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PROJECT NO. 52373

| REVIEW OF WHOLESALE ELECTRIC MARKET DESIGN | § § § | BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS |
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**STAND-ALONE EXECUTIVE SUMMARY OF VISTRA CORP.'S COMMENTS IN RESPONSE TO STAFF'S SEPTEMBER 20, 2021 REQUEST**

- To accomplish the Legislative mandate in Senate Bill 3 to ensure "appropriate reliability" from dispatchable resources, the Governor's directive to "foster development" of "reliable sources of power," and the stated objective of this Commission to move away from a "crisis-based" electricity market model to one that produces sufficient revenues in "normal" operating conditions, the Commission should modify the Operating Reserve Demand Curve (ORDC) and create a new Dispatchable Standby Reserves (DSR) ancillary service (DSR Product).
- The ORDC and ancillary services are the two primary "levers" that the Commission has available to it in the current energy-only market construct. To achieve the stated goals of policymakers and regulators, changes to these levers should aim to bridge the "missing money" gap that exists for investment in existing and new dispatchable resources in today's market.
- The ORDC should be modified in a manner that produces more meaningful adders at a higher level of operating reserves (e.g., 6,500 to 7,500 megawatts (MW)) and a more gradual increase in the energy price toward the value of lost load (VOLL), which should be significantly reduced from its current level of $9,000 per megawatt-hour (MWh).
- Such an outcome requires modification of not only the level of VOLL and the minimum contingency level (MCL) (i.e., the level of reserves at which the energy price would reach the VOLL), but also (and perhaps even more importantly) the shape of the curve, which is accomplished by modifying the loss of load probability (LOLP).
- Specifically, Vistra recommends that the Commission reduce the VOLL (e.g., to $4,000/MWh), increase the MCL (i.e., to 2,300 MW), and apply a modifier to the standard deviation for LOLP (i.e., ~1.5x).
- In addition, the Commission should adopt a new DSR ancillary service as "insurance" against emergency events due to unusually high demand and/or abnormally low resource availability.
- Resources selected for the DSR Product would be prohibited from participating in the normal ancillary services market, as well as the energy market below a floor price, and would be dispatched when needed for supply (e.g., when ERCOT otherwise would employ reliability unit commitment (RUC) service for supply).
- DSR Product units would be selected in a periodic auction, based on competitive bids, and would receive an availability payment, as well as be paid the prevailing energy price when dispatched. Capacity providing the DSR Product would be excluded from the calculation of the energy price to avoid price suppression. DSR Product units would be subject to performance requirements and penalties for non-performance.
- DSR Product units could be any qualifying dispatchable resource, but presumably would be resources that otherwise would rarely participate in the existing ancillary services market or the energy market, including existing generation that might be on the verge of retirement or mothballing, or are specifically built to provide backup generation services such as battery energy storage or gas peakers. These types of resources would have a low opportunity cost to

forgo energy and/or ancillary services revenues. The DSR Product could attract such dispatchable capacity that might otherwise be mothballed or retired.

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**VISTRA CORP.'S COMMENTS IN RESPONSE TO STAFF'S SEPTEMBER 20, 2021 REQUEST**

**TO THE PUBLIC UTILITY COMMISSION OF TEXAS:**

Vistra Corp. (Vistra) files the following comments in response to the Public Utility Commission of Texas (Commission) Staff's September 20, 2021 Request for Comments.[1] These comments are timely filed.[2]

## I. COMMENTS

A. The Objective of Market Design Changes – Defining the "Problem"

Since the transition to a competitive market in 2002, the Electric Reliability Council of Texas (ERCOT) has been an "energy-only" market, in which realized reserve margins have depended on the "aggregate outcome of private investment decisions based on wholesale prices."[3] Wholesale prices, in turn, have historically remained low the vast majority of the time due to various factors, including the influx of low cost, federally subsidized intermittent generation, consistently low (for the most part) natural gas prices, and the market-clearing-price mechanism that sets prices based on the offer of the marginal generator (which is strongly incentivized to bid based on its short-run marginal cost). Wholesale prices can be augmented, at times, through mechanisms such as congestion, mitigation, and price adders such as the Operating Reserve Demand Curve (ORDC) and Reliability Deployment Price Adder (RDPA). The ORDC is typically the most notable in terms of resource adequacy, because it provides a price signal that reflects the risk of available resources' ability to meet demand in real time, which in turn should provide

[1] Request for Comment (Sept. 20, 2021).

[2] *Id.* (setting deadline for comments on September 30, 2021).

