TEXAS PUBLIC POLICY FOUNDATION
PolicyPerspective

January 2014
Center for Economic Freedom

Texas' Competitive Capacity Market*

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Findings

- "Energy-only" is at best a misleading term for Texas' market because a large portion of power flows under contracts between REPs and generators focused on providing adequate capacity.
- Texas' competitive market is already functioning as a capacity market without the $4 billion electricity tax and excessive regulation proposed by advocates of a centralized capacity market.
- Adding capacity payments for generators is not necessary and would introduce complex and uncompetitive elements that would adversely impact Texas' competitive market.

Introduction

There is a conflict between two visions of power markets administered by the Electricity Reliability Council of Texas (ERCOT). On the supply side ERCOT is populated by a large number of competitive generators that can choose either to contract with individual customers for delivery or bid their energy production into markets and be paid the market-clearing price for it. Most of the power under contract is delivered to Retail Energy Providers (REPs) who compete to sell it to households and businesses. Non-contract energy production is bid into either 1) a "balancing market," where time-varying prices equate supply and demand, or 2) a set of markets for "ancillary services" that are necessary to maintain reliability, including load following and reserves with different degrees of readiness.

The controversy is between those who advocate continuation of existing markets on the basis of observed performance and those who believe that today's markets do not produce revenue sufficient to encourage investments in new generation that will be necessary to maintain reliability over the future. Accordingly, the critics of today's market arrangements (predominantly generators) wish to see changes that will supplement the revenue obtained from energy market transactions. They have made a number of proposals, two of which are analyzed here.

To anticipate the paper's conclusions, it finds that the existing arrangements have worked quite well to ensure reliability and competitive prices. Modifying them to incorporate additional payments to generators is not necessary and would introduce complex and uncompetitive elements that would adversely impact the competition that pervades Texas markets today. Existing capacity markets in other regions may have raised power prices and generator incomes, but in reality they have brought forth far less new generation than ERCOT members have put in place under its existing markets.

Energy and Capacity in ERCOT

Transactions in electricity markets are for either "energy" or "capacity." Energy is an instantaneous flow of power sold by the generation owner to either the market or to an REP with which it has a supply contract. The buyer of energy has no other rights to the generator's future output. Capacity is the source of that energy, i.e. a contract for capacity allocates the productive capabilities of a given generator to a particular purchaser. That buyer typically has the option of taking delivery on the energy or reselling it, either by another contract or in the balancing market. If generation capacity is scarce a customer (REP) that has not obtained rights to capacity may find itself unable to purchase energy except at a very high price. Somewhat simplified, a mandatory capacity market will require that load-serving entities purchase rights to capacity that suffices to meet their peak loads. Supply and demand for capacity determine the market-clearing payment for it. In a "forward" capacity market, prices are set today for capacity to be made available at a given future date. If markets do not separately price capacity and energy, transactions in energy alone must produce enough income for generators to pay the cost (fuel) of the energy itself and the capital cost of the plant that produces it, along with an acceptable return to investors.

At this point we encounter a fundamental problem in terminology. ERCOT's balancing market is the primary trading post for energy (Some also comes from generation that produces ancillary services). Energy traded in the balancing market is typically a consequence

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*This paper was originally submitted as written testimony to the Texas Senate Committee on Natural Resources on November 22, 2013.

of discrepancies between planned and actual production and demand, along with some power submitted or purchased on short notice. In all but exceptional circumstances, energy traded in the balancing market represents no more than 10 percent of the total throughput in ERCOT. The remainder trades under contracts between generators and REPs, with a small volume of direct transactions between generators and large industrial loads. With the passage of time ERCOT has come to be called an "energy-only" market, by both advocates and opponents of an organized forward capacity market. A seeming implication of the term is that ERCOT lacks markets for capacity that may be necessary to ensure future generation adequacy. If an energy market is the only one available a generator must survive on the margin between its production costs and fluctuating prices in that market.

