to their cost effectiveness, which helped further develop the process for monitoring and verifying the validity of energy savings from efficiency measures. But the amount of power and efficiency to be acquired were determined in advance by planners.

While the utilities were still vertically integrated, most of the system-wide benefits of energy efficiency could be internalized, so utilities were willing to invest in energy efficiency if the regulators would at least allow cost recovery for their program costs. For example, some utilities promoted the use of thermal energy storage and offered thermal energy storage incentive rates to encourage larger commercial customers to use cold water and ice storage systems to store energy at night (when the cost of generation was much lower), and cool their buildings during the day from their overnight storage. This reduced the need for distribution system upgrades, and leveled the loads on the utilities' generation fleets, avoiding the need to build additional generation, without reducing sales.

Then as now, the only way the utilities were allowed to make a profit for their stockholders, however, was to earn the regulated return allowed by the PUCT—the cost of financing, including the return on investment by the utility on generation, transmission, and/or distribution assets. The recovery of that allowed revenue was made through a volumetric charge for energy delivered and consumed. A reduction in sales below projected levels meant a revenue shortfall for the utility until the next rate hearing. Given that the IRP process was administered by the investor-owned utilities, efficiency—particularly efficiency that reduced overall sales—was granted a modest role in meeting the region's overall needs.

When the private, investor-owned utilities were unbundled in Texas, and a wholesale, and then a retail market was created to capture structural efficiencies and limit the burden of risk for consumers, the means of capturing the energy efficiency needed to be changed. The socialized benefits of energy efficiency were now scattered across separate competitive retail companies and generators, and regulated utilities, as well as end-use customers.[11] For those reasons, the state legislature considered

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[9] Municipally-owned utilities and electric cooperatives were not required to adopt portfolio management type approaches or later market variations on the basis that they are member owned and run. Their locally elected or appointed leadership was allowed to determine whether and how to integrate considerations of demand side management.

[10] Municipal and Cooperative utilities were not required to adopt portfolio management type approaches or later market variations on the basis that they are member owned and run. Their locally elected or appointed leadership was allowed to determine whether and how to integrate considerations of demand side management.

[11] Even with end-use customers, the benefits of efficiency are often split between the building owner and the tenant, or current owner and potential future owners, and so on.

energy efficiency acquisition programs as a 'stranded benefit' of the transition to a restructured market. Rather than losing that benefit, the legislature delegated to the regulated electric T&D utilities, within their own service areas, the responsibility to continue to acquire cost effective efficiency.

The question of how much energy efficiency was appropriate to acquire fell to the legislature, which declared that 10% of the rate of growth in demand should be acquired through efficiency. In the spirit of supporting the movement toward competitive markets, the legislation said that the T&D utilities would serve as the market-neutral administrators of the efficiency acquisition programs, and would not be allowed to offer services available competitively in the market. The primary mechanism for acquiring efficiency was to be a standard offer program.

The standard offers were, and are, envisioned as a means through which utilities could offer a standardized payment representing the public value of efficiency. Energy Service Companies (ESCOs), or retail electric providers (REPs), were to compete at the place of business or home of each customer to deliver energy efficiency services. Using these payments as incentives to stimulate additional energy upgrades by consumers or builders should lead to more energy efficiency for end-users and system wide. Competition assures the maximum benefit delivered per dollar of utility contribution.

Unfortunately, the reality in practice has not lined up with the theory. REPs have opposed the utility administration of the efficiency programs because they see them as competing with their own customer offerings. Most REPs have also opposed increasing customer charges to fund efficiency programs, because those charges show up on their bill and just have to be passed on to the utility to spend.

Although it was anticipated that the REPs would be a primary delivery vehicle for the utility efficiency programs, at least during a transition period, the utility administered program funds are far too modest to be useful to a REP interested in creating an efficiency services program offering in the competitive market. As a result, the competitive efficiency offerings by REPs are extremely modest, at least for all but their very largest customers.

Why is that? One of the challenges the State is discovering about the energy-only market design is that the competitive retailers cannot claim a secure hold on their customers in the way the former incumbent monopolies could. This has made bankers reluctant to fund new generation (because they are not guaranteed a customer base either) beyond a certain point to meet the demands of what is an uncertain customer base. In fact, this uncertainty—and the negative effect it has had on investment in generation—has become the focus of a major public dialogue about resource adequacy in the state.

The implications for energy efficiency investment are even more extreme, however, than for generation investment. Most retailers are reluctant to push customers to sign up for more than a one-year contract in fear of losing the customer to a competitor, and consumer protection rules allow customers to switch providers every 30 days in the absence of a contract. So, while a REP's customer base in general may seem somewhat stable, any one customer is a very high risk, and investments in long-payback items like ceiling insulation or efficiency upgrades both reduce immediate revenues, and require much longer customer commitments. No REP has yet emerged that has been able to turn higher quality services, such as efficiency upgrades, into longer-term customer relationships in the mass market.

In the absence of implementation by REPS, the legislature increased the goal for the transmission and distribution utilities to 20% of growth in demand (2007) and the PUCT increased the efficiency goals to 30% of growth in demand (2010). When the market finally looked like it might begin to grow substantially coming out of the recent great recession, the legislature put a ceiling on the utility efficiency goals of 0.4% of the utility's total residential and commercial demand (2011). Depending on the rate of growth over the next few years, the 0.4% goal will likely be less than 30% growth in demand; in any case, it pales compared to the 2% of total demand goals fast becoming the standard for many states with energy efficiency programs.