[3] *See, e.g.*, The Brattle Group, *ERCOT Investment Incentives and Resource Adequacy* at 11 (Jun. 1, 2012) (hereafter "June 2012 Brattle Report"), *available at* http://www.ercot.com/content/gridinfo/resource/2015/mktanalysis/Brattle_ERCOT_Resource_Adequacy_Review_2012-06-01.pdf.

investment signals to the market. Since its implementation in 2014, however, the ORDC has rarely resulted in meaningful investment price signals outside of extreme physical scarcity events.

The current market design has been aptly described by this Commission as a "crisis-based business model," which effectively requires near emergency conditions to produce revenues greater than a power plant's variable costs, excluding very real fixed costs like labor, maintenance, repairs, or taxes. In effect, many power plants only recover their break-even revenues, much less profits, during a handful of days – or even hours – when weather conditions and high demand lead to higher prices. This crisis-based model by design results in extreme volatility, making long-term investment in this market by dispatchable, non-subsidized resources challenging. In addition, this feast or (largely) famine market structure also creates risk for the competitive retail electric market where at times it is impossible to properly hedge risk for retail electric providers or their customers. This comprehensive risk threatens the viability of the competitive electric market and its participants and exposes the State's citizens to unacceptable risk.

Following Uri, the Legislature and Governor have provided clear direction that the ERCOT market must be thoroughly redesigned to move from a crisis-based model and to a model that provides reliable service, fairly compensates power plants that perform even outside of tight grid conditions, and distributes revenue in a less volatile manner to attract and maintain investment in the market broadly. For example:

- Senate Bill 3 mandates that:

  "The commission shall … evaluate whether additional services are needed for reliability in the ERCOT power region while providing **adequate incentives for dispatchable generation**."[4]

  "The commission shall ensure that the independent organization certified under Section 39.151 for the ERCOT power region:

  (1) **establishes requirements to meet the reliability needs of the power region**;

  (2) periodically, but at least annually, determines the quantity and characteristics of ancillary or reliability services necessary to **ensure appropriate reliability** during extreme

[4] 87th Tex. Leg., R.S., Senate Bill 3, Section 14 (effective Jun. 8, 2021) (codified in Public Utility Regulatory Act (PURA), Tex. Util. Code § 35.004(g), (h)) (emphasis added).

heat and extreme cold weather conditions and during times of low non-dispatchable power production in the power region;

(3) procures ancillary or reliability services on a competitive basis to **ensure appropriate reliability** during extreme heat and extreme cold weather conditions and during times of low non-dispatchable power production in the power region;

(4) develops appropriate qualification and performance requirements for providing services under Subdivision (3), including appropriate penalties for failure to provide the services; and

(5) sizes the services procured under Subdivision (3) to **prevent prolonged rotating outages** due to net load variability in high demand and low supply scenarios."[5]

- In a July 6, 2021 letter to this Commission, Governor Abbott directed, among other things, that the Commission take actions to "**[s]treamline incentives within the ERCOT market to foster the development and maintenance of adequate and reliable sources of power, like natural gas, coal, and nuclear power**."[6]
- At the September 23, 2021 open meeting, Chair Lake recognized the challenge of, and need to move away from, a crisis-based model to one that provides predictable revenue streams for dispatchable generators during normal operating conditions, at a reasonable cost for consumers:

  "I would ask our stakeholder community to think about the kind of substantial changes to the normal functioning of the ERCOT market in the normal -- on a normal day, in the normal course of business, that will ensure that the revenues and economics of the ERCOT model go to **generating resources that provide reliable power** of any form or fashion and so that companies and entities that provide -- reliably provide power to Texas **can run a reasonably profitable business under normal conditions**. They **don't need a scarcity event or crisis to generate reasonable returns for their investors**."[7]

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[5] 87th Tex. Leg., R.S., Senate Bill 3, Section 18 (effective Jun. 8, 2021) (codified in PURA § 39.159(b)) (emphasis added).

[6] Letter from Governor Greg Abbott to Commissioners (Jul. 6, 2021) (emphasis in original), *available at* https://gov.texas.gov/uploads/files/press/SCAN_20210706130409.pdf.

[7] Transcript of Sept. 23, 2021 Open Meeting at 34 (emphasis added).