This reasoning is both incorrect and misleading. The balancing and ancillary services markets produce ERCOT's only publicly visible prices, but these prices bear no necessary relation to the profitability of generators. As in other competitive markets, generators and REPs exchange the remaining power under contracts whose prices and terms are confidential. No one other than the parties knows their details, and in a competitive market this confidentiality is desirable. Successful innovations in contract terms can provide benefits just as do successful innovations in technology. In the same way that patents allow technological innovators to be rewarded for their efforts, confidential contract terms that came into being through exceptional efforts by the parties can do likewise. We may know little about contractual details, but we can be certain of one thing: successful performance by a REP requires that it be able to make commitments to a generator that supplies it, and those commitments can also produce greater benefits for the generator than the alternative of sales to the balancing market. The sheer fact that so little power flows through the balancing market is testimony to the economic value created by those contracts. I know of no instance in which a generation investor obtained financing solely on a promise that all of its power would be sold into the balancing market. There have been instances of REPs that chose to obtain all of their resources in the balancing market, none of which survived for long.

Looked at another way, a REP that intends to succeed in competition must be able to manage and mitigate risks of adverse events that might occur as it procures the power it will resell. Its contracts with customers will often carry price adjustment terms, as will its contracts with generators. There is no reason to assume that balancing market prices can act as stand-ins for these, because unlike energy market purchases the generator contracts will often include valuable commitments of capacity. The retail competition that has made Texas a model for the world can only happen if REPs and their suppliers transact far more than "energy-only" in the relatively tiny balancing market. At the Federal Energy Regulatory Commission's (FERC) recent symposium on capacity markets, David Patton, President of the firm that serves as ERCOT's market monitor, made the same point. He said that whether or not there is a mandatory forward capacity market, "[b]ilateral forward contracting [as described above] remains key under any market design for locking in revenues and facilitating financing of new resources." Reviewing the northeast's experience with mandatory forward capacity markets, he concluded that "[i]t is premature to determine whether [such a market] is an improvement."[1]

Paradoxes of Profitability

Calling the market "energy-only" tells us almost nothing about how REPs obtain their supplies or how generators manage their production and sales. Most importantly it tells us nothing about profitability of either generators or REPs. The commonly cited "peaker net margin" was not devised as an indicator of profitability, but has been used as one.[2] It compares a hypothetical generator's balancing market revenues and heat rates with indexes of fuel prices. In most recent years the peaker net margin calculation has indicated that new generation investment would be unprofitable and past investments would likely have been failures. Peaker net margin implicitly assumes that all of a generator's income would have come from the balancing market. It does not even consider the option of supplying capacity and energy for ancillary services. Most importantly, it tells us nothing about income from contracts that will typically cover a much larger percentage of its production. Without extensive data on individual generator operations and details of their contracts it is simply impossible to verify claims of unprofitability. No generation owner who favors capacity markets or reserve requirements has produced such data. My published research (co-authored with Professor Andrew Kleit of Pennsylvania State University) has used hourly data to show that under reasonable assumptions the addition of ancillary services as an alternative to the balancing market often lifts generator income into the range of profitability.[3] As of this writing our admittedly limited findings remain unchallenged.

We now encounter a fundamental contradiction. If market conditions have been as bad for as long as asserted by ERCOT's critics, powerplant construction in Texas should be at a standstill. If anything it is as robust or more so than ever in the past, as shown in data collected by Texas Industrial Electric Consumers and filed at the PUCT:

> Since the Commission began addressing resource adequacy concerns two years ago, more than 5,000 MW of new