The PUCT also adopted language that further eroded funding for the programs by allowing a wide range of commercial and industrial customers to simply opt out of any contribution to, or participation in, the programs. As noted, Texas has fallen in efficiency program ranking from 11th to 33rd among the states according to the American Center for an Energy Efficient Economy. This is all emanating from the fact that Texans, or at least Texas leadership, have stopped thinking of efficiency as a resource, and have come to consider them to be no more than "out-of-market" subsidies or mandates.

If energy efficiency could participate in the market, as a fungible commodity like generation, perhaps it would be easier to see energy efficiency as a resource. One possible way to proceed is to transfer all "standard offer programs" into the market when they can compete against generation, while increasing utility goals and funding for utility run "market transformation programs." That is, move acquisition of accepted and commercially available efficiency measures into the market in some form, and focus the utility programs on overcoming market failures unlikely to be resolved by the simple imposition of a more organized market mechanism. This could continue the utilities' vital role in expanding markets for new energy efficiency technology or services which have yet to reach scale, or where significant market failures or barriers exist, while forcing more established efficiency measures and projects into a competitive market where it can compete and win or lose based on its price.

As the ERCOT market monitor recently noted, "one megawatt is as good as another." The marketplace at ERCOT is not built to recognize differences for the most part. So, for example, it is indifferent to whether demand response comes from industrial, commercial, or residential customers. At the price ERCOT offers for demand response, larger customers can afford the necessary labor or equipment to participate, but it would take several years to pay a residential customer for the cost of in-home controls. The irony is that residential customers are largely driving the ERCOT market peak demand (see Figure 8), and have the lowest cost of lost load. Someday, every home will automatically be equipped with two-way communicating home controls, and will be more efficient. REPs will then be able to see residential customers as a competitive resource, but today the market structure is delaying this transition. Utility administered market transformation programs could initiate the movement to overcome that market barrier.

Energy Efficiency Auctions in Capacity Markets: A Known Commodity

While the compensation of energy efficiency resources in energy-only markets would be novel, it is not in capacity markets. Over the last year in Texas, capacity markets have been a topic of many discussions. Should the Commission decide to implement a capacity market, energy efficiency should be part of the design right from the beginning.

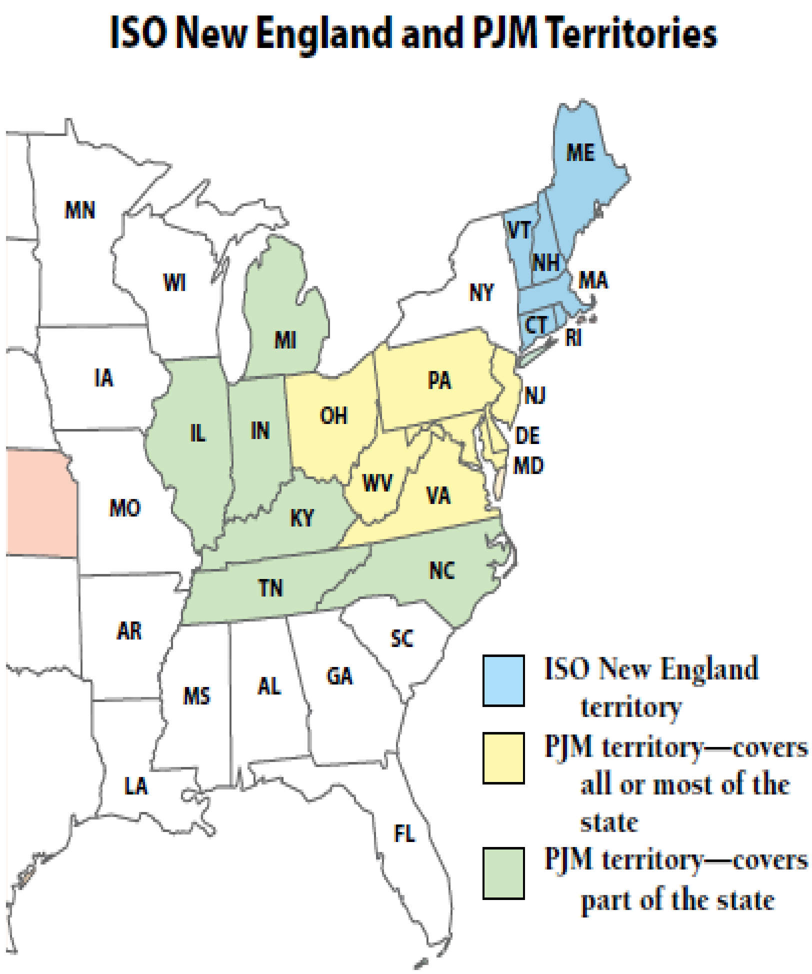

Figure 12: PJM extends into 13 states. ISO-NE covers six states (Gottstein 2010).

Energy efficiency is compensated as a fungible commodity with other supply-side and demand-side resources in two capacity markets, ISO New England and PJM. In those markets particularly, the meaning of capacity has expanded significantly over the last six years as regulators and grid operators began to understand the magnitude of the missed opportunity of leaving demand side resources out of the resource mix. More recently, as of 2012, MISO, or the Midwest Independent System Operator, introduced energy efficiency into its capacity market (Midwest ISO 2012a). The trend is clear.

Energy Efficiency in ISO-New England's Forward Capacity Market

ISO New England began including energy efficiency in its forward capacity market auctions in 2007. In the first auction, several hundred megawatts cleared. Only five years later that number had jumped to 1,500 MW. To put that in context, ISO-NE is less than half the size of EROCT. A proportional amount here would mean over 3,000 MW, or about the size of the peak demand of Austin Energy's customers.