The policy makers and regulators are aligned in these statements that the current market design cannot provide the bulk of generator compensation only when on the precipice of involuntary load shed. Further, the market design changes must be achieved in a way that is "non-discriminatory" and allocates costs based on cost causation.[8]

The question, then, is what changes to the current market design would achieve this reliability mandate. In an energy-only market, "appropriate reliability" from dispatchable resources will require predictable and sufficient revenues via the energy and ancillary services markets that adequately and reliably compensate investors for the cost of owning, operating, and maintaining their resources, including a competitive return on that investment—i.e., that would solve the so-called "missing money" problem. Of course, the market design should not be a handout or guarantee a return to the vertically integrated and rate-regulated industry structure that saddled captive ratepayers with billions of dollars of stranded costs and bred inefficiency. The market should continue to uphold basic tenets that reward operators that perform reliably. There should be skin in the game for market participants, and they must perform to earn a return.

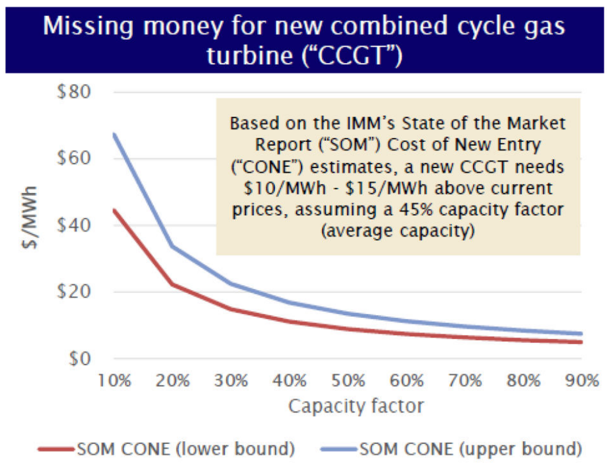
As recognized in the Independent Market Monitor's (IMM's) most recent *State of the Market Report*, net revenues in the ERCOT market (payments for producing energy and ancillary services less estimated variable production costs) have been below (and, in fact, typically far below) the estimated cost of new entry (CONE) for either a new peaking resource or a new baseload dispatchable resource in all but one of the past seven years—i.e., since 2014, the year that the ORDC was implemented.[9] That differential between actual net revenues and the net revenues needed to support new entry and retain existing investment in the market is sometimes referred to as the "missing money."[10] As demonstrated by London Economics International LLC

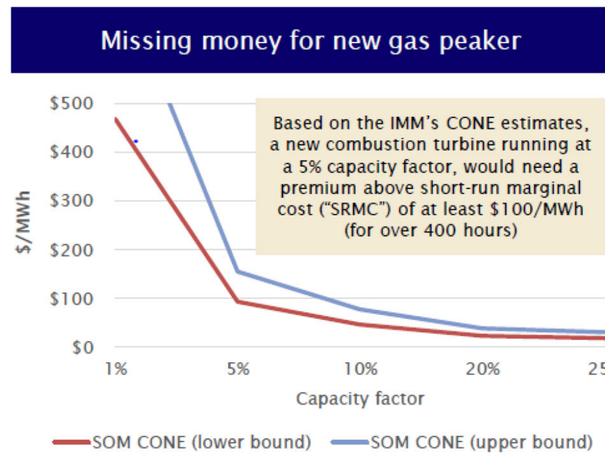
[8] PURA § 35.004(h).

[9] Potomac Economics, *2020 State of the Market Report for the ERCOT Electricity Markets*, at 72 (May 2021). Before 2014 (back to 2002), revenues similarly were below CONE in all but three years—2011 (when there was one involuntary load shed event in February and nearly another such event in August), 2008 (resulting from "extremely inefficient transmission congestion management and inefficient pricing mechanisms associated with the deployment of non-spinning reserves"), and 2005 (due to high gas prices). Potomac Economics, *2014 State of the Market Report for the ERCOT Wholesale Electricity Markets*, at 88 (Jul. 2015); Potomac Economics, *2006 State of the Market Report for the ERCOT Wholesale Electricity Markets*, at xiv, 51-52 (Aug. 2007).

[10] *E.g.*, Federal Energy Regulatory Commission, Docket RM01-12-000, Roy Shanker's *Comments on Standard Market Design: Resource Adequacy Requirement* (Jan. 10, 2003), *available at*: http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=9619272.

