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Protecting the Market from ''Hockey Stick'' Pricing: How the Public Utility Commission of Texas is Dealing with Potential Price Gouging

An automatic mitigation procedure called the Competitive Solution Method offers a way of guarding against price gouging while keeping the door open to appropriate scarcity rents and price signals.

David Hurlbut, Keith Rogas, and Shmuel Oren

I. Introduction

The Public Utility Commission of Texas (PUCT) has taken a new approach to curb the effects of ''hockey stick'' pricing in the spot electricity market run by the Electric Reliability Council of Texas (ERCOT). The Texas model departs from the automatic mitigation procedure pioneered by the New York Independent System Operator (NYISO), incorporating a sunshine policy as a psychological deterrent and an automatic mitigation mechanism triggered by temporary market failure.

The hockey stick strategy involves offers of a small, expendable quantity of energy or capacity well in excess of its marginal cost. This strategy, which is virtually risk-free to the generator, exploits short-term inelasticity of demand for balancing energy and ancillary services capacity when all offers for these services are exhausted. In markets where energy or capacity is purchased through a uniform price auction and all accepted offers

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are paid the same market clearing price (MCP), the presence of even one hockey stick offer can drive market prices to extremely high levels when nearly all offers are struck. The hockey stick offers may thus be viewed as an ''ambush strategy'' that exploits the rigidity of the system operator's procurement rules and the lack of demand response. Since the additional supply offered at the high price under the hockey stick strategy is very small, even slight flexibility on the demand side would forgo these few extra megawatts and avoid the resulting price spikes.[1]

The severe potential consequences of hockey stick pricing manifested themselves in Texas during the ice storm that occurred from Feb. 24 to 27, 2003. During this extreme weather event, ERCOT was forced to procure all the offered balancing energy for many hours. One megawatt offered at $990 per hour on a routine basis by one of the market participants set the clearing price for all the procured balancing energy for several hours. That resulted in settlements millions of dollars in excess of what they would have been if that last megawatt would have not set the clearing price. The high clearing prices contributed to one retail provider's bankruptcy.

Figure 1 illustrates a typical hockey stick offer on Feb. 24, 2003. **Figure 2** shows the resulting clearing prices during that same day as ERCOT increased its deployment of balancing energy.

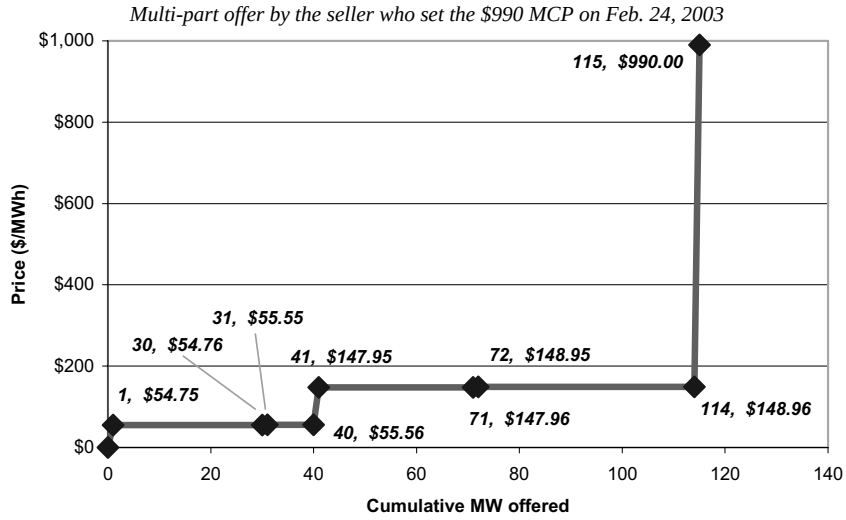

Figure 1: Example of a Hockey Stick Offer

Regulatory staff and generators argued tenaciously over the harm and legitimacy of hockey stick pricing. Arguments against mitigating the effects of this strategy often—and erroneously—drift towards a broad-brush defense of high prices and the need for market price signals. Generation owners contend that suppressing high prices during supply shortages will discourage investment in new capacity, and to some extent this is true. As a matter of public policy, however, the question that really matters is more discriminating: When does a high price provide the market with a legitimate and coherent price signal, and when does it reflect opportunistic price gouging?

