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REVIEW OF WHOLESALE ELECTRIC MARKET DESIGN	**§**	**PUBLIC UTILITY COMMISSION**
	§	
	§	**OF TEXAS**

COMMENTS OF EXELON GENERATION COMPANY, LLC

Exelon Generation Company, LLC ("Exelon")[1] respectfully files these Comments with the Public Utility Commission of Texas ("Commission" or "PUCT"), addressing questions posed by the Commission to guide its upcoming work session on Market Design.

EXECUTIVE SUMMARY

Exelon appreciates the opportunity to comment on the challenges with the current market design that led to the devastating effects from the Winter Storm, and the market reforms that are needed to meet Texas' growing reliability needs going forward. The Texas electric grid is unique and therefore requires unique market design solutions. No other electric grid is isolated from neighboring grids like Texas, which reduces the ability to receive support during emergencies. Additionally, intermittent resources make up 35% of installed capacity. These resources range from providing a maximum of 66% of energy on a mild spring day to only 8% on a peak summer day. This trend is not abating anytime soon: ERCOT's May 2021 CDR[2] report shows that only 5% of expected new build capacity is thermal generation, and yet residential and commercial load growth remains robust.

Exelon commends the Commission for taking a holistic approach to market reform, recognizing that the protocols were drafted to work together in harmony, that modification to one aspect of the market will have impacts on other areas that must be considered, and that all the market design objectives must be consistent with the policy goals established by the Commission.

The next page summarizes Exelon's recommendations.

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[1] Exelon Generation Company, LLC, through subsidiaries, owns 3,620 MWs of gas-fired capacity and 87 MWs of wind power in Texas. Exelon Generation Company, LLC also provides wholesale supply to a number of Texas cooperatives and municipalities.

[2] Capacity, Demand, and Reserves.

Exelon recommends that the following steps be taken as a holistic solution to accomplish the important policy goal of ensuring electricity reliability in Texas:

	Item	Recommendation	Why is this needed and what does it accomplish?
1	Price cap & ORDC	The energy cap should be lowered and the Operating Reserve Demand Curve (ORDC) widened to ensure sufficient real-time operating reserves are procured.	• Moves the market away from a crisis-based pricing scheme with extreme price volatility, and thereby reduces systemic financial risk • Provides a stronger price and performance signal well before a loss of load condition occurs • Maintains the current high standard for real time operating reserves through a market-based mechanism as opposed to command-and-control
2	Reliability Standard	A reliability standard should be set by calculating the quantity of Dispatchable Firm Resources (DFRs) needed to meet each season's peak net load plus the real-time operating reserve under extreme weather and extreme low output from intermittent resources.	• Ensures sufficient procurement of DFRs in step 3 below.
3	Dispatchable AS Product	A DFR procurement process should be created where ERCOT procures seasonally the quantity of dispatchable resources required by the reliability standard.	• Significantly improves reliability during all seasons of the year, including times when customer demand is high and intermittent resource output is low. • Reduces price volatility by strengthening the investment signal for existing and new dispatchable generation
4	Season-specific requirements	DFR procurement should ensure sufficient generation is procured to meet season-specific requirements	Includes, but is not limited to: • Winter: on-site fuel storage, dual fuel capability, or fuel supply arrangements to ensure winter performance for several days • Summer: facilities or procedures to ensure operation under drought conditions. • Spring and Fall: resource planned outage scheduling to ensure sufficient dispatchable generation.

Texas Senate Resolution 342 urges "the Public Utility Commission of Texas to significantly reduce the high system-wide offer cap and evaluate changes to the market structure". The high system-wide offer cap and the Value of Lost Load ("VOLL") in the Operating Reserve Demand Curve ("ORDC") are both currently set at $9000/MWh and should be lowered to potentially as low as $3,000/MWh. Exelon supports lowering the high system-wide offer cap and VOLL but notes that a lowering of these values needs to be met with a commensurate outward shift in the downward-sloping portion of the ORDC in order to simply maintain the current level of expected energy and reserve revenues available to the market that is desperately needed.

Carefully making both adjustments to the ORDC will create a revenue mix weighted more heavily towards near-scarcity conditions rather than loss-of-load conditions and will increase the number of intervals in which the ORDC adder rises above zero while providing higher prices during intervals where the market is approaching scarcity. These results will maintain the same high operational reliability that exists today by virtue of ERCOT's conservative operations that call for frequent Reliability Unit Commitments, for example. However, shifting the ORDC curve in the manner Exelon recommends will create a market-based solution and obviate the need for command-and-control actions by ERCOT. More resources will be committed in the day-ahead market for operation in real-time, and will thus be available to meet sudden and unexpected events occurring in the hour or day.