But it's not just power plant costs that are deferred. According to Stephen Rourke, VP of System Planning for ISO-NE, capturing and accurately calculating energy efficiency saved big dollars in transmission alone: "The revised analysis shows that the region can actually defer 10 transmission upgrades that earlier studies showed were needed to ensure system reliability. By deferring these upgrades, the region will save an estimated $260 million" (Rourke 2012). Texas could similarly save large amounts of money by procuring cost effective energy efficiency as a resource.

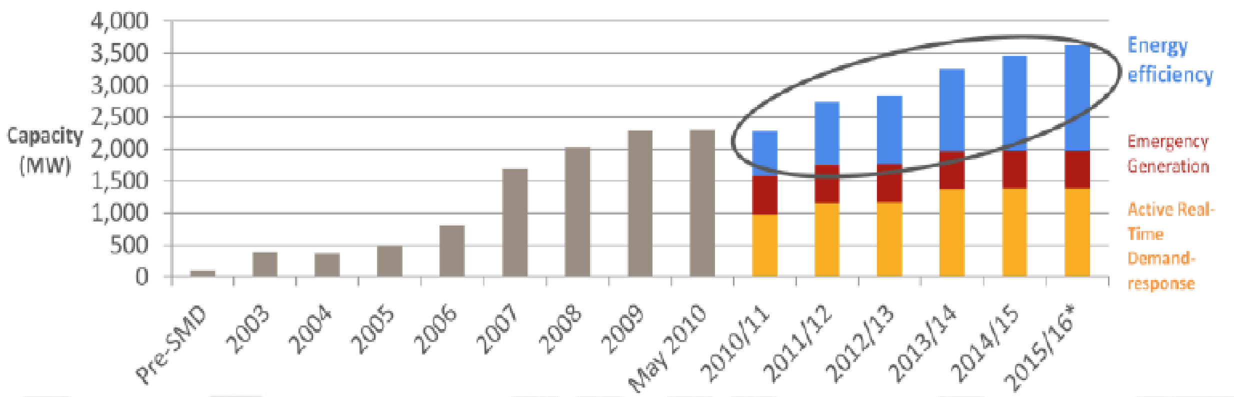

Figure 13 Energy efficiency has doubled in ISO New England's capacity market since 2008. It accounted for 1,500 MW in the latest auction (for delivery in 2015-16) (Rourke 2012).

Energy Efficiency in PJM's Capacity Market

PJM, or what used to be called the Pennsylvania-New Jersey-Maryland Interconnection, serves 60 million people in 13 states and has a peak load of 164,000 MW, about twice the size of ERCOT. It has run the Reliability Pricing Model (RPM) auction since 2007 and, just like ISO-New England, it runs on a three-year forward basis. PJM first allowed energy efficiency to participate in the RPM auction in May of 2009 for delivery year 2012. Energy efficiency has a steady growth pattern in PJM as in ISO-NE, though it hasn't reached the levels of ISO-NE yet. Still the growth is notable:

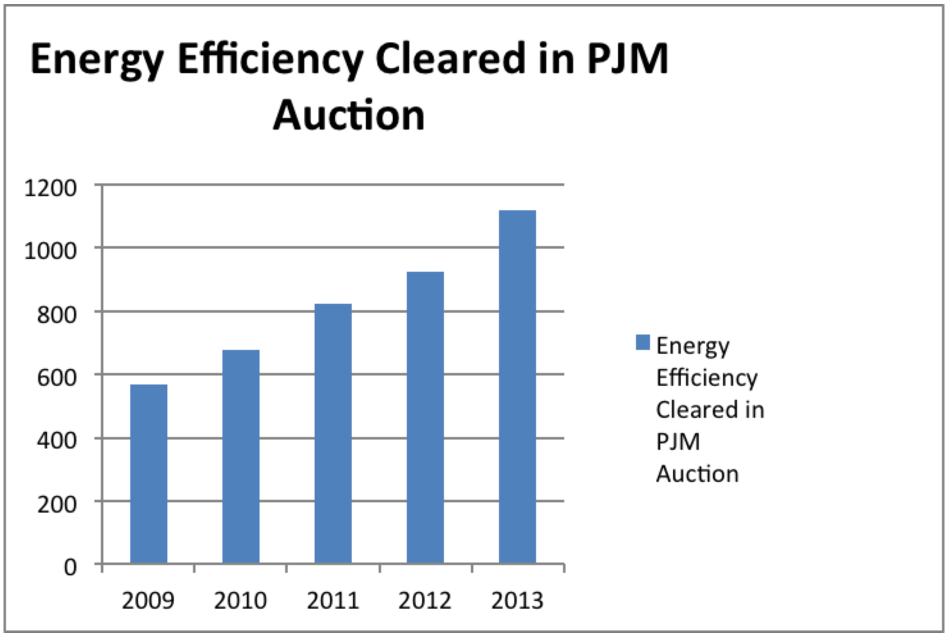

Figure 14: PJM's forward capacity market cleared over 900 megawatts in last year's auction, a 57% increase over the first auction when energy efficiency was allowed to participate just three years ago (Sotkiewicz 2012; Harvey 2012; PJM 2012).

The 2012 auction saw a 5% increase for DR resources and a 12% increase in energy efficiency. Paul Sotkiewicz, Chief Economist for PJM, wrote: "If EE follows DR in its evolution, then much more capacity will be made available in subsequent auctions" (PJM 2012). In the 2013 auction, just completed last month, energy efficiency increased more than 20%. Demand side resources now account for a majority of the new capacity procured through the RPM auction (both the red and green bars below represent demand side capacity).