> generation has been added to the resources included in ERCOT's Capacity and Demand Report (CDR). In addition to the well-publicized Panda plants, which add roughly 2200 MWs of efficient gas-fired generation, recent CDR Reports also include new thermal generation projects by NRG, Calpine, Golden Spread, [Lower Colorado River Authority], and others totaling 1,649 MWs. This does not even include the significant amount of renewable generation (wind and solar) that has been added to the CDR Report since May of 2012.
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> And this is just the tip of the iceberg. Public announcements and greenhouse gas (GHG) permit filings reveal that GDF Suez is constructing 134 MW of uprates, Invenergy is planning 330 MWs of peaking capacity, Southern Company is planning a 530 MW combined-cycle plant, MinnTex is pursuing 650 MWs of peaking capacity, Indeck is planning 650 MW of peaking capacity, STEC is constructing 225 MW of peaking capacity, Frontera is constructing 45 MW of uprates, and Tenaska and the Brownsville Public Utilities Board (BPUB) are jointly developing 800 MW of combined-cycle capacity in South Texas. These projects alone would add more than 3,500 MW to ERCOT's resources. While TIEC acknowledges these projects may not all be constructed, conservative projections that account for all available resources (including mothballed generation) indicate that ERCOT would not fall below the current 13.75 percent target reserve margin for many years.[4]

To my knowledge, none of these plants intends to dispose of its entire output in the balancing market. The figures contradict the Brattle Group study's purported finding that ERCOT's "energy-only" market poses a serious deterrent to generation investment. That result was based on interviews with financiers and researchers' expectations that contracts between generators and REPs were unlikely to induce the necessary investments. To my knowledge Brattle has not attempted to explain the seeming disconnect between its findings and actual levels of generation investment. Further, these levels have been achieved while much of the risk exposure of consumers under the old regulated system is now borne by generators. In 2008 the Governor's Competitiveness Council summarized the situation:

> Many experts and financial analysts view the competitive structure in Texas as a successful example of wholesale and retail competitive electric markets. The ERCOT market has experienced unprecedented investment in the generation sector since restructure [sic], all at the risk and expense of the generation developers. To the extent the owners of generation make decisions that ultimately turn out to be poor economic choices or operate their units in an inefficient manner, the owners bear the risk of foregone profit or an inadequate return on their investment," the Governor's Competitiveness Council said.[5]

Increased options for consumers are transforming Texas electricity into a system whose performance and reliability are determined by both producers and users, moving away from a past in which supply could adjust while demand remained passive.

Data on generation investment show that it is substantial relative to ERCOT's load. Unfortunately throughout the PUCT's resource adequacy proceedings the question of how much capacity is "enough" has received relatively little attention. Estimating that amount requires valuing the losses that outages inflict on consumers, and policy design hinges on the analysis of possible linkages between increased generation and reduced outages. The survey of value of lost load (VOLL) studies by London Economics for ERCOT showed no consensus in a mass of existing studies, and reached no conclusion of consequence.[6] Absent a rigorously derived measure of VOLL it is impossible to specify the economically efficient level of generation investment. Even with such a measure the nexus between system-wide capacity and reliability is tenuous at best. All but a handful of outages in ERCOT occur at lower voltages. Higher-level outages have been few in number and unrelated to possible shortfalls in capacity.[7] To further complicate matters, consumers have different abilities to respond to outages and they place different values on outage-related losses. Those who place very high values on reliability can and do invest in their own protective measures.

Increased options for consumers are transforming Texas electricity into a system whose performance and reliability are determined by both producers and users, moving away from a past in which supply could adjust while demand remained passive. As demand response grows in importance, capacity will change from being an ironclad requirement for system integrity to a resource whose value depends on both costs and demand. Texas' near-universal rollout of smart meters promises to accelerate the process as it increases the competitiveness of RECs. We already see offers of free NEST programmable thermostats to customers who sign up for certain rate plans (Reliant Energy) and software that allows smart phones to adjust home electrical use from a distance.

(TXU).[8] Other REPS are beginning to offer time-of-use rates for smaller customers, and these customers may soon be able to impact competition in upstream markets. City Public Service of San Antonio has designed a program (not yet operational) that allows the aggregation of residential loads to be offered into the non-spin reserve market.[9] ERCOT has long had in place its Loads Acting as Reserves (LAAR) program.