That said, it is unlikely that an ORDC modification alone will significantly strengthen the investment signal needed in existing and new firm dispatchable generation necessary to reliably serve customers during all seasons of the year, or to keep pace with load growth. As discussed earlier, even with the present design with VOLL set at $9,000/MWh, the ORDC has not driven a significant amount of new investment in thermal resources and did not drive "hardening" of existing resources sufficient to forestall the challenges of the Winter Storm. To address this shortfall, a new ancillary service product should be created, available to firm dispatchable resources, to supplement the recommended ORDC modifications.

To improve reliability, Texas needs to retain its existing dispatchable resources, ensure that existing and new dispatchable resources make necessary investments to operate reliably during extreme conditions, and to incentivize new dispatchable resources to meet the needs of the grid when intermittent resources are unavailable. The current amount of dispatchable resources is

insufficient even for routine maintenance, creating reliability issues in the shoulder months in the Spring and Fall that did not previously exist, let alone an unexpected event when large swaths of intermittent resources fail to perform. As such, Exelon recommends that the Commission create a new Dispatchable Firm Resource ("DFR") product, and establish a procurement process to obtain the desired number of megawatts of firm dispatchable resources on a seasonal basis, with eligibility requirements determined by the Commission. Selected dispatchable resources would be paid for the reliability services that they provide and would be required to pay penalties for any non-performance. Because the DFRs would be procured in advance on a rolling seasonal basis, it would be able to evolve as Texas' load and reliability needs change.

RESPONSES TO COMMISSION QUESTIONS

1. What specific changes, if any should be made to the Operating Reserve Demand Curve (ORDC) to drive investment in existing and new dispatchable generation? Please consider ORDC applying only to generators who commit in the day-ahead market (DAM). Should that amount of ORDC-based dispatchability be adjusted to specific seasonal reliability needs?

Response:

The ORDC is a powerful market design feature of the Texas electric market and should remain a prominent feature of the Texas market design available to all resources that provide energy and real-time operating reserves. That said, there are two significant recommended changes to the current ORDC in order to drive investment, and to provide better operational use of existing and new dispatchable generation: (a) lower the HCAP; and (b) shift the ORDC tail.

Exelon supports the resolution from the Senate of the State of Texas 87th Legislature which urges the Public Utility Commission of Texas to significantly reduce the high system-wide offer cap (HCAP). The purpose of the HCAP is to encourage resource performance and demand response during potential loss of load conditions and to signal investment. A HCAP of $3000-$4500 per mega-watt hour, coupled with an outward shift and extension of the downward-sloping portion of the ORDC, provides an equally strong performance incentive to the current ORDC and, when coupled with additional market design changes discussed below, will improve the overall investment signal for existing and new dispatchable generation.

As part of this modification to the ORDC, the "tail," or downward-sloping portion, of the curve should be shifted outward and extended to create a revenue mix weighted more heavily

towards near-scarcity conditions rather than loss-of-load conditions. Extending and shifting the curve outward will increase the number of intervals in which the ORDC adder rises above zero and will provide a higher price during intervals where the market is approaching scarcity. While market volatility is a naturally occurring event in the electric market, in an energy-only market, a shifted and extended ORDC tail will produce fewer extreme spikes in market prices because the market will ultimately carry a higher level of operating reserves. The increased amount of operating reserve commitments is beneficial from an operational reliability perspective, as ERCOT has recently recognized through its out of merit commitment of additional operating reserves and ancillary services, but would have the further desirable effect of bringing most of these out of merit commitments "in-market." Smoothing market volatility benefits generators by providing more predictable revenues, which contributes to long-term resource adequacy by dampening the boom-bust cycle that exists under the current structure, which by extension improves reliability in Texas, benefitting all customers.

One important feature of the outward shift of the downward-sloping portion of the ORDC is that it will only significantly impact energy prices when the system approaches true physical scarcity – that is, when the market lacks excess physical capacity to commit to provide reserves. When the market does have excess physical capacity, the impact of the outward shift of the ORDC will largely manifest via increased self-commitment of the offline capacity in response to the price signal created by the re-calibrated ORDC. Therefore, the effect of the ORDC adder under such conditions would be to induce market participants to provide an increased level of operating reserves relative to what they do today, while leaving prices largely unchanged.

The changes outlined above will improve the operation of the ORDC and by extension the real time reliability of the electric grid. However, given the vast and growing amount of intermittent resources, whose output is highly variable, a new ancillary service product should be created and made available only to firm dispatchable resources to ensure reliability round-the-clock and year-round in Texas. The new product is described in detail in response to question 3.