(LEI), the "missing money" for an efficient baseload new natural gas fired combined cycle gas turbine (CCGT) is \$10 to \$15 per megawatt-hour (MWh), and the "missing money" for a cheaper, lower capacity factor gas peaker is roughly \$100/MWh above short-run marginal cost for over 400 hours per year :



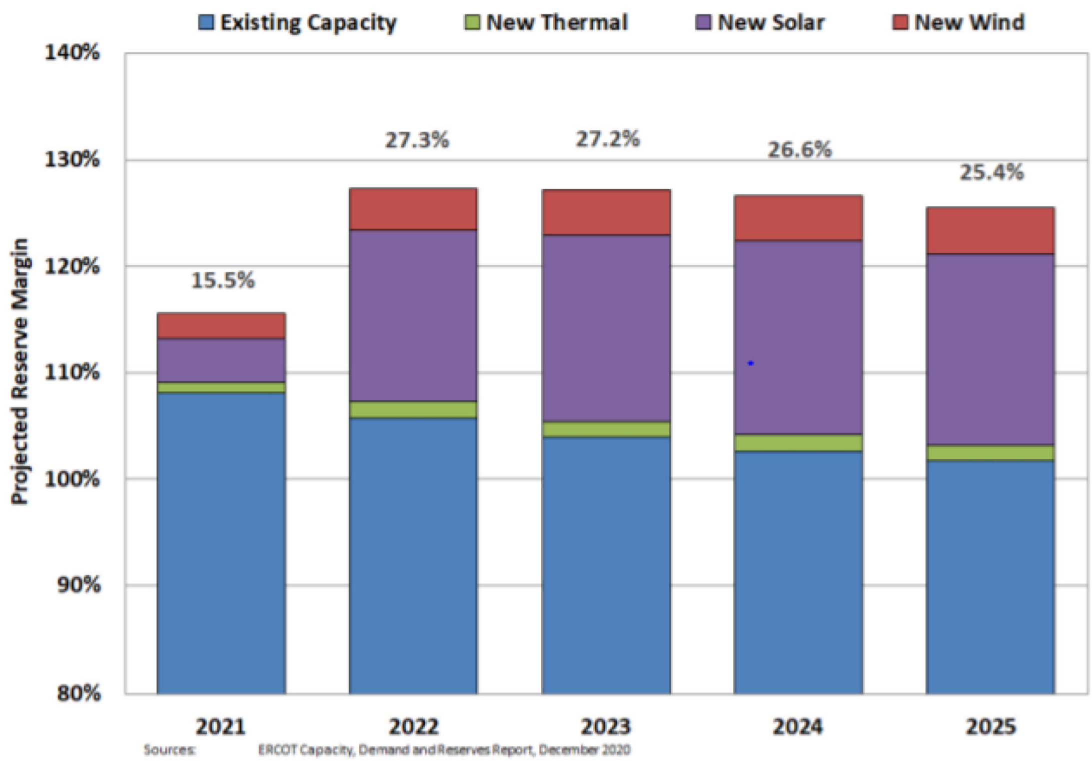

This is not a new problem. ERCOT has seen more dispatchable retirements than new build in recent years.[11] The persistent "missing money" problem means limited new build and more retirements. The risk inherent in capturing the "missing money" during periods of extreme weather also reduces investment, as factors outside of a plant owner's control such as natural gas availability puts more risk on the investment.

As demonstrated in the most recent *State of the Market Report*, and reflected in the graph below, while the projected reserve margin between 2022 and 2025 is between 25 to 27 percent, nearly the entirety of the growth in this reserve margin consists of new intermittent (non-dispatchable) resources. The IMM's projections show that in future years, if the market design

[11] According to the Independent Market Monitor's *State of the Market* reports, in 2020, there were thermal retirements of 1,030 MW, compared to 390 MW of new capacity from combustion turbines; in 2019, there were thermal retirements of 470 MW, with only 200 MW of new capacity from a source other than wind (out of 4,900 MW of total new build); and in 2018, there were thermal retirements of more than 5 GW of coal, with only 670 MW of new capacity from a combustion turbine. Potomac Economics, *2020 State of the Market Report for the ERCOT Electricity Markets*, at A-20 (May 2021); Potomac Economics, *2019 State of the Market Report for the ERCOT Electricity Markets*, at A-18 (May 2020); Potomac Economics, *2018 State of the Market Report for the ERCOT Electricity Markets*, at xii (June 2019).

remains unchanged, dispatchable generation will make up less and less of the grid, making reliance on intermittent resources a requirement of preventing load shed.[12]