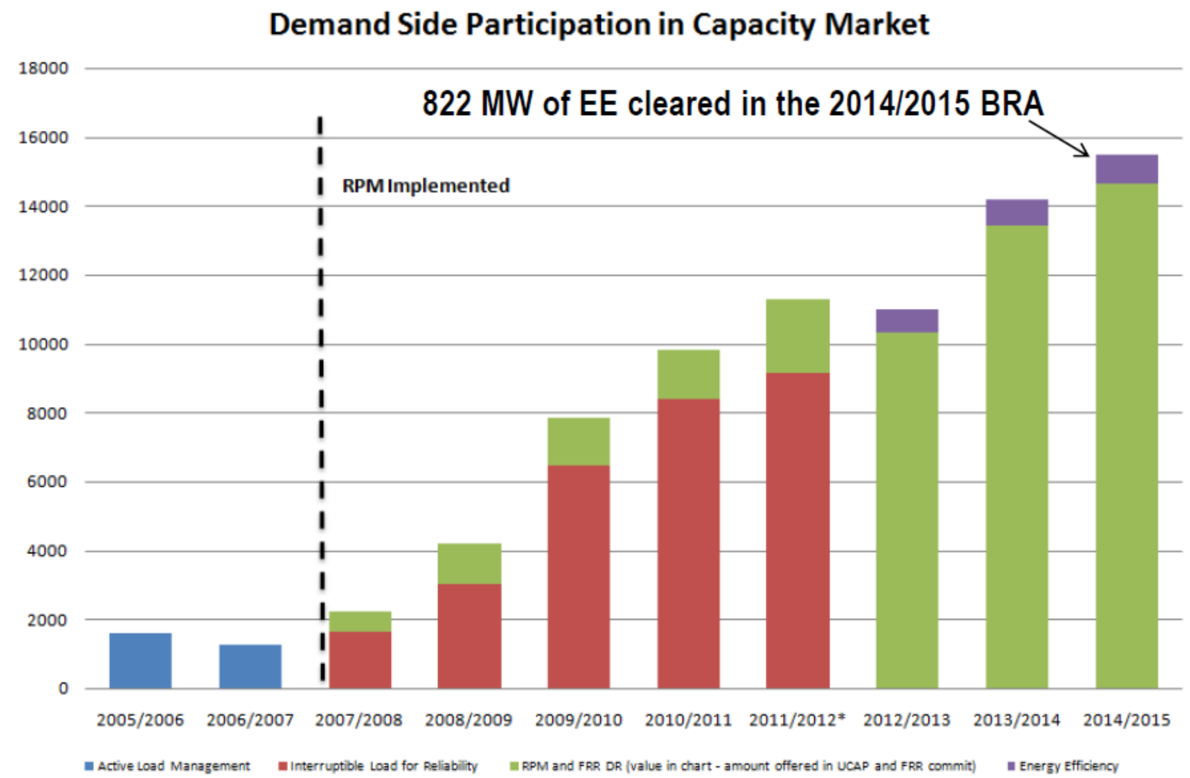

Figure 15 Demand Response has risen to over 14,000 MW over the last 8 years, but its growth has slowed in the last three auctions while energy efficiency has grown by about 20% per year (Sotkiewicz 2012).

In PJM's 2012 auction, over 15,700 megawatts of demand side resources cleared the RPM while less than 5,000 MW of new generation did (PJM Fact Sheet). Often, advocates and pundits bemoan the picking of winners and losers by political entities. **But excluding resources from competition is the penultimate act of picking winners.** The losers are not only providers of demand side resources, but consumers as well.

If demand side resources, including energy efficiency, are allowed to compete directly against generation, they can win and help keep prices down.

Further, energy efficiency and demand response represent far less risky resources for meeting system demand than generation. The upfront investment is less and the assets are smaller scale and potentially far easier to finance than generation investments which has several high risk factors. Electric resource risk was examined in depth by Ceres in a paper called "Practicing Risk Aware Electricity Regulation" (Binz 2012). The conclusion: efficiency was not only the lowest cost resource, it was also the lowest risk resource.

Figure 16: Efficiency represents lowest cost *and* lowest risk (Binz 2012).

Energy Efficiency in Capacity Markets: A Step Forward But Some Perspective

The successful integration of energy efficiency into the capacity markets of ISO-NE and PJM are important market-based indicators of the potential for the resource in two important respects. First, as a matter of substance, it shows that energy efficiency can make a meaningful impact in meeting demand. Second, as a matter of administration, each market has established rigorous market inclusion and measurement and verification practices to a degree that both ISO-NE and PJM fully rely upon the resource to “show up” in meeting market resource adequacy requirements.

Again, these are essential steps forward. But taking the analysis one level deeper reveals important lessons from the experience of ISO-NE and PJM with energy efficiency to date – lessons that may enable Texas to improve upon these approaches in a way that just so happens to integrate energy efficiency into the pre-existing ERCOT energy-only construct.

Capacity Markets and the Incomplete Compensation of Energy Efficiency

The growth of energy efficiency in the capacity markets of ISO-NE and PJM is noteworthy. It must also be appreciated that the vast majority of energy efficiency resources provided into ISO-NE and PJM are not supported by the price signals of capacity payments themselves. Capacity markets have instead functioned primarily as mechanisms for investor-owned utilities and more sophisticated municipalities and cooperatives to cover 10-15% of already mandatory efficiency portfolio budgets. So the growth in energy efficiency in each capacity market, while certainly impactful for resource adequacy planning, should probably be understood as representative of the adoption curve of investor-owned utilities, municipalities, cooperatives, and their third-party implementers of the operational requirements necessary to bring energy efficiency programs into capacity markets.