Ignoring this fundamental question amounts to denying that price gouging can even exist. At the same time, however, scarcity pricing is a legitimate market signal that is crucial to the long-term vibrancy of a competitive market. The PUCT's Market Oversight Division (MOD), which monitors the ERCOT markets, set about the task of finding some way to guard against price gouging while at the same time keeping the door

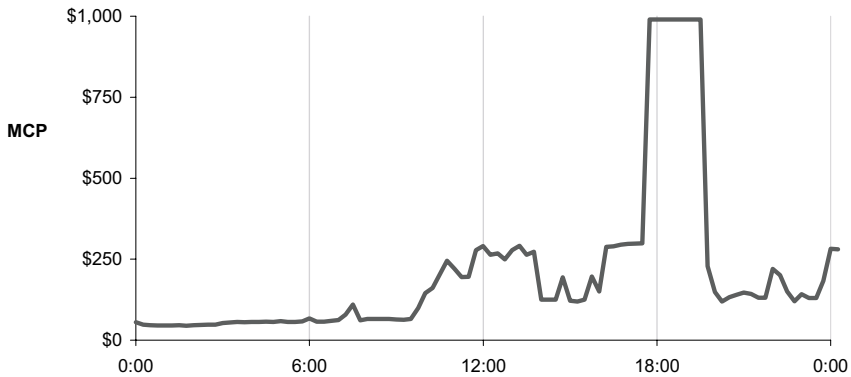

Figure 2: MCP for Balancing Energy in ERCOT on Feb. 24, 2003

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open to appropriate scarcity rents and price signals.

The ''sunshine'' component of the Texas solution involves no change to market structure at all; it simply releases names. When prices spike above $900 for a 15-minute settlement interval, the next day ERCOT will automatically disclose who submitted offers of $900 or higher during that interval. If the MCP is slightly below $900, the commission can still exercise its discretionary authority to identify high bidders, thereby adding disclosure risk to below-the-radar-screen gaming.

As a backstop to the psychological deterrent of disclosure, MOD also crafted an automatic mitigation procedure called the Competitive Solution Method (CSM).[2] The approach tests each settlement interval for competitive sufficiency, and then applies a scarcity rent proxy if the interval fails the test. In the case of balancing energy, the test is simple and consistent with basic economic theory. If all available supplies are exhausted and the demand is inelastic, then the market is deemed to have failed for that interval. The MCP is then adjusted based on the characteristics of the offer stack taken as a whole.

II. Hockey Stick Bidding: What Is It and Why Is It a Problem?

As in many competitive wholesale power markets, generators submit individual *offer curves* for the energy or capacity they offer in auction markets run by ERCOT. Each point on an individual offer curve consists of a price–quantity pair ordered by increasing price. The smallest quantity commands the lowest price, while procuring the entire quantity results in the highest price in the offer. Each operating hour, ERCOT combines all individual offer curves for that hour to create a market *offer stack*. ERCOT operating requirements determine the quantity of balancing energy procured from the market offer stack at 15-minute intervals, and the price corresponding to this quantity in the offer stack is the MCP.

As a backstop to the psychological deterrent of disclosure, MOD also crafted an automatic mitigation procedure, CSM.

In a typical competitive market, each point on an individual offer curve is in the neighborhood of the supplier's marginal cost. A hockey stick strategy, however, would raise the offer price on the last few MW well in excess of marginal cost. In pursuing such a strategy the supplier accepts the chance that the overpriced MWs at the end of the offer stack will not be selected most of the time. The forgone revenues are inconsequential, however, because the quantity offered at the high price is small. On the other hand, while the probability of having the tip of the hockey stick struck in an auction at any given time is remote, when it is struck, the jackpot can be huge under a uniform market clearing price rule. Under such a rule—which is common in all electricity auctions in the United States—when the tip of the hockey stick is struck it sets the price for all the balancing energy procured in that interval.

A market is particularly susceptible to hockey stick pricing when the reserve margin is large, as is currently the case in ERCOT. With many suppliers and little demand, each supplier knows it risks not being selected (and therefore not being paid) if its offer departs from marginal cost. The bulk of its offer curve remains flat, and if the supplier chooses to sacrifice a megawatt by pricing it exorbitantly, the contrast between the last megawatt and the next-to-last megawatt is dramatic, as shown in **Figure 3**.