Mandatory Forward Capacity Markets

If demand response becomes a market influence symmetric with supply, the case for mandatory forward capacity markets or other backstop resource requirements becomes weaker. All power markets are inescapably complex, reflecting constraints on reliability resulting from the characteristics of power flows and the impossibility of storing electricity. Complexity, however, is a matter of degree, and there can be little doubt that ERCOT's balancing energy and ancillary services markets are far more transparent than capacity markets in other RTOs. A contractual transaction between a generator and an REP in ERCOT may carry complex provisions that allow the parties to maximize the economic value that they are creating. In ERCOT, however, only the transacting parties themselves need to understand (or even be aware of) that complexity in order to reach agreement and participate in the market. This system obviates the need for extensive negotiations and rulemakings to achieve consensus on standardized terms of mandatory contracts. Regulation can affect the details of a generator-REP contract, but the contract's terms in general will differ little from those for other commercial transactions. Contrast this with a mandatory forward capacity market:

> Each and every aspect of a forward capacity auction must be administratively determined, leading to contentious stakeholder debates, regulatory decisions, and subsequent litigation, as demonstrated by the experience in PJM. [As of October 2012] [t]here are approximately 50 separate, voluminous documents governing the PJM capacity auctions. Even assuming that the MOPR [minimum offer price rule] and locational capacity markets are not created this would only reduce the number of governing documents by four."[10]

In so complex an environment risk takes on new roles. New rules must be formulated to cope with the unintended consequences of old ones, and contingencies will arise on which existing rules are silent or ambiguous. Transactions carry greater risks and higher mitigation costs in a more uncertain environment. Further, some rules that emerge may be more reflective of politics than a concerted desire to create economic value. PJM's evolving minimum offer price ("MOPR") rules are intended to protect investments that would not have been made in a competitive market by supporting a cost-based floor on capacity prices. Although there are clear differences between demand response and dispatchable generation as capacity resources, PJM prices them identically for the most part. Perhaps most problematically, owners of productive and obsolete generators get the same prices, in effect a subsidy to the latter that deters the entry of more efficient new units. The clear rationale behind a capacity market is that it provides incentives to invest in new generation, but the record in PJM is otherwise. From the 2007 start of PJM's capacity market through 2011 93 percent of payments in it went to pre-existing generators. The American Public Power Association estimates that the $50 billion collected over this period could have built 129 400-megawatt gas-fired plants, or 51,000 MW. Over the same interval only 7,000 MW of new generation emerged in PJM.[11]

Forward capacity markets can in principle reduce risk and incentivize planning for new generation, but if conditions change that generation may not be forthcoming. In PJM unbuilt capacity can be bid three years forward, but there are few if any ways to compel construction if investors balk when circumstances change. Earlier this month Thad Hill, the President and COO of independent power producer Calpine (which favors a forward capacity market in ERCOT) informed his audience on an earnings call:

> Moving on to PJM … [s]tarting next summer, the resources that make up the reserve margin increasingly consist of demand response resources rather than power generation resources. This is even more impactful in the next several years when you remove the plants that clear in the capacity auctions that either can't be built on time or unlikely to be completed. This will add volatility to market pricing as we saw this past summer on a couple of occasions, and the frequency of this will increase."[12]

This also suggests that PJM's similar prices for demand response and physical generation do not match their dissimilar values for reliability.

In practice, generators make their own operating decisions and RTOs have little power to impose their wills on reluctant ones. ISO New England recently testified before FERC regarding nearly 200 reported instances of fuel unavailability [whether by choice or accident] and "poor contingency response, with the ISO getting only about 60 percent of the requested megawatts in response to contingency reserve activations.[13] Here too the contrast with ERCOT is clear. A generator in ERCOT can only receive income if it is operating (other than acting as ancillary services capacity). In ISO-New England operable

generators that had cleared the capacity market have found it most profitable not to operate at times when the region's resources were strained, while still receiving capacity payments.