Participation from independent ESCOs that are not otherwise subsidized by state or municipally mandated efficiency programs is developing, but more limited. The reason is that capacity payments are in many cases not sufficient – in and of themselves – to support significant growth in non-subsidized, private sector investment in energy efficiency.

At its core, a capacity market is a regulatory construct that provides a price signal to supply-side resources to either: (A) build new supply to meet expected demand or reserve targets, or (B) engage in capital improvements to existing supply assets, thus keeping such supply online in out years. Demand-side resources fit into the construct well because they either mitigate the need to build new supply or price out the capital expenditure required to keep an existing supply-side resource online, thus retiring that supply.

Any generator who takes a position in a capacity market understands that the lion's share of its revenue will be derived from compensation received in the energy market. While ranges vary, as seen in Figure 17, capacity payments make up between 15 – 20% of proceeds to the resource; energy makes up between 80 – 85% (Source Monitoring Analytics 2012). It goes without saying, but for the sake of clarity: **capacity markets are not and never were intended to fully support any resource type's entrance and performance in electricity markets.**

Total Cost of Electricity Procurement in PJM in 2010 and 2011

Category	2010 $/MWh	2011 $/MWh	2010 Percent of Total	2011 Percent of Total
Energy	$48.35	$45.94	72.5%	73.4%
Capacity	$12.15	$9.72	18.2%	15.5%
Transmission Service Charges	$4.00	$4.42	6.0%	7.1%
Operating Reserves (Uplift)	$0.79	$0.79	1.2%	1.3%
Reactive	$0.44	$0.42	0.7%	0.7%
PJM Administrative Fees	$0.36	$0.37	0.5%	0.6%
Regulation	$0.35	$0.32	0.5%	0.5%
Transmission Enhancement Cost Recovery	$0.21	$0.29	0.3%	0.5%
Synchronized Reserves	$0.06	$0.09	0.1%	0.1%
Transmssion Owner (Schedule 1A)	$0.09	$0.09	0.1%	0.1%
Day Ahead Scheduling Reserve (DASR)	$0.01	$0.05	0.0%	0.1%
Black Start	$0.02	$0.02	0.0%	0.0%
NERC/RFC	$0.02	$0.02	0.0%	0.0%
RTO Startup and Expansion	$0.01	$0.01	0.0%	0.0%
Load Response	$0.00	$0.01	0.0%	0.0%
Transmission Facility Charges	$0.00	$0.00	0.0%	0.0%
Total	$66.72	$62.56	100.0%	100.0%

PJM Capacity Auction Results: (for RTO, $/MW-day)	2009/10	2010/11	2011/12	2015/16
	$102	$174	$110	$136

Sources: PJM RPM Base Residual Auction Results;
Monitoring Analytics, State of the Market Report for PJM, March 2012

Figure 17: Capacity payments make up a small percentage of the value of an energy resource (Monitoring Analytics 2012).

But for energy efficiency, again, capacity markets are the *only* market-based compensatory mechanism for the resource in ISO-NE and PJM. The energy markets of both system operators are not yet available for energy efficiency. And so the Ceres paper 's conclusion (discussed in the above section) does remain true – that efficiency is the lowest cost resource, but that fact has no absolutely bearing on the potential for increasing the role of the resource if private markets do not fully compensate energy efficiency for the value it provides.

With this, the practical impact of energy efficiency's inclusion in *only* the capacity markets in ISO-NE and PJM is to function as: (1) a resource adequacy planning mechanism for system operators (very important), and (B) an energy efficiency program cost mitigation tactic for state or municipally-mandated efficiency programs. It would, therefore, be a mistake to conclude from the development of energy efficiency in ISO-NE and PJM over the past seven years that the capacity market constructs have led to the creation of a large amount of new energy efficiency. This is to say that the experience to date in ISO-NE and PJM ought be treated as useful data points for how system operators have brought energy efficiency as a resource into market-based settings, and not as complete models for how the resource might be more appropriately be compensated. The good news is that there is even more promise for non-subsidized, private sector energy efficiency in an energy-only market setting.

Energy Efficiency as a Resource in an Energy-Only Market

The PUCT, ERCOT and the stakeholders of the ERCOT market are seriously considering changes or additions to the market structure to enhance the current energy-only market. The ongoing problem with attracting enough investment to meet peak demand has the PUCT deliberating on what changes are needed.

Energy efficiency should be an explicit part of the solution because any solution that excludes a potential competing resource will result in higher prices. In the previous section, we explored including energy efficiency in a capacity market setting. Regardless of whether the decision is made in Texas to keep the current energy-only market with enhancements to ensure a higher level of reliability or to add a capacity market, the inclusion of energy efficiency can and should be included as an enhancement.

ERCOT is already considering developing a mechanism for participation of loads in the energy market, an initiative referred to by the short-hand of "Loads in SCED." (SCED is the "security constrained economic dispatch" engine behind the continuous transactions that make up the balancing energy market.) Progressive retail electric providers (REPs) today can already use energy savings by the customers as a hedge against a plant tripping off line, or as an option to a financial hedge against unexpected price spikes. These actions are largely limited to short-term manipulations, like demand response, however, and don't usually include significant investment in longer-term energy savings, or real base-load demand reductions that would also reduce REP revenues year round.

