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

Texas Solar Power Association Comments

The Texas Solar Power Association ("TSPA") is a statewide industry trade association that promotes the development of solar electric generation. Our member companies invest in the development of solar photovoltaic products and projects in Texas, serving customers in both wholesale and retail markets, with products ranging from utility-scale generation, community solar and customer-sited solar and storage solutions.

Executive Summary

No changes should be made without a measurable reliability benefit.

If any changes are made to cost allocation of Ancillary Services, those changes must be based on a fact-based finding of cost-causation and be non-discriminatory, which means that any cost-causers, to the extent they can be determined at all, must pay for costs incurred. This includes thermal generators that have forced outages, highly variable loads like steel mills, electric vehicles that charge at inopportune times, the largest single contingency, etc. This is an extraordinary task that may not be achievable or palatable, since the ultimate beneficiary of reliable electric services are consumers.

Inverter-based technologies, such as solar, can provide all grid services, respond to frequency, and follow dispatch instructions. They are fully dispatchable and can offer more precision and quick response than traditional generation technologies. Solar is capable of providing these services without an onsite battery. While batteries are very useful for a variety of reasons, they do not make a solar generator more dispatchable (for example, a battery would allow energy storage during curtailment resulting in more energy available later if needed). If in the future ERCOT has "too much" solar so that regular curtailment occurs, solar generators will have headroom to move up and down in response to ERCOT instructions. In the present environment, solar generators are often dispatched to their maximum output because ERCOT dispatches generators based on cost, and solar has a very low fuel cost.

Solar projects are exposed to replacement power costs, similar to any generator – gas, solar, wind, coal, nuclear – that has a contract to provide a certain quantity of power for a point of time in the future. These projects must either produce that power themselves or buy it back on the market. The idea that solar is somehow uniquely different from other fuels when it comes to replacement power has been repeated many times but has no basis in reality. Additionally, given that solar is a daytime resource that produces and sells power in higher priced peak hours - when the system needs it the most - solar is exposed to the highest replacement power costs compared to other technologies. Furthermore, it is deeply troublesome to suggest that the Commission weigh in on mutually agreed upon contracting matters between private parties. All projects that contract into the future, whether day ahead or longer term, have the same burden to provide replacement power, and like other technologies, solar capacity is typically built under this type of supply contract.

Distributed Energy Resources (DER), such as customer-sited solar and storage solutions, serve generation needs, increase resiliency, and reduce loads especially at critical times. The Commission's proceedings on distributed energy resources (DERs) should be concurrent with other market design questions, since they are so intertwined. The PUC's proceedings on DERs should determine pathways for DERs serve the ERCOT market, grid, and customer needs concurrently with other projects.

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?

The ORDC mechanism can drive investment in new dispatchable generation in one particular way very quickly – by responding to ERCOT's current conservative operations. In response to recent reliability events, ERCOT has prudently procured more reserves through market-based and non-market-based mechanisms. While we hope this procurement can become more efficient in the future, we anticipate that a higher quantity of reserves online will be the "new normal" for the ERCOT market. Therefore, the existing policy for ORDC dictates that the Value of X be raised to reflect this conservative approach. The Commission should seek comment on what the Value of X should be raised to, but this value being raised will incentivize new investment and maintenance expenses[1].

However, paying the ORDC to only a subset of generators is technically infeasible and misguided. Regardless of what mechanism is selected to discriminate between generation types to pay or not pay ORDC, it would break the market design. The ORDC price is included in all settlement point prices at every node in the system, and included in all prices paid by load. If some generators receive ORDC and others do not, what prices do loads pay?

Even if the questions above could be resolved, determining who should receive the payment is difficult. Should nuclear plants that prefer to operate at the same dispatch level day after day be considered differently than other facilities? Generators with a slow ramp rate?

Fundamentally, these questions can be avoided by remembering that ORDC is for operating reserves. Solar generators provide physical responsive capability to ERCOT regardless of whether they participate in the DAM. Increased solar output means increased headroom for other dispatchable generators with higher fuel costs.