**Figure 46: Projected Planning Reserve Margins**




As the Commission is aware, market design changes need to be mindful of the impact that the cost of electricity has on the continued growth of the unprecedented Texas economy. However, we must also be mindful that intermittent renewables have driven down electric prices below sustainable levels for dispatchable generation, which threatens reliability. In the long run, a properly functioning market will provide sufficient revenues to maintain reliable operations and incentivize new build, while competition drives prices to their most efficient and sustainable level in equilibrium. This is how markets work in every competitive business in Texas and around the world. The only way for the Commission to meet the obligations of recent legislation and to satisfy the Legislature's and Governor's intent is to solve this "missing money" problem and provide

[12] Potomac Economics, *2020 State of the Market Report for the ERCOT Electricity Markets*, at 79 (May 2021).

meaningful incentives to retain existing and add new dispatchable generation. This is the only path that will improve reliability and reduce the magnitude and frequency of involuntary load shed events and the associated significant human, economic, and political costs.

### B. Connecting Problems to Solutions - Two Primary Levers in the Existing Energy-Only Market Framework: ORDC and Ancillary Services

Vistra appreciates the Chair's directive for stakeholders to "think big" and propose market design changes that will not simply be "Band-Aids on bullet holes."[13] Vistra believes that the issues highlighted above can be solved by updating the ORDC and creating a new ancillary service or reliability service that moves some of the reliability decisions out of the ERCOT control room and into the marketplace. These changes will make the market more competitive, reducing reliance on physical scarcity, and reducing the incentive for ERCOT to rely on out-of-market mechanisms like reliability unit commitment (RUC). These changes are meaningful and can be implemented on an expedient timeline to address the directives of Senate Bill 3.

Changes to the ORDC and the creation of a new ancillary service are changes that could be done quickly and efficiently for ERCOT. If the Commission desires to make big changes to the market that do not rely as heavily on administrative pricing mechanisms, the best and most efficient way to do that is to adopt a centralized forward capacity market, in a manner that targets capacity needs in times of projected shortage (i.e., in the Senate Bill 3 conditions of extreme heat, extreme cold, and low non-dispatchable generation) and that avoids the "pitfalls" experienced in other markets by ensuring stringent qualification standards and onerous penalties for non-performance. A forward capacity market can be constructed that benefits reliable online units and penalizes power plants for not performing. However, Vistra is keenly aware of the sometimes visceral negative reaction in Texas to the mention of a centralized forward capacity market. But Vistra is also aware that the fundamental premise of an energy-only market is that generators generally only have an opportunity to recover their fixed costs when they are infra-marginal – particularly during scarcity pricing periods and not during normal operating days. If the Commission wants a market model that does not depend upon scarcity events to provide investment-attracting revenue, then at least some features normally associated with a forward capacity market must be part of the

[13] Transcript of Sept. 23, 2021 Open Meeting at 34-35 (emphasis added).

conversation. Importantly, capacity markets can be structured to maintain the basic tenets in the ERCOT market of paying only for performance

1. ORDC Changes – Move Away From "Crisis Based" Model and Produce Meaningful, But Reasonable Increases to Energy Prices in More Operating Conditions Without Fundamentally Changing the Current Market Construct

The ORDC is a function of (1) the value of lost load (VOLL)—which is an administratively-determined number that sets the cap of the ORDC and equals the currently effective system-wide offer cap (SWOC) (i.e., either the low system-wide offer cap (LCAP) (currently $2,000/MWh) or high system-wide offer cap (HCAP) (currently $9,000/MWh), as applicable)—and (2) the loss of load probability (LOLP), which is defined in reference to a specified minimum contingency level (MCL) (currently 2,000 MW).[14] The VOLL determines the maximum level that prices will reach under the ORDC, and the MCL determines the reserve level at which prices will reach that maximum level. The LOLP, in turn, is the parameter that determines the slope and shape of the curve—in other words, it determines whether prices will be spike up quickly toward the cap, or produce more meaningful adders at higher levels of operating reserves (i.e., at lower scarcity levels), with a more gradual progression toward the cap.

The LOLP represents the probability, at a given level of reserves, of the occurrence of a loss of reserves greater than the MCL. In essence, the ORDC is a probability-weighted valuation of a grid emergency occurring. The LOLP distribution is based on the mean and standard deviation of the differences between the hour-ahead forecasted reserves and the reserves that were available in real-time during the applicable operating hour using historical data. The LOLP considers this distribution to inform the *cumulative* probability that a given reserve level could fall below the MCL.[15] The MCL is important because the hour-ahead reserve error distribution does not reflect the fact that ERCOT will take actions to preserve the supply and demand balance of the grid along with contingency supply reserves (i.e., controlled load shed) before allowing reserves to go negative (i.e., uncontrolled load shed).