Larger industrial or commercial customers may have the scale and sophistication to make investments that improve their ability to respond better to market opportunities and avoid downsides. And, they have scale enough that REPs may help them do so to avoid losing their business. Smaller customers, and especially residential customers, are unlikely under the current market structure to attract that kind of attention or assistance. Why not develop a mechanism to recognize the real value of energy efficiency in an ongoing manner that allows that value to be shared with anyone that can deliver the benefit within the market?

It is our challenge to consider what market design might allow the fair and open competition between generation, demand response, and more permanent load reductions or load shifting associated with energy efficiency upgrades.

Anyone other than a building sciences professional who has attempted to undertake their own home improvements to achieve reduced energy needs, has quickly learned the complexity of that task and experienced the hassle factor associated with execution. As an organization composed of a broad range of companies and professionals engaged in making or delivering efficient products and services we acknowledge we represent a diffuse and decentralized "industry," if that term can even be used. A fundamental underlying reason for the genesis of SPEER itself is to explore the means for creating more order within our own ranks. We are convinced that the market could be improved, and customers better served, if we could evolve an "organized market" for energy efficiency upgrades.

Capacity markets allow third-party energy efficiency providers to capture the public value of efficiency capacity contributions. By doing so in a market, the providers of energy efficiency, demand response, and distributed generation are literally going head-to-head with central generation.[12] To the extent that these demand side resources can capture congestion costs associated with transmission and distribution congestion, they may even be able to compete with new transmission and distribution.

In theory, energy efficiency should be able to compete directly with other options for meeting our energy needs, even in an energy-only market. In point of fact, ISO-NE and PJM already model the effect of energy efficiency into the demand curves used by each market to structure price in their energy markets. This means that while energy efficiency is not presently "compensated" in the energy market of either ISO-NE or PJM, the effect of the resource's participation has been in full effect in both the capacity and energy markets for years. Understood this way, one might think of the performance of energy efficiency in the energy markets of ISO-NE and PJM as a resource that is recognized and relied upon but not fully compensated. In other words, energy services providers are paid for capacity reductions but not for energy, thus compensating providers for a very small portion of the actual value of the efficiency delivered, which must then be captured in transactions with the energy end user.

In an energy-only market, the capacity value of generation, or demand response by loads, is theoretically embodied in the incremental energy values paid out during every day to match supply and demand. In practice this may be imperfectly reflected in market prices due to influences such as the oversight of regulators and the market monitor with respect to market power, and elaborate bidding rules meant to protect consumers or ensure fairness, or offer strategies of market participants. In ERCOT's organized market, this has led to a situation in which prices do not reflect full capital cost, or replacement cost, for generation so that limited investments are being made in new power plants.

The PUCT and stakeholders are struggling with how to alter the current design to stimulate further investment, not only to meet the immediate needs, but to also assure sufficient reserve (excess) capacity to weather the unexpected interruptions of supply due to weather or equipment malfunction which eventually occur. To do so they are considering addition of a market mechanism to compensate generation and short-term demand response for capacity value contributions, or a marginal capacity market for reserve capacity only. It would be no more complicated to create a market that compensated the contribution of efficiency, including the avoided costs of capacity, the savings associated with the overall reduction in market prices across the board, and the avoided costs of transmission and distribution associated with the reductions in congestion on the grid.

Even given all the issues being addressed in the current market design, there is nothing preventing incorporation of an energy efficiency market within, or alongside the energy-only market. This is unlikely to be a popular idea among generators, or possibly even demand response aggregators, as the PJM market recently showed that efficiency may displace the need for a good deal of both over time. Still, the challenge is discovering how to configure such incorporation to simply function within ERCOT in

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[12] Again, ignoring the generation subsidy granted to transmission and distribution, especially in a system of postage stamp rates and socialized costs for expansion of the grid.

a practical way, to make is transparent to participants, satisfactory to regulators, and successful in the broader market place with energy services providers and end-use customers.

Because savings delivered by energy efficiency measures can be effectively measured and verified, both under our current utility administered incentive programs, and using the experience and rigor of the capacity markets in ISO-NE, PJM, and soon in MISO, it can certainly also be done for an energy-only market. The PUCT has relied upon the International Performance Measurement and Verification Protocols (IPMVP) historically, and has recently hired a third-party evaluation, measurement, and verification contractor to establish pre- and post-facto measures of performance for the utility efficiency incentive programs. PJM has used "PJM Manual 18B" successfully for years (PJM Manual 2010).

ERCOT could establish a set of guidelines for qualifying energy efficiency resources, and verify their actual contribution to reduced demand and consumption. Knowing their eligibility for participating in the energy-only efficiency market, energy services companies could invest in building a portfolio of new load reductions, and during the course of one year, prove those savings up to the satisfaction of ERCOT. The validated savings accepted by ERCOT would have to assume to be subtracted from the demand curve, or added to the bid stack so that total bids including generation, demand response, and efficiency still meet actual real-time demand. The difference between the actual amount the market must pay in any given increment for energy and demand response in real time, and what it would have been at the higher level of the bid stack required to meet the market need in the absence of efficiency, would define the real value of efficiency for that increment. Qualified suppliers of efficiency could in theory be compensated for this value.

Once a load reduction was qualified as a valid contribution to the system, it would be granted a license to bid into the energy market on a basis reflecting its nature and persistence. Efficiency contributions would likely have to be treated as a price taker in the day-ahead market, similar to wind resources because many resources, once implemented, have zero marginal cost.