Figure 3 illustrates average offer patterns in ERCOT's balancing energy market for the first quarter of 2003. The figure separates all hourly offer stacks for this quarter into two subsets: those terminating at $900 or higher, and those terminating below $900. Significantly, both curves are virtually identical for the first 99 percent of quantity. The $900 and higher subset, however, shows a hockey stick pattern: a gradual

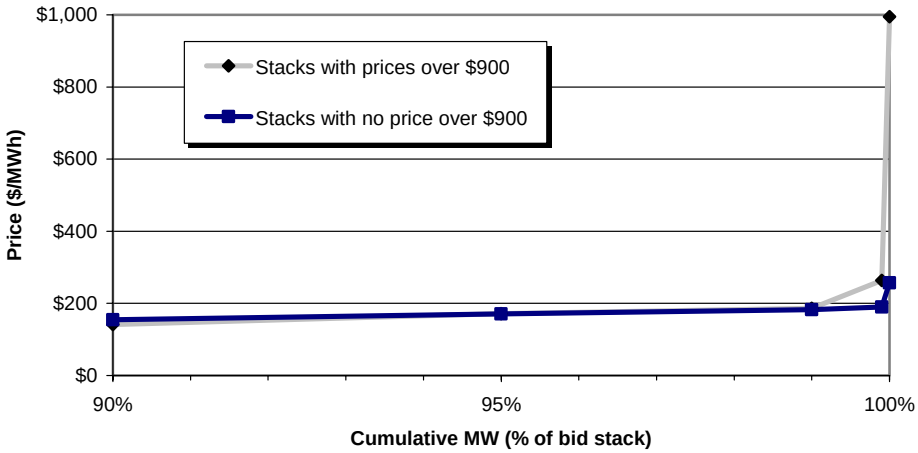

Figure 3: Average ERCOT Offer Stacks, First Quarter 2003

slope upwards for 99.9 percent of the stack, then a four-fold leap in price for the last 0.1 percent. When there was no hockey stick offer in the stack, the supply curve tended to increase more gradually and typically terminated at a high offer of around $260.

As illustrated by the figure, only a few very small quantities were used in hockey stick offers. It takes only 1 MW, however, to dramatically raise the clearing price during periods of tight supply. As a result, most sellers need not submit hockey stick offers in order to enjoy the windfall that results when someone's hockey stick offer is struck.

Some stakeholders have argued that hockey stick pricing is a legitimate mechanism for generating scarcity rents under supply shortage conditions. A comparison of how similar markets responded to the February 2003 extreme weather event shows that this argument seriously overstates the matter. **Table 1** shows the typical magnitudes of scarcity rents in the ERCOT bilateral spot market, northern spot electricity markets, and the natural gas market, as well as what they would have been in the ERCOT balancing energy market without hockey stick offers. This comparison shows that the rent transfer resulting from hockey stick pricing was excessive.

Hockey stick pricing matters only when competition fails. Here, ''failure'' does not mean a widespread collapse of the market. Rather, it means that for a given settlement interval (which in ERCOT is 15 minutes), the clearing price cannot be determined by competitive forces. The simplest example of competitive failure is when the buyer needs all available supply and, therefore, does not have the luxury of being able to choose one supplier over another on the basis of price. Under standard economic theory, if a market is to be competitive, buyers must have the potential to substitute one supplier for another or reduce their demand. Without the ability to switch or to cut back demand buyers are hostage to market forces they are unable to influence. When any supplier can

Table 1: Scarcity Pricing During the February 2003 Ice Storm

		Prices Week Before Weather Event	Peak Price During Weather Event	% Increase
Scarcity rents exaggerated by hockey stick pricing	• MCP for balancing energy in ERCOT	$47–$63 per MWh	$990 per MWh	**1,471–2,006**
	• What MCP for balancing energy in ERCOT would have been had the hockey stick offer not been present		$500	**694–964**
	• Natural gas (Henry Hub)	$5–$6 per MMBtu	$18.85 per MMBtu	214–277
	• Standard 16-Hour Daily Products in Northern Electricity Markets (Ontario)	$45–$90 per MWh	$200 per MWh	122–344
	• Standard 16-Hour Daily Products in ERCOT North Zone	$49	$340	594

Sources: New York Mercantile Exchange natural gas price indices and *Megawatt Daily* power price indices.