2. Should ERCOT require all generation resources to offer a minimum commitment in the day-ahead market as a precondition for participating in the energy market?

a. If so, how should that minimum commitment be determined?

b. How should that commitment be enforced?

Response:

As described in Exelon's response to question 3, the only resources that should be required to offer into the day-ahead market are the resources that are qualified and selected to provide DFRs.

3. What new ancillary service products or reliability services or changes to existing ancillary service products or reliability services should be developed or made to ensure reliability under a variety of extreme conditions? Please articulate specific standards of reliability along with any suggested AS products. How should the costs of these new ancillary services be allocated.

Response:

Exelon proposes that ERCOT procure a new DFR ancillary services product on a seasonal basis. The goal of DFR procurements would be to ensure that ERCOT has sufficient reliable dispatchable resources going into every season to reliably serve load under extreme weather and loss of intermittent generation conditions. This would be accomplished by procuring sufficient reliable dispatchable resources on a forward basis going into each season to serve load under extreme conditions, while putting in place measures to ensure that the resources procured fully meet weatherization standards necessary to perform under extreme conditions and are financially incentivized to perform when required. In short, DFR procurements would ensure that ERCOT has dispatchable resources that are both sufficient in quantity and quality to serve load under extreme conditions at all times of the year. DFR procurement would operate in tandem with ERCOT's existing energy and ancillary services markets and would not require extensive revisions to any existing markets; rather, the DFR market would be an additional and separate market for procuring the resources ERCOT needs for reliable seasonal operation while allowing all resources to continue participating in energy and ancillary markets as they do today.

Qualification criteria for dispatchable generators to participate in DFR Procurements

Resources that seek to provide DFRs would need to meet specific criteria to be eligible to provide the product, to ensure that the resources selected are capable of high performance during extreme weather conditions. The DFR product would be four separate seasonal products

(summer, winter, fall, spring) with similar, but not identical, eligibility requirements, all tailored to the goal of ensuring performance. Depending on specifics, a given resource could be eligible to sell all four seasonal products or could be eligible to sell less than four. In each season, eligible resources could offer up to their maximum emergency output level under temperature conditions appropriate to the season. To be eligible to offer DFR, the resource would need to be fully dispatchable or capable of operating at a fixed, must-run level with minimum deviation on an ongoing basis (such as a nuclear unit). Further, a resource would need to certify that it meets the base weatherization requirements for the season in question, subject to inspection by ERCOT. Finally, resources providing DFR would need to submit their planned outage schedules to ERCOT for approval. Provided they make the necessary weatherization investments and otherwise abide by the qualification criteria, most if not all thermal generation resources in ERCOT would be eligible to offer DFR, while some demand response, private-use networks, and storage resources may also be eligible if they can meet the qualification criteria. Intermittent resources would not be eligible to offer as DFR.

A reliability standard to ensure sufficient dispatchable resources

ERCOT would determine the amount of DFRs to procure on an ongoing season-to-season basis using a seasonal reliability look-ahead process that would be similar to, but ideally more rigorous than, the current Seasonal Assessment of Resource Adequacy ("SARA") process. As it does with the SARA today, ERCOT would perform this assessment several months prior to a given season. The objective of the assessment would be to quantify the total amount of DFRs needed to reliably serve load under a well-defined extreme stress-test scenario involving both higher-than-expected peak load and worse-than-expected performance from intermittent resources applicable to the coming season. This stress-test would be analogous to the extreme load and intermittent generation scenarios defined in the current SARA process, but ideally ERCOT would develop a single probabilistic stress-test scenario that jointly considers the combined possibility of extreme load and poor intermittent performance up to a very high standard of reliability, such as a 1-in-100 years rate of occurrence. One key aspect of the stress test would be that dispatchable resources would be assumed to perform to expectations rather than to a stress scenario with a high level of outages because the eligibility requirements and performance incentives of the new DFR product would drive higher performance of such resources even under extreme conditions. Based on the stress test, ERCOT would determine the total amount of DFRs needed to avoid a reserve shortage

under extreme weather and intermittent resource output conditions. A simple example of this calculation is shown below, using the Summer 2021 SARA and its associated extreme load/wind scenarios as a proxy for the more rigorous stress test discussed above.

A seasonal procurement of resources to reach the reliability standard

Using the seasonally determined target procurement quantities, ERCOT would administer rolling seasonal central procurements of DFRs at regular intervals prior to each season. Resources would be expected to offer the incremental revenue they require to provide DFRs, net of expected energy and ancillary services revenues. The clearing price of DFRs would generally be based on the incremental cost of the marginal cleared resource, with a shortage of DFRs resulting in a clearing price at a cap established by the Commission that would send a price signal to incent more entry in subsequent seasons.