Without a doubt, our proposal raises as many questions of design as we offer solutions here. The qualification of efficiency portfolios would have to either include simplified pre-assigned load reduction profiles or involve the adoption of thermodynamic models of the contribution which could sufficiently reflect the load reduction or consumption reduction associated with the qualifying measures at each hour of the year, at varying weather conditions. It might require validation in real time by somehow linking values to measured results using the same real-time metering network used for settling energy payments. Even if we can agree upon a protocol for qualifying resources, and/or monitoring and validating savings, can the efficiency industry evolve with the market to accept payments over time? What challenges would that present for financing efficiency investments (would banks be any more ready to loan money to ESCOs to invest in insulation and weather stripping than they are ready to loan developers for new power plants)? Could a payment system be established that paid out an amount to qualifying ESCO contributors each year based on the forecast value of efficiency, and then true up the value forecast each year based on another year's experience? The market (and all customers) would benefit from the year or portion of the qualifying year in which efficiency measures were already installed and contributing benefits, but not yet being compensated. This would provide a safety factor to forecasting total value, but also affect the demand curve in real time. How exactly would one set the price for contribution of efficiency? The same issue faced by load participation in demand response—whether to pay the locational marginal price for savings, or the locational marginal price less energy—raises its head here as well. Would an organized market for efficiency require scale by the participating ESCOs? Or would a new set of intermediaries emerge to help aggregate, qualify and monetize the value of efficiency from small service providers?

Assuming the PUCT stays with an energy-only market, but continues to desire a 1-in-10 year outage level of reliability, another simpler option available is to create some form of reserve capacity obligation, to be imposed on either the generators, or more likely the load-serving entities. In this event, it would be appropriate for efficiency to also participate in this supplemental capacity market. Naturally, only efficiency measures that reliably reduce peak loads could offer into this market, whereas non-peak energy savings measures (e.g., outdoor lighting) could not. Still, this would be an important step forward for inclusion of longer-term investment in alternatives widely accepted as preferable options. Even this limited efficiency opportunity would require the development of a capacity to qualify efficiency resources by ERCOT in the manner it currently does for generation and demand response load resources. In each case, because the ESCO or REP would develop efficiency resources and only offer them into the market after the work is complete and energy savings were verified, this mechanism would represent even less risk than other forward capacity markets, in which energy efficiency providers have a good track record already.

Alternatively, a parallel or shadow market-like auction could be established within ERCOT for efficiency offerings. Prices could be set in relation to the market price of power. The PUCT has already established avoided costs for kW and kWh reductions for the utility efficiency acquisition programs, within the substantive rules of the commission (Section 25.181). The appropriate amount of efficiency could be determined by the adoption of a demand curve as is currently being considered for demand response in the ERCOT Emergency Response Service. That is, ERCOT, based on the market price history of generation and the forecast for reserve capacity and future prices, could issue a demand curve that would define how much efficiency it would procure depending upon the nature and price of the resource offered. The auction could recognize both the capacity value of the load reductions offered in, plus the actual energy savings to all ratepayers by the average reduction of the cost of energy procured in the market, because it would be more transparent what effect efficiency was having on the bid stack for generation and demand response. Each year the demand curves for efficiency can be adjusted in recognition of its comparative value and its comparative success in delivering that value.

This might be considered as a statewide replacement for the current standard offer programs administered by the utilities, which serve a similar if constrained purpose. ESCOs and REPs could respond, as was originally intended for the utility programs, but it would be more open, transparent, and competitive, in that the offers would establish the incentive level below the PUCT determined avoided cost caps, rather than utility administrators. This could be done on an annual, or seasonal basis. Utility programs could remain in place to focus on market transformation programs rather than standard offer programs. That is efficiency products and services that are accepted by the market and widely available would move, literally, to participation in the electric market, while those technologies or services that are new or face significant market barriers could be addressed by utility programs until such time as the market could be transformed, when they too, could enter the market and leave the utility programs.

We offer these alternatives, not because the current structure of the utility programs could not be seen as a valid approach to capture the value of efficiency that would benefit the market generally and all ratepayers, but because the shift to a competitive market has apparently lead stakeholders to see them as "out of market" programs of unfair or uneconomic subsidy. Every alternative considered here will take a long while to develop, especially within the ERCOT environment. There are many details to sort through and many stakeholders and market participants who will want to weigh in.

A nearer term solution is available to the state. In 2010, the PUCT increased the state energy efficiency goal by 50%, albeit from a fairly small base. The PUCT could again increase the utility administered efficiency programs to help relieve the challenge of resource adequacy and reduce the disparity between peak and off-peak loads. This could even be done as a short-term remedy, while we address the design issues of incorporating efficiency into the energy-only market, or any capacity market enhancements to come.

The PUCT is implementing new and more rigorous evaluation, measurement, and verification protocols for the utility administered programs currently. The program rules already set the ceiling price paid for demand reductions at the avoided cost of the most likely marginal new generation plant, and for energy consumption reductions at a price based on the ERCOT energy market. The PUCT already recognizes the cost savings attributable to efficiency from transmission and distribution system losses and could easily create an adder to recognize the value of avoided transmission and distribution capital costs. The PUCT could allow the programs to expand to acquire more of the cost effective savings possible, at a reasonable investment rate.