ORDC has been described as "the cherry on top." However, on the most crucial days of the year, when availability is critical, ORDC is the cherries in a cherry pie. Not paying some generators this adder when ERCOT wants them to be online and available isn't a sound market design. Further, unless ORDC was altered in unrecognizable ways, not paying some generators ORDC wouldn't result in more payment for other generators – the online reserves would still be the same. Thus, non-payment would not create any additional market incentives.

Solar is fully controllable and fully dispatchable, up and down. Modern solar is highly technically sophisticated with DC to AC ratios, tracking systems, inverter controls, etc. In current practice, solar isn't dispatched up because it's always at the top because the fuel is free. Solar doesn't provide ancillary services today because the payment for an ancillary service would have to be higher than the opportunity cost of not providing energy – the energy price. But if solar generators were paid to not produce at its full potential to be ready to ramp up, they easily could. However, the best way to have solar headroom is to have "too much" solar. A bigger solar investment will make ERCOT more reliable and provide more MW of capacity, and if solar was regularly curtailed because of over-production, it would have the headroom to move up too.

In particular, the DC/AC ratio shows how solar is already responding in the market to concerns from PPA buyers and market incentives. DC/AC ratio is the ratio of panels on the DC side compared to the capacity of the facility to output energy. Having additional panels above the

[1] Methodology for Implementing ORDC to Calculate Real-Time Reserve Price Adder.

capacity of the interconnection allows for the solar output to be better managed. This incentive happens naturally from the market and every development will have a different ratio based on its costs and siting decisions. Additional DC capacity is particularly helpful when a battery is sited to charge from the DC side. These decisions are being made today based on market-demands, and don't require regulators to intervene – market discipline is a very powerful regulator.

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?

No. There's no reliability benefit to requiring a DAM commitment. However, if the PUC decides to order one, there must be a payment for being required to commit, including being forced to sell in a congested area when it may not be economic. The RTM price signal exists for a very good reason – to respond to real-time conditions. Requiring DAM participation will increase costs for some generators without a quantifiable reliability benefit. For example, should load resources be required to submit daily offers to curtail when it is unlikely that they will ever be struck? Should natural gas peakers offer to commit in the DAM, only to find that real-time conditions don't warrant a commitment?

If required to do so, solar can commit in the DAM without issue. This may require some contracts to be renegotiated, which could take some time. However, the hourly nature of the DAM market makes it difficult to account for ramps efficiently. DAM participation, if required, should be at some minimum level that reflects resource constraints, such as solar irradiance.

Regardless of whether the Commission requires DAM participation, it should reform the DAM to have additional price formation from ramping periods that are washed out by hourly DAM prices.

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.

<u>New Services</u>

Any new ancillary services should have a measurable impact on reliability. Additionally, they should be predictable, liquid, and able to be provided by all technology types including load. These are elements are essential to market outcomes so that ancillary services can be hedged and do not have excessive costs.

As an alternative to some ancillary services, the Commission should explore having more voluntary forward markets in future workshops.[2]

As mentioned above, solar is a fully dispatchable resource, whether or not it is attached to energy storage. Current market conditions lead to solar almost always being fully dispatched to its maximum output. Consider accelerating the ERCOT Contingency Reserve Service (ECRS). ECRS, a ten-minute service, is planned for future implementation. ECRS will give ERCOT an additional reliability tool to manage forced outages or ramping conditions. The PUC

[2] "Lessons from the 2021 Texas Electricity Crisis," Peter Crampton. Working Paper, University of Cologne, June 2021. Pages 19-23. Accessible at https://www.cramton.umd.edu/papers2020-2024/cramton-lessons-from-the-2021-texas-electricity-crisis.pdf

could require that it be provided by ERCOT sooner. In addition, ERCOT could develop mechanisms to pay for voltage and inertia. Synthetic inertia can be provided by any inverter-based resource.