Administrative difficulties along with omissions and ambiguities in the rules allow perverse attempts by generators to game capacity markets that would be impossible and/or unprofitable in ERCOT. Testifying for GDF/Suez, Harvard University's William Hogan comments:

> It is difficult to properly define the capacity product, determine the amount and location of capacity needed many years ahead, and integrate diverse products that blend capacity and energy in a variety of configurations. Experience has shown that forward capacity markets, with their preset procurements, are subject to manipulation by generators and loads. For example, in PJM the independent market monitor regularly finds that aggregate energy markets are workably competitive and capacity market structures are not competitive. This leads to requirements for capacity market regulations on offers and performance, bid mitigation, and other complications. The problems are fundamental. It is not easy to build a good forward capacity market model based on first principles.[14]

ERCOT's comparative simplicity acts as the foundation for a system of markets and contracts that allows participants to operate with some assurance that their choices will have predictable results. Market forces and random events will affect the values of their investments, but those random events are unlikely to be the consequence of unanticipated rule changes. Texas' institutions make it less likely that one's competitive strategy can be undone by gaming the regulations. The effects of unstable and inefficient regulation extend beyond the power industry, to every household and business served by REPs in ERCOT.

If a forward capacity market comes to ERCOT, there will be consequences for competition and the well-being of consumers. In effect, capacity payments to owners of old generation (which may be fully depreciated) are barriers that raise the cost of competing for those REPs that do not own generation. The flourishing of retail competition and the continuing volume of generation investment all lead to a conclusion that competitive markets do not require that retailers integrate into generation. Pressure for change has largely come from financially interested parties whose claims about resource shortages utterly fail to match reality. A recent letter from Nucor Steel to the PUCT and Governor aptly summarized the current system and the consequences of abandoning it.

Out of market subsidization of any Texas industry without regard to the thrift, business acumen and prudence of the subsidized businesses is nothing more than corporate welfare, which causes far more harm than good.

> Nucor believes that implementation of a forward capacity market in Texas would be a serious mistake. Since 1999, ERCOT in an energy-only market has managed to construct far more new generation than has been constructed in PJM during the same period, notwithstanding that PJM has more than three times ERCOT's aggregate load. There is absolutely no assurance that implementing a forward capacity market in ERCOT will spur the building of new generating plants. In fact, the experience in other forward capacity markets suggests the opposite. In the case of PJM, their forward capacity market is widely recognized as an abysmal failure. Despite burdening their consumers with administratively imposed non-market based capacity payments, PJM has totally failed to significantly ameliorate their longstanding shortage of new generating capacity.
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> Out of market subsidization of any Texas industry without regard to the thrift, business acumen and prudence of the subsidized businesses is nothing more than corporate welfare, which causes far more harm than good. The administrative imposition of capacity payments upon all Texas consumers is the equivalent of a new energy tax, and more taxes will not contribute to the future prosperity of this state. Under a forward capacity market, Texas consumers will in the future pay literally billions more in electricity with no assurance that a single additional megawatt of capacity will be built.[15]

Resource Adequacy Requirements

Once we realize that ERCOT's outstanding performance is rooted in contracts for both capacity and energy, it becomes easier to analyze resource adequacy requirements that have been proposed as alternatives to a capacity market. The reality of today's competitive markets requires that a REP maintain resource adequacy if it is to meet its load obligations. No REP thus far has survived on balancing energy alone, and every surviving one must have access to adequate capacity. Seeing it this way, competitive markets impose their own resource adequacy requirements on REPs. What constitutes adequate capacity for a REP depends on its particular circumstances.

The observed record of generation growth strongly suggests that Texas can rely on the capital markets to bring forth adequate capacity. Any credible advocate of an imposed requirement must first show that the market behavior of REPs and generators has systematically failed to produce capacity sufficient to meet peaks.

A REP whose customers have extensive demand management capabilities will rationally choose access to less capacity and more energy than one whose customers are without alternatives. One that operates in several states might choose to manage its risks by participating more heavily in ERCOT's balancing market than one that operates only in ERCOT and cannot diversify in this way. Nothing forecloses a REP that is temporarily "short" of resources from making an exchange with one that is temporarily "long."