Illustrative Example for Setting DFR Summer Procurement Target, Using Summer 2021 SARA

Step One: Determine Available Resources Under Normal Peak Operating Conditions		
	DFR-capable resources identified in Summer 2021 SARA	(MW)
	Existing Thermal/Hydro	64,153
	Private Use Networks	3,210
	Switchable Capacity	3,056
	Mothballed Capacity	588
	Planned Thermal	183
	Storage	0
	Demand Response	2088
a	Total DFR-Capable Resources	73,278
b	Non-DFR Resources	15,673
c = a+b	Total Resources	88,950
d	Expected Planned + Forced Thermal Outages	3,642
e = c-d	Total Expected Available Resources at Peak	85,308
f	Peak Demand	77,244
g = e-f	Expected Operating Reserves at Peak	8,064
h = g - 2300	Excess over 2300 MW operating reserve target to avoid EEA1	5,764
Step Two: Determine Additional Dispatchable Firm Resources Needed to Maintain Reserves Under Extreme Conditions		
	Stress-Test Scenario Adjustments (illustrative using 2021 SARA scenarios; to be replaced by more rigorous extreme net load analysis)	
i	Extreme Peak Load	4,911
j	Extreme Low Wind Output	6,577
k = i + j	Total Stress-Test Adjustments	11,488
l = g-k	Operating Reserves Under Stress-Test Scenario	-3,423
m = l - 2300	Excess (Defiency) Relative to 2300 MW operating reserve target to avoid EEA1	-5,723
n = a-m	DFR procurement amount	79,001

Multiple options exist as to the specific mechanics as to how the procurement would be conducted. One straightforward approach would be to utilize a market-wide demand curve with a price cap and downward slope. Suppliers would offer their marginal cost to provide DFR at a given quantity and ERCOT would form an upward-sloping supply curve from the resulting offers

that it would clear against the demand curve, with the marginal resource setting the price. The resulting price would be paid to all DFR providers that clear the market. Other procurement structures, such as a descending-clock auction or a pay-as-bid RFP with an offer cap, have been utilized in other regions and could be considered, as well. The cost of the DFRs procured could be allocated in a variety of ways, such as to retail electric providers based on seasonal peak load share.

Penalties for non-performance

A key element of DFR procurement is ensuring that resources selected to provide DFRs have strong incentives to perform when needed for system reliability. First, as discussed, to qualify as a DFR supplier, a resource must meet stringent qualification criteria to ensure that it is able to supply capacity when needed under stress conditions. Resource owners that are found to willfully misrepresent or fail to abide by the qualification criteria should be subject to forfeiture of all DFR revenues, and possibly additional financial penalties. Second, DFR resources would be required to either offer into the day-ahead energy market or self-commit their resources and, if committed, would be required to offer their capability into real-time energy and/or ancillary services markets to ensure that their energy and operating reserve capability is available to the market when needed. Finally, resources supplying DFRs that fail to provide energy or operating reserves during periods approaching reserve scarcity would forfeit a portion of DFR revenues for the season for each instance of non-performance and potentially would forfeit all DFR revenues for the season with repeated instances of non-performance.

Summary of DFR Procurement

The overall impact of DFR procurement will be to greatly enhance the reliability of ERCOT in all seasons by ensuring that ERCOT has sufficient dispatchable capacity able to reliably operate during extreme conditions for the season in question. Going forward, as intermittent resources continue to enter the market, DFRs will ensure that sufficient dispatchable resources to serve load are available even if intermittent resources are unable to perform. DFR procurement creates a new revenue stream for firm dispatchable resources and leads to enhanced reliability, which will naturally result in fewer periods of scarcity and near-scarcity, which will reduce the level and frequency with which the ORDC drives increases to energy prices.

4. *Is available residential demand response adequately captured by existing retail electric provider (REP) programs? Do opportunities exist for enhanced residential load response?*

Response:

Residential demand response should, with appropriate qualifications, be consolidated into the DFR procurements described in response to question 3.

5. How can ERCOT's existing emergency response service program be modified to provide additional reliability benefits? What changes would need to be made to Commission rules and ERCOT market rules and systems to implement these program changes?

Response:

The existing emergency response program should, with appropriate qualifications, be consolidated into the DFR procurements described in response to question 3.

6. How can the current market design be altered (e.g., by implementing new products) to provide tools to improve the ability to manage inertia, voltage support, or frequency?

Response:

Additional information from ERCOT is needed to understand the nature of each problem before a market design solution can be developed.

CONCLUSION

For the foregoing reasons, Exelon respectfully requests that the Commission make changes to the current market design, consistent with the above. Exelon is willing to participate in the upcoming workshops should the commission desire.

Respectfully submitted,

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On behalf of Exelon Generation Company, LLC