To the extent the Commission orders ERCOT to create new ancillary services, it should require those ancillary services by establishing the particular requirements are technology neutral, or to the extent that is infeasible, be requirements that any technology can meet. For example, for a "firm fuel" ancillary service that might be considered, natural gas can provide it by hardening the supply chain or solar can install batteries, every effort must be made to be flexible, because ancillary service hedging is important, costly, and difficult. Always consider whether the energy-only market provides sufficient signals for the reliability need, or could provide them, instead of creating new products that are difficult to hedge.

Black start is a critically important service and deserves careful attention from the Commission. ERCOT was minutes and seconds away from a grid blackout that could have taken weeks to recover from. The Texas economy can't afford this risk. Relatedly, investments in black start resiliency can provide other grid benefits too. For example, a black start program that funds a battery and a solar site also provides a battery to be used every other day of the year. The Commission should seek comments or issue an RFP for how to improve ERCOT's black start service.

Cost Assignment

Cost assignments for ancillary services – existing ones and any new services – should be paid for by load, as has been the practice for many years and is common throughout all organized markets. Load ultimately pays for the whole system, and is the beneficiary of reliable electric service.

To the extent the Commission seeks to alter this historic practice, it is inappropriate to apply costs to solar unless the Commission can clearly demonstrate the change in methodology is based on cost-causation with a clear fact pattern that was done in a non-discriminatory way. It's unlikely that this is possible. For example, solar (and wind) have increased dramatically since 2005, but the ancillary service procurement has been roughly the same. Further, the reasons ERCOT procures ancillary services are sometimes different for why it deploys them. Ancillary services are frequently deployed in response to unit trips of thermal generators.

When ERCOT procures ancillary services for solar forecast uncertainty or deploys ancillary services due to a solar forecast error, it is the forecast provider's fault, not solar. ERCOT has bought fewer ancillary services in the past when it improves its forecast, demonstrating factually that solar did not cause the cost. For example, see the implementation of SCR 811. ERCOT modified how it uses solar forecasts in real-time, and then procured fewer ancillary services as a result. Solar behavior didn't change to reduce the procurement quantity, and thus solar generators didn't cause the cost of procurement.

ERCOT has historically relied on a GE study to procure ancillary services. This study is extremely outdated and was based on wind. It is not useful for determining cost assignment, but merely guides ERCOT procurement. To the extent that a study is used for cost-assignment, this study is not appropriate.

Even if some costs could be determined to be caused by solar generators, other costs might be caused by other entities that should also receive a cost assignment, and the Commission risks assigning these costs in a discriminatory manner. Arguments could be made to assign costs to steel mills and other variable loads, residential air conditioning loads, electric vehicles, and massive nuclear generators that represent the largest contingency on the system. This Pandora's box of cost-assignment will be difficult at best.

To the extent the Commission determines that solar should be assigned costs for ancillary services, it should also consider how solar has led and will lead to reduced energy costs from its low fuel prices. These consumer savings should offset any cost-assignment.
Finally, even if the PUC could create a mechanism to assign costs that was based on a fact-based finding of cost-causation that was non-discriminatory, there is no reliability benefit to doing so. At worst, it would merely reduce investment in solar generation on the margin, which will result in a lower reserve margin for ERCOT. As a rough approximation, if future solar investment was reduced by 1/3 due to additional cost burdens, it would reduce the reserve margin by 7.8% in 2023 and 8.1% in 2024.

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

Residential demand response and distributed energy resource (DR and DER) aggregations can provide vital demand-side and distribution grid resiliency assets. However, retail electric provider (REP) programs have not captured these benefits to date. Currently, market design does not reflect the value of these benefits and there are some technology blockers to DER market participation. TSPA recommends the Commission develop a proceeding to identify efficient pathways for distributed energy resources to serve the ERCOT market needs and send price signals to ensure market and customer participation.