If "adequate resources" differ among REPs, one that chooses the wrong amount and mix of them will be a less effective and less profitable competitor. Although data are confidential there can be little doubt that the resource choices of REPs differ widely in type and coverage. An REP's resource mix is as important a tool for competing as its marketing plan. Different REPs risking their own funds choose different mixes, and there is no reason to expect that a uniform imposed requirement will be an improvement. More importantly we must assume that regulators will choose the "right" requirement. ERCOT's markets and contracts are flourishing today because so few requirements have been imposed from above that might limit the range of actions available to producers and consumers. The observed record of generation growth strongly suggests that Texas can rely on the capital markets to bring forth adequate capacity. Any credible advocate of an imposed requirement must first show that the market behavior of REPs and generators has systematically failed to produce capacity sufficient to meet peaks. Even if such a failure can be documented (as is unlikely) Texas should insist on a showing that a resource adequacy requirement is the best way to respond.

A seemingly simple resource adequacy rule is unlikely to stay simple, and in the end could lead to difficulties like those seen in northeastern RTOs. PJM basically offers the same amount to any qualifying resource that clears its auction, but we already know that the values of dispatchable generation and demand response to the operator are unlikely to be the same. The same problem may be more aggravated in Texas, where intermittent resources (which presumably have some capacity equivalence) have become so economically and politically important. Although the resource adequacy requirement is superficially only about amounts of capacity, Texas can probably expect to encounter the same questions of dispatch response and operability described above for northeastern RTOs.

A requirement that REPs actually own powerplants will adversely affect retail competition, as non-owners face new and substantial costs that current owners do not. If a REP must instead have some sort of "access" to generating capacity we are left with the question of which access arrangements are in compliance. Will a REP be in compliance if it holds a call option on the output of a generator? What if it can lease a generator's capacity only during peak months? What sort of assurance of transmission access is necessary if a distant resource to qualify for compliance? However such issues are resolved we must also specify both the types of resources that could qualify as capacity and their relative values. Those values depend on market conditions, which themselves vary with the capacity mix. If demand response grows greatly over the same period that capacity grows by little we would probably expect their relative prices to change, but how such changes should be effected is unclear.

If compliance is to have any meaning, any adequacy requirement must be forward looking. Historically, however, ERCOT has seen substantial load forecast errors, some of whose sources cannot be identified. Forecasted load will determine a REP's compliance obligations, but it is unclear how to set and enforce a compliance requirement for an REP whose load has grown sharply. We expect to see a market in which undercompliant REPs trade with overcompliant ones, but enforcing noncompliance carries the same difficulties as enforcing orders to operate. All of the difficulties mentioned here constitute only a small subset of a full list, and we can be certain that most items on it will be docketed or litigated by parties with substantial wealth at stake. There are few if any reasons to expect that the net effect of all these proceedings will be an improvement relative to the markets and institutions being abandoned.

Conclusions

ERCOT's transformation from regulation to competition has been a singular success. Texans now trade capacity and energy in highly competitive markets. Competitive retailing of those products has produced unprecedented choices for both large and small users. Success has come with minimal use of

centralized markets that numerous experts have deemed necessary if the public is to benefit from competition. Despite the success a mix of semantic difficulties and interest-group politics has produced a mass of unjustified conclusions about the sustainability of these markets. The pessimism is founded on a belief that ERCOT's "energy-only" market will soon be unsustainable because it fails to produce competitive returns for investors in generation. The critics have proposed two solutions, the first a "forward capacity market" that mandates separate capacity payments to generators, and the other a resource adequacy requirement imposed on load-serving entities.

"Energy-only" is at best a misleading term because only a small fraction of power in ERCOT trades as pure energy, while the much larger remainder flows under contracts between REPs and generators. The contracts are best classified as elements of a capacity market. Their confidential commitments protect generators' returns and allow REPs to buy much of their power for resale on predictable terms. Competition in that market takes the form of generators and REPs evaluating alternative contracts and settling on the mutually agreeable one that maximizes benefits to the parties. They are capacity contracts because their terms almost surely include payments that will amortize some of the generator's capacity costs.