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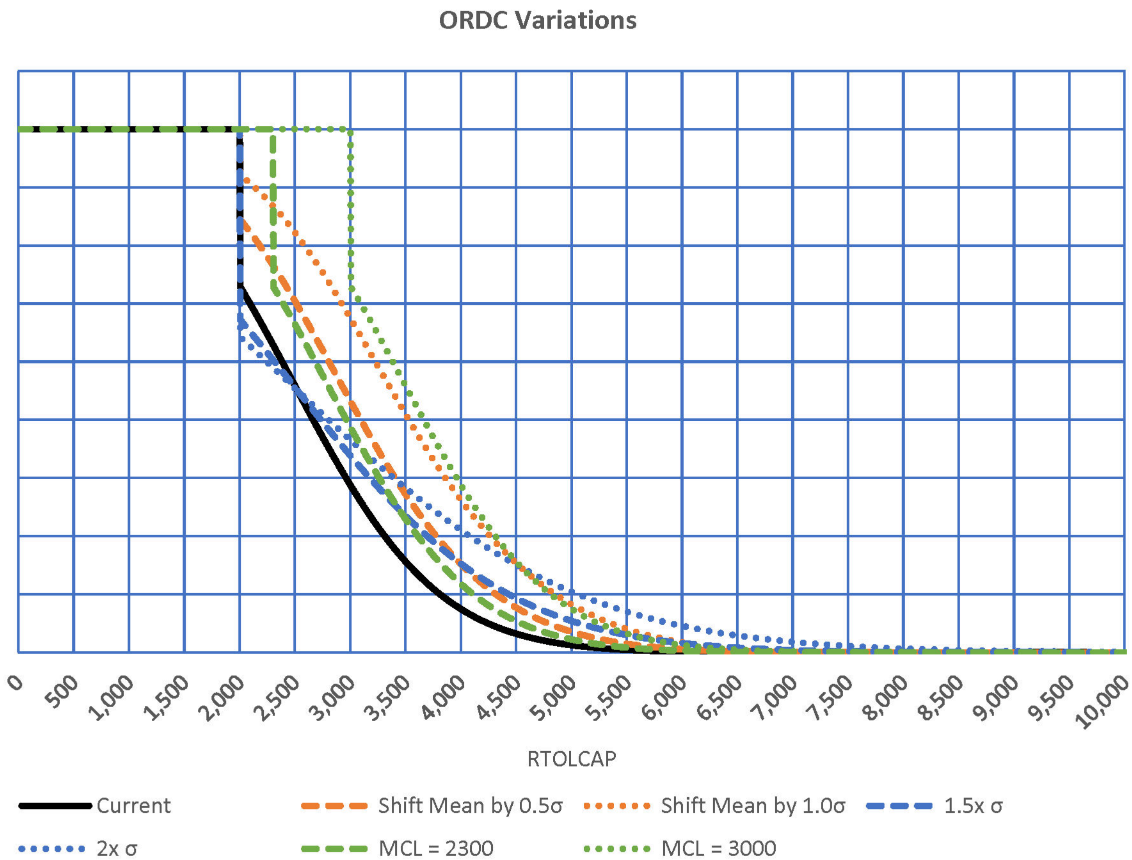
[14] ERCOT, *Methodology for Implementing Operating Reserve Demand Curve (ORDC) to Calculate Real-Time Reserve Price Adder*, at 1-2 (Apr. 13, 2021), *available at*: http://www.ercot.com/content/wcm/key_documents_lists/89286/Methodology_for_Implementing_ORDC_to_Calculate_Real-Time_Reserve_Price_Adder.zip; *see also* 16 Tex. Admin. Code (TAC) § 25.505(g)(6)(A), (B), and (E).

[15] Appendix 1 provides a more detailed explanation and illustrative graphs regarding the LOLP.

The ORDC simply takes this LOLP distribution and multiplies it by VOLL for any given level of operating reserves. Thus, while changing the value of VOLL and MCL will have an impact on the amount of the applicable adders as reserves near the MCL, a change to the LOLP (either via the mean or standard deviation) will impact the distribution of adders relative to a given level of reserves and is the way to achieve more revenues at higher operating reserves and thereby to incentivize the occurrence of higher operating reserves in the first place.[16] In sum, the ORDC assigns a value that reflects available reserves, in particular, as overall reserves decrease.