DER aggregations can provide essential services and benefits to the ERCOT market, grid resiliency, and directly to residents. DERs create more predictable load shed and avert rolling utility outages as a resiliency microgrid. In the report, *Smart, Clean, Neighborhood Grids, A Solution for Avoiding Customer Curtailments* recommends "The deployment of substation-sited energy storage, customer-sited DERs along the distribution network, advanced controls, and upgrade of utility switchgear and protection, can enable the creation of self-sustaining distribution segments[3]." Solutions such as a Virtual Power Plant (VPP) can leverage customer-sited solar and storage and maximize benefits to the grid. VPPs can export stored power back during peak demand and/or reduce consumption on a predictable timeline and in targeted areas. VPPs are fully dispatchable and can provide ancillary services to the grid. Residential VPPs can protect customers during outages and keep the local distribution system online.

The development and incorporation of DERs in ERCOT could result not only in increased resiliency, but significant savings for ratepayers and utilities. A grid that optimizes DERs not only serves local load and reduces peak load, but can also lessen the need for some of the distribution infrastructure as well as potential transmission buildout. The Commission should ensure DERs are integrated and optimized into ERCOT and regulatory planning using advanced modeling tools[4]. In the paper, *Why Local Solar Costs Less: A New Roadmap for the Lowest Cost Grid*[5], Vibrant Clean Energy's Christopher Clack reported that new modeling shows the incredible benefits of planning the transmission and distribution grid together. Clack reported that when VCE's model accounted for local weather conditions, the distribution grid, and could deploy DERs, billions were invested in DERs, and they had hundreds of billions in savings. Summarizing the report, David Roberts stated "Whether you're concerned about climate change or not, whether you want to reduce emissions or not, whether you care about the health and resilience of local communities or not, deploying DERs brings down system

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[3] Smart, Clean Neighborhood Grids: Redesigning Our Electricity System To Help Communities Power Through Blackouts. Feb 25, 2020. Sunrun. Accessible at https://www.sunrun.com/home-solar-blog/sunrun-neighborhood-grid

[4] https://www.vibrantcleanenergy.com/products/wisdom-p

[5] Why Local Solar Costs Less: A New Roadmap for the Lowest Cost Grid. Vibrant Clean Energy, Dec 1, 2020. https://www.vibrantcleanenergy.com/wp-content/uploads/2020/12/WhyDERs_ES_Final.pdf

costs. It's the fiscally responsible thing to do.[6]" Clack's modeling shows that large DER penetration doesn't take away growth in other zero fuel cost resources. Grid-scale solar investment increases in the modeling because DERs are able to easily absorb excess electricity that would otherwise be curtailed. This increased demand partially offsets the marginally reduced energy price that incremental solar investment causes. Distributed solar and batteries and grid-scale solar can work together to deliver a cheaper, more reliable ERCOT power grid. The implications of this research are enormous, and the PUC should begin to study them as soon as possible.

The Commission could ensure efficient pathways for DERs to serve the ERCOT market needs and send price signals to ensure market and customer participation through a future proceeding and workshop process. Given resiliency needs, this proceeding should happen in parallel to other proceedings, and not be considered an afterthought to the Commission's work.

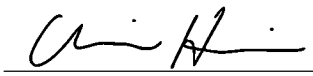
5. How can ERCOT's emergency response service program be modified to provide additional reliability benefits? What changes would need to be made to Commission rules and ERCOT market rules and systems to implement these program changes?

ERCOT's emergency response service program may not be sending the appropriate price-responsive signals to drive needed levels of participation. The Commission could evaluate budget increases and investment into increased participation. Driving additional participation in ERS through solutions like DERs would also bring additional benefits if reliability and resilience such as VPPs and back-up power for customers and critical loads.

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?

Please see the responses to question 3.

Respectfully submitted,



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[6] Volts. David Roberts. "Rooftop Solar and Batteries Make a Clean Grid Vastly More Affordable." May 28, 2021. Available at https://www.volts.wtf/p/rooftop-solar-and-home-batteries