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command any price without fear of diminishing demand, the price reflects little more than the whim of the least merciful supplier and does not provide a rational, coherent signal for market behavior. One could regard this as a ''Don Corleone'' equilibrium—because the last seller has the power to make the market an offer it can't refuse—except that it doesn't really constitute an equilibrium. The ''price signal'' is arbitrary, irrational, and not really a signal at all.

Competitive failure in a market with abundant reserves is infrequent. When it does happen, failure has little to do with any systematic supply shortage. Such failures arise from unexpected shocks such as terrorism, computer failure, or extreme weather events. Hockey stick pricing under such aberrant conditions results in at least three problems: The market pays a lot but gets virtually nothing in return; prices are more volatile (a bad signal to the investment community); and it rewards opportunistic behavior.

In Texas, the extreme weather event of late February 2003 provided a detailed case study of the effect hockey stick pricing can have on a wholesale power market. The severity and timing of the cold front that moved into the state—coupled with already low levels of natural gas storage—drastically reduced fuel supplies and the output of many generators on the grid fell significantly. As a result, during many operating intervals ERCOT had to buy all the balancing energy that had been offered into the market. Balancing energy prices shot up to $990 per MWh from an average of around $55 the previous week. A close examination of the data revealed that those prices were the result of one entity that had priced a single MWh at $990. MOD estimated that, had that one MWh not been in the offer stack (which was usually around 4,000 MW throughout the day), the market would have cleared at $300 to $500, which is what the MCP was during intervals ERCOT bought less than 100 percent of the bid stack. The absence of the hockey stick would have saved the market at least $17 million and possibly as much as $37 million.[3] Moreover, during the intervals it bought the entire balancing energy stack, ERCOT still had to procure more balancing energy from capacity that had not been offered into the market. Paying the exorbitant price of the last MW in the auction did nothing to solve the problems posed by the ice storm.

Competitive failure in a market with abundant reserves is infrequent. When it does happen, it has little to do with any systematic supply shortage.

III. The Texas Solution

One way of dealing with hockey stick pricing is to define the behavior and prohibit it under market rules. The problem is that hockey stick pricing constitutes a pathological *intent* that does not lend itself to a bright-line definition. A supplier submitting a hockey stick offer does so with the intent of maximizing revenues when the market has failed and is vulnerable to manipulation. How this intent manifests, however, is a strategic problem determined by what existing market rules allow.

The U.S. Supreme Court has faced a similar dilemma in what Chief Justice Warren Burger described as the court's ''somewhat tortured history'' of decisions involving obscenity.[4] There is general agreement that the First Amendment does not protect obscenity. The harder question is distinguishing obscene material from expressions that have some legitimate social, artistic, or scientific value. The court's guidance has varied over the last 50 years, but throughout that time the ''I know it when I see it'' principle has always been present in some form or another.[5]

In the case of hockey stick pricing, the economic issue is similar: Does the price reflect a legitimate economic signal, or is it simply opportunistic price gouging? Market monitors know a hockey stick offer when they see it in the context of the rules they police, but an objective ''bright-line'' definition is elusive. Indeed, a

measurable definition could even lead to *more* hockey stick behavior. As seen with the soft price caps imposed in California during the onset of the electricity crisis, most gaming occurs around the bright line, and essentially the same behavior will occur just below the line. Requiring a precise definition of what constitutes hockey stick pricing would be equivalent to asking the Internal Revenue Service to publish the triggers for a tax audit.

The Texas approach is different. The premise is that competition is the best immunization against the effects of hockey stick pricing. Consequently, the only time an antidote is needed is when competition fails. When competition fails, then the mitigation procedure needs to approximate what might reasonably be expected to happen if no hockey stick offers were present.

The first step of CSM is to conduct a competitive sufficiency test. Insufficiency may be defined in a number of broader ways, but for balancing energy, the simplest and most incontrovertible criterion is whether demand exhausts supply. If all available supplies have to be procured, there is no competition because no substitution is possible. Exhausting the offer stack is the signal that the market cannot protect itself against abusive bidding practices however they may be defined.