We also acknowledge this approach is far from perfect as well, and suffers from practical issues now well understood in Texas. Namely, while utility-administered efficiency programs are offered by transmission and distribution providers, these providers no longer have the customer-facing responsibilities; rather, Texas has transitioned to a retail energy provider model in which retail providers maintain the customer relationship. The Goal for Energy Efficiency in State statute (PURA 35.905) recognized this by establishing the utilities as "market neutral" administrators, and requiring the distribution of efficiency funds through REPs and ESCOs, but the scale of the programs has never reached a level to support the function of a real market through this mechanism. Rather than asking what the correct amount of efficiency investment is for the state, stakeholders, and regulators ask, how much efficiency support can be lent to consumers without their noticing it on their bill. Recent legislation even codified a move by the current PUCT to impose spending caps on what a utility could charge each customer class for the cost of efficiency acquisition, caps which had noting do to with the question of resource adequacy, or impact on consumers relative to alternative investments in power generation or T&D, but only with the absolute impact on consumer monthly bills. In this context efficiency was not being seen as a competing resource, only an inconvenient mandate to comply with. he current cost caps are too low (roughly one-fourth what Austin or San Antonio spend per capita on efficiency for example), and the minimum goals are half to one-quarter what efficiency potential studies indicate are possible, and many states achieve (Itron 2008). Given the reluctance of the State leadership to support what some consider administered "out of market" approaches, we believe, the energy efficiency industry should be willing to consider any market structure that fairly recognizes the real public contribution of efficiency and finds a way to monetize that value. We offer this paper as an introduction to the idea of reforming the organized market for energy efficiency to keep pace with the conceptual framework of the state for energy markets generally, and hope that it will lead to a more widespread consideration of how this might be brought about.

Value of Efficiency for Congestion Mitigation and Avoided Infrastructure Costs

Any resource which can help avoid line losses, obviate the need for new transmission and distribution infrastructure, and/or mitigate congestion on the grid, should be compensated for doing so. Existing efficiency incentives already compensate for losing energy to resistance over the lines, but building new infrastructure and paying to relieve congestion are expensive propositions currently exceeding $1 billion per year. Demand-side resources could be paid a premium for delivering that value (or avoiding that cost).

Some parts of the grid experience congestion at higher loads. Load relief in these places saves significant congestion costs during high electric demand hours and is very valuable. ERCOT and the PUC could, using LMP data from ERCOT's nodal market, add a large weight to each project in a highly congested zone, a somewhat smaller one for projects in mildly congested zones and so on. This would incent energy efficiency project developers to find and develop projects in those areas of high need.

Energy efficiency, demand response, and distributed generation can be ramped up quickly and located where congestion issues are greatest. It is very difficult to site generation in these places, often because the areas with the greatest congestion are also the places with the greatest population, air quality problems, and thus strict regulations for construction of power plants. Plus, power plants have a long lead time.

Market participants could gain a higher price for demand side resources aggregated and located in severely congested areas. One way to do this would be to set a higher percentage adder for projects in areas of high congestion, if those projects are aimed at reducing peak load.

Con Edison in New York implemented such a solution ten years ago:

> Con Edison first began including DSM in its load forecast with the launch of its targeted DSM program in 2003. **In fact, the specific purpose of this program was to defer new infrastructure investments by implementing energy efficiency projects in capacity constrained networks** (emphasis added). The program acquired peak load reductions through firm contracts with energy service companies (ESCO), and contracted future DSM deliveries were subtracted from the 10-year load forecast. By design there was certainty about where load reductions would

> occur. In fact, Con Edison only credited ESCOs for efficiency measures installed within contracted networks, and the grid location of each proposed efficiency project was verified in advance.
>
> There was also little uncertainty around the coincidence of the DSM with the local network peak, as Con Edison specified acceptable efficiency measures for each network—*e.g.,* commercial measures in day peaking networks, residential measures in evening peaking networks. This ensured that efficiency measures were routinely in use during the corresponding network peaks (Gazze 2011).

Con Edison implemented this solution through bilateral contracts with ESCOs. Con Edison is not the only entity to offset T&D in congested zones using energy efficiency. PJM does it through its RPM auction, including localized prices for severely transmission constrained area. In the case of PJM's capacity market, generation, DR, and efficiency all compete against each other to capture these higher localized prices. There is no reason why this couldn't occur in an energy-only market as well. Demand side resources can, if allowed to compete and compensated for their value, solve many problems in any market structure.

If a competitive market can be adopted that recognizes locational marginal price contribution of efficiency measures offering into the market, than this will be accomplished internal to that market. If not, the state can consider modification to the existing utility administered programs or market enhancements which could compensate this contribution as well. In the alternative, the ERCOT transmission and distribution planning processes could be required to consider localized acquisition of efficiency as an alternative to construction of new T&D assets.

Conclusion

In this report, we take no position on the questions dominant in Texas today: how reliable do we need our electric system to be, and can we achieve an acceptable level of reliability through our energy-only market, perhaps with modifications or enhancements, or will it require a capacity market construct of some kind? Our answer is: **regardless, include energy efficiency**.

The benefits accrue to all Texans. If permanent load shifting and load reduction strategies are implemented, even generators see more stable load profiles.

Energy efficiency can yield a more economically efficient market, but like any competitor, it can only prove itself if it's in the game. We don't claim to have identified every issue associated with the design of a fair market mechanism by which efficiency might be included in the ERCOT energy-only market, or its successor. We have discussed that possibility in light of our history, in order to stimulate a dialogue among the stakeholders toward that end.

This paper is being circulated among a variety of parties to obtain your thoughts and feedback on the concept, and your suggestions on how to improve it. We hope to hold a forum among market experts in the near future to focus more on potential energy efficiency market mechanisms. Please let us know of your interest in participating in or attending such a forum.

Please submit comments and indications of interest to: info@EEPartnership.org

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