Advocates of a capacity market for ERCOT face a fundamental paradox that they have thus far failed to address. Despite their claims that ERCOT generators face an inability to recovery capacity cost, generation investment there continues strong, more so than in PJM which has operated a forward capacity market for several years. Claims of unprofitability appear to be based on erroneous formulas and mistaken use of balancing market data to draw conclusions about the entire market. As demand-side participation rises in ERCOT and elsewhere, capacity itself is being transformed from a strict operational requirement into a resource whose supply and demand depends on market prices.

The actual functioning of capacity markets has hardly met the ideals of their advocates. Unlike ERCOT's relatively simple bilateral arrangements, generators and RECs in capacity markets are faced with masses of rules and definitions that must constantly be modified if they are to achieve predetermined outcomes. Generation investment in northeastern RTOs has fallen far short of ERCOTs, and in practice generators in them may have less interest in responding to dispatch orders than they do in ERCOT. As has happened elsewhere, a capacity market in Texas will encourage the retention of obsolete generation and discourage investments in newer technologies, while simultaneously placing unnecessary financial obstacles in the paths of competitive REPs. Although resource adequacy requirements are seemingly more straightforward than capacity markets, they have many of the same administrative and operational difficulties. They also entail unnecessary costs, because adequate resources for a competitive REP will seldom be a set percentage of loads. The conclusion is straightforward: Both capacity markets and resource adequacy requirements will serve Texas citizens poorly, needlessly raising their power bills while attacking the non-problem of insufficient generation investment. ✯

Endnotes

[1] David B. Patton, "Resource Adequacy in Wholesale Electricity Markets: Principles and Lessons Learned," presentation at FERC Technical Conference on Capacity Markets (25 Sept. 2013) Graphic 8.
[2] Peaker net margin is defined in the PUCT's Substantive Rules to serve as an indicator of market power for a generator that can trigger certain actions if it passes a certain threshold. The rules say nothing about its use to estimate profitability or hardship.
[3] Andrew N. Kleit and Robert J. Michaels, "Reforming Texas Electricity Markets," *Regulation* 36 (Summer 2013) 32-37. A copy of this article is attached to my testimony.
[4] Texas Industrial Energy Consumers, Comments in Response to Discussion at the Aug. 29, 2013 Open Meeting, Public Utility Commission of Texas, Project No. 40,000 (23 Sept. 2013). My use of this quotation should not be taken as an indication that I support policy positions taken by TIEC.
[5] Texas Governors' Competitiveness Council, 2008 Texas State Energy Plan, 15.
[6] London Economics, Estimating the Value of Lost Load, Briefing Paper Prepared for ERCOT (17 June 2013).
[7] PUCT Commissioner Kenneth Anderson, Filed Presentation on Reserve Margins in Proceeding No. 40,000 (12 Feb. 2013).
[8] "Warm Up to Smart Energy This Winter for Free," and "TXU empowers Electricity Customers with Android Smartphones," (12 July 2012).
[9] For information on this and numerous consumer-related efficiency projects, see the U.S. Department of Energy's summary compilation.
[10] Texas Industrial Energy Consumers, Comments on Oct. 19, 2012 Brattle Group Presentation, Public Utility Commission of Texas, Project No. 40,000 (23 Oct. 2012) 7.
[11] American Public Power Association, Money for Nothing in the Power Supply Business, Issue Brief (Mar. 2012) 2.
[12] "Texas Capacity Market Supporter Continues to Call New Capacity Investments in PJM Capacity Market "Questionable", Again Says New Plants "Unlikely to be Completed," Energy Choice Matters, Energychoicematters.com (8 Nov. 2013).
[13] Comments of Robert G. Ethier, Vice President Market Development, ISO New England, FERC Docket No. AD13-7-000, 6. (footnotes omitted).
[14] William W. Hogan, "Electricity Scarcity Pricing Through Operating Reserves: An ERCOT Window of Opportunity, submitted in PUCT Project 40,000 (1 Nov. 2012) 4.
[15] Letter from John Farris to Public Utility Commissioners and Governor, submitted in PUCT Project No. 40,000 (13 Nov. 2013).

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