The second step of CSM is to calculate an adjusted MCP. MOD looked for an adjustment formula that would accomplish the following when ERCOT needed everything in the auction:

- Leave the original MCP alone if there were no hockey stick offers;
- Provide for a reasonable scarcity rent when emergencies and random events cause momentary shortages;
- Ensure that most of the supplies purchased in the auction were paid more than their offer price; and
- Ensure that every quantity purchased was paid at least enough to recover costs.

Ultimately, in the presence of a hockey stick offer, the mitigation chosen was to take the price corresponding to purchasing 95 percent of the offer stack and multiply it by 150 percent. If this resulting mitigated MCP is higher than the unmitigated MCP, the final MCP is the unmitigated MCP. Otherwise, the mitigated MCP is used as the final MCP used for settlement.

To illustrate how CSM would differ between a hockey stick scenario and a high marginal cost scenario, consider the two aggregate market offer stacks contrasted in **Figure 4**, both terminating at a maximum price of $1,000. In the hockey stick scenario, the 95 percent price is approximately $120. If the entire stack were exhausted in this scenario, CSM would mitigate the MCP from $1,000 down to around $180. At this price, every offer other than the hockey stick would be paid more than its offer price. The hockey stick quantities would be paid at their offer prices, however, ensuring that these sellers would still be made whole even though they didn't set the price at which all other sellers were paid. Even though paying the hockey stick quantity in this manner is exceptional treatment, it is unlikely to distort seller behavior because the quantities at stake are so small. The fundamental risk remains the same: the more quantity that is offered at a high

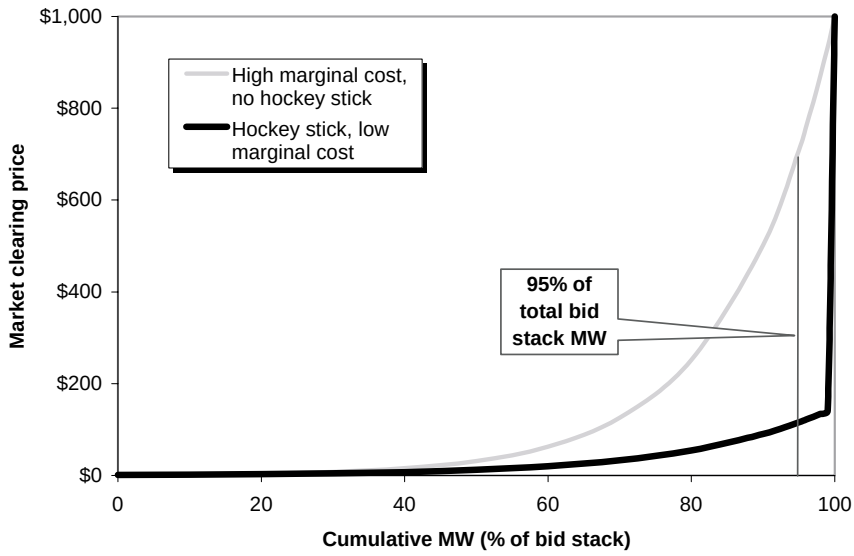

Figure 4: Two Examples of How CSM Works

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price, the greater the probability that it won't be selected.

CSM performs quite differently under the scenario in which marginal costs are high (caused, for example, by an upturn in natural gas prices). In this example, the 95 percent price would be around $700. If this stack were exhausted and the market were to clear at $1,000, the mitigated MCP would be $1,050—higher than the unmitigated MCP of $1,000, so that the unmitigated MCP would remain unchanged.[6]

A retrospective empirical analysis of balancing energy offer data in ERCOT reinforces the robustness of CSM. In Figure 3, the curve showing only those offer stacks terminating higher than $900 aggregates the hockey stick behavior actually observed in the ERCOT balancing energy markets. On this curve, the 95 percent price is $171, which would result in a mitigated MCP of $257. By comparison, the price corresponding to 99.9 percent of the stack is $264. In other words, if ERCOT had to buy all available balancing energy in an auction containing at least one hockey stick bid and CSM were activated, on average approximately 99.9 percent of everything that was purchased would be paid more than its offer price. The remaining 0.1 percent would be paid at its offer price, but would not set the MCP for everyone else. On the other hand, the average non-hockey stick offer curve would not have been mitigated. Here, too, the 95 percent price is $171 and the adjusted MCP would be $257. But the highest point on the non-hockey stick average curve is also $257, consequently no mitigation would have occurred.