The following graph illustrates the impact of changing various "levers" of the ORDC under any given VOLL (and therefore leaves the y-axis unlabeled). Two versions each of changes to the MCL, mean, and standard deviation are shown. Note that a lower VOLL would correspondingly shift all of the curve values lower, so a reduction in VOLL necessitates pulling one of these other "levers" to extend the ORDC and keep the same aggregate market investment incentives in place. That is, a flatter ORDC must also be a wider ORDC in order to support the Commission's stated intent of moving away from a "crisis-based business model."

[16] As noted in Vistra's proposal below, this does not need to mean that revenues uniformly increase – it can be paired with other changes such as a reduction in VOLL to lower revenues in other periods.




This dynamic is borne out below in Vistra's proposal (and in the attached LEI presentation[17]), which recommends a modified ORDC with a $4,000/MWh VOLL,[18] 2,300 MW MCL, and 1.521x standard deviation for the LOLP calculation. This recommendation has an impact earlier—before physical scarcity becomes acute. Specifically, the recommended ORDC would produce meaningful adders at 6,500 MW of operating reserves, which is the minimum level of reserves ERCOT has repeatedly stated[19] it aims to maintain in all hours. In contrast, today's ORDC does not begin to work until the amount of operating reserves are well below these

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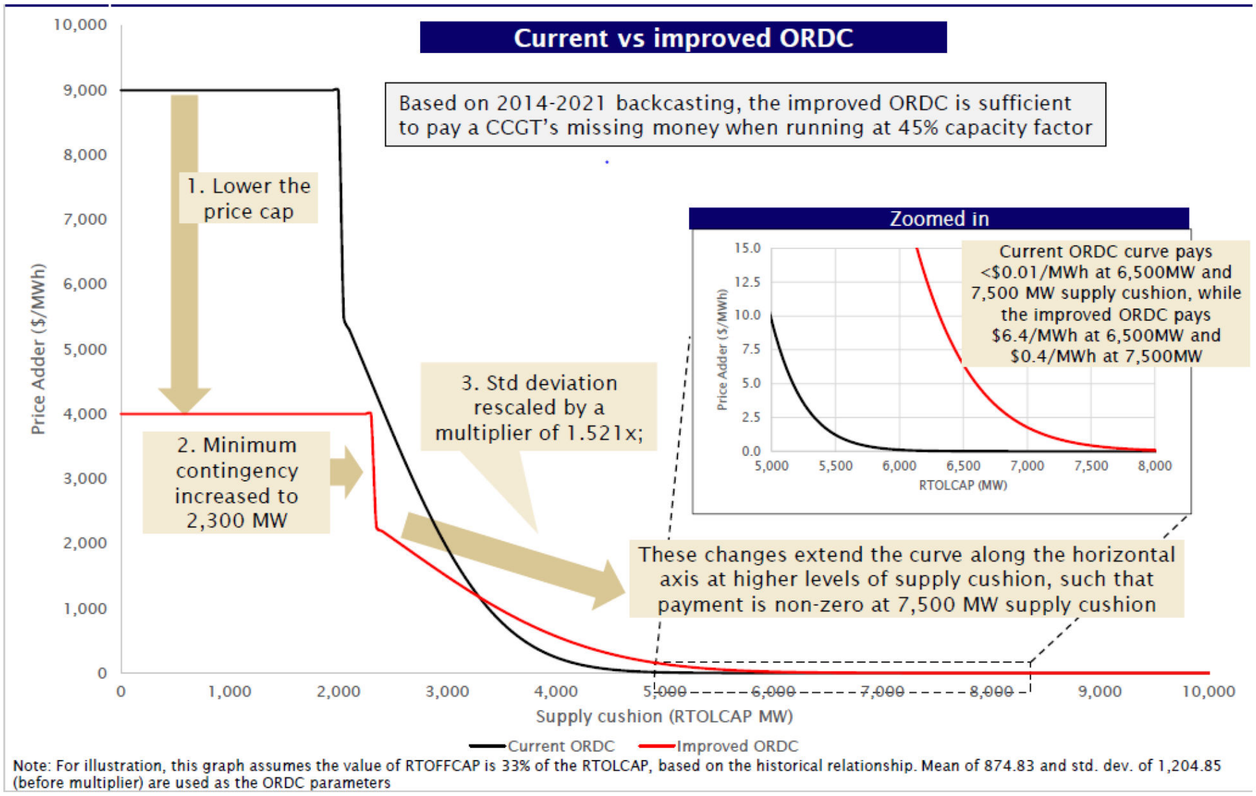
[17] See Appendix 2.

[18] As addressed in comments filed concurrently with these comments in Project No. 52631, changing the VOLL to $4,500/MWh would not produce a meaningfully different result than $4,000/MWh. While the VOLL certainly needs to be significantly lowered from its current level **if done so in conjunction with** changing the ORDC shape and MCL, the exact value of VOLL (and even MCL) are not as important as the shape of the curve.

[19] *See, e.g.*, ERCOT, Brad Jones Presentation to the Board at 5 (Aug. 10, 2021), *available at:* http://www.ercot.com/content/wcm/key_documents_lists/214069/5_CEO_Update.pdf.

operational targets, with less than $0.01/MWh of adders at and above 6,500 MW of operating reserves. Vistra's proposed ORDC is shown below in comparison to the current ORDC: [20]




As illustrated in the above graphs and in the attached LEI presentation, the above modifications will properly value reserves sooner (i.e., 6,000 to 7,500 MW) and thus will help achieve the Chair's stated goal of producing more investment-attracting revenues during normal business conditions. The ORDC, following the recommended improvements, will also provide more stable "in-market" signals to promote ample operating reserve levels, reducing ERCOT's reliance on "out-of-market" actions like RUC as it has this summer, especially if done in conjunction with Vistra's proposed new Dispatchable Standby Reserves service, described below. These improvements will serve as a catalyst for new dispatchable investment and will inherently deliver more relative benefit to dispatchable resources compared with intermittent resources because the ORDC would pay relatively more to dispatchable resources, because it is more likely to produce adders in hours when intermittent resources are not available. However, when and if

[20] The modified ORDC curve proposed by Vistra and illustrated by LEI's graph above is based both on 2014 to 2021 back-cast data, as well as potential supply conditions in the next 5 years.

intermittent resources are producing energy in hours of system scarcity and producing energy that contributes positively to system reliability, then they should continue to be compensated in those periods on equal footing with all other resources. This ensures efficient dispatch decisions by ERCOT and complements the economic signal for investment.

More specifically, Vistra's proposed ORDC changes will align with the following public policy objectives:

- Consumers will benefit from increased reliability and reduced likelihood of physical scarcity.
- Consumers will benefit from the lower price cap, because prices will be less volatile and less extreme during scarcity events.
- Dispatchable generators will be incentivized to enter and remain in the market because the expected payments under the improved ORDC would be more frequent and predicable. Ensuring that dispatchable generators enter and remain in the market is critical—as recognized by the Legislature in Senate Bill 3, the Governor, and this Commission—to ensure reliability, grid resiliency, and balance the continually increasing proliferation of intermittent resources.
- ERCOT has nearly 70,000 MW of dispatchable resources, many of which are more than 30 years old. As intermittent renewable resources have expanded, dispatchable resources have been forced out of the market. Maintaining this fleet, much less building more, requires reasonable compensation. For instance, dispatchable resources must complete major overhauls of their major components every few years and perform routine maintenance every year. Vistra alone spends well over a billion dollars annually on these efforts to maintain reliability. Maintaining the existing fleet is equally important as incentivizing new build.
- ERCOT would benefit because it would be able to rely on the market, and not need to rely on RUC as frequently.

Finally, an additional benefit to Vistra's proposed changes to the ORDC is that they can be accomplished in a relatively streamlined and timely manner, by simply making changes to existing Protocols and the applicable Other Binding Document setting out the methodology for calculating the ORDC.[21] This means that the Commission could act swiftly and make these changes effective in time for winter 2022.

2. New Ancillary Service – Dispatchable Standby Reserves

In addition to modifying the ORDC, Vistra also recommends that the Commission direct ERCOT to implement a new ancillary service. This new service would, as directed by Senate Bill 3, incentivize dispatchable generation and would help to both signal new investment needs for dispatchable resources and to retain existing dispatchable generation. The recommended improvements to the ORDC will improve the predictability and sufficiency of revenues in more "normal" operating conditions. This leaves a gap for those power plants that are typically idle but are called upon during periods of very high demand. Because demand varies over a year, it is critical that the grid have a source of power available during limited periods of time. These power plants, typically gas peakers, experience greater challenges earning sufficient revenues to enter and remain in the market. Because these units usually only run during peak periods, an updated ORDC with a lower HCAP would yield lower revenues during periods of scarcity, and that may lead to lower revenue for those types of plants. To mitigate the risk of these units retiring, Vistra's recommended DSR Product would (1) provide competitively determined revenues to retain dispatchable resources that might otherwise retire, and (2) incentivize new peaking backup capacity that