IV. Sunshine as a Market Disinfectant

The commission's sunshine policy involves publicly disclosing the names of suppliers who submit high-priced offers when the MCP spikes. The expectation is that the threat of public identification will deter unwarranted, high offers by generators averse to bad publicity (or in some cases, averse to *further* bad publicity) and by public power authorities who must be responsive to elected public officials.

Independent power producers vociferously opposed any form of wholesale price mitigation.

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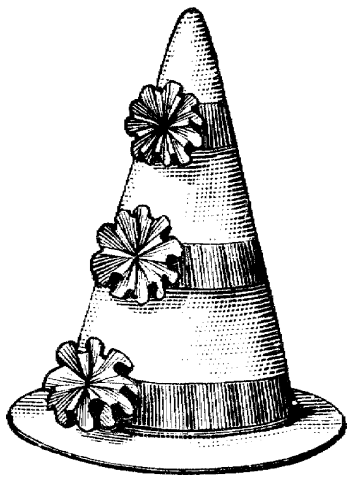
The PUCT's disclosure policy has an automatic component and a discretionary component. The automatic component is triggered whenever the balancing energy MCP reaches $900 or higher during an operating interval. On the following day, ERCOT will release the names of those who offered balancing energy at $900 or more during those intervals.

The discretionary component is intended to deter suppliers who keep their offers just under $900 in an attempt to avoid the automatic disclosure. Because the PUCT has jurisdiction over ERCOT, it has the authority to order the identification of those who offer at less than $900. In essence, the PUCT has put auction participants on notice that even though a bright-line definition of hockey stick pricing is problematic, the PUCT will know it when it sees it, and will name names when it does.

Sunshine has already worked in ERCOT. In July 2002, ERCOT began identifying all balancing energy suppliers who submit offers priced above $300. ERCOT posts the list on its Web site the next operating day. Once this policy began, the number of auction participants offering balancing energy above $300 dropped by two-thirds.

V. Conclusion

Independent power producers as well as large incumbent power producers in ERCOT vociferously opposed any form of wholesale price mitigation. Nevertheless, MOD attempted to find a mitigation method that would protect the market from price gouging while at the same time allowing prices to rise when generation supplies were systematically scarce. The approach adopted by the Texas commission assumes



that competition, when present, will immunize a market against hockey stick pricing regardless of how it is defined. CSM is designed to be an automatic mitigation measure that minimally responds only when necessary for those times that competition fails.

Balancing energy usually comprises between 5 and 10 percent of the energy flowing over the ERCOT grid at any given time. The remainder is scheduled under bilateral contracts between loads and suppliers. The limited form of CSM described above for balancing energy became effective in late June 2003. MOD will continue to monitor bidding and other market behavior to assess how well CSM has guarded against the effects of hockey stick pricing.■

Endnotes:

1. ERCOT lacks the authority to reduce its market procurement by 1 or 2 MW in response to exorbitant prices. In fact, ISO operators are expressly prohibited from taking price into account at all when deploying balancing energy.

2. For the purposes of this article, CSM refers to a general model involving (1) a whole-market test for competitive sufficiency during an operating interval, and (2) a price mitigation formula that is activated if the interval fails the test. The Federal Energy Regulatory Commission has endorsed a theoretically similar approach in its Supply Margin Assessment, which it approved for New England ISO's new market design. See FERC, Order on Proposed Tariff Revisions, Docket Number ER03-849-000 (July 9, 2003), at 10–12 *et passim*.

3. During MOD's inquiry into bidding behavior during the extreme weather event, a number of market participants said their high bids in the ERCOT day-ahead ancillary capacity service markets were a response to the $990 per MWh prices they were seeing in the balancing energy market. Consequently, the hockey stick bid had a ripple effect that was felt not only in the balancing energy market but also in the ancillary service markets. MOD estimates this indirect effect to be around $20 million.

4. Chief Justice Warren Burger, writing in the majority opinion in Miller v. California, 413 U.S. 15 (1973).

5. Justice Potter Stewart, writing in his concurring opinion in Jacobellis v. Ohio, 378 U.S. 184 (1964), which for a time was the benchmark decision on obscenity and constitutional protection.

6. Offer caps in the ERCOT-run balancing energy and ancillary service capacity markets prevent any seller from actually submitting an offer above $1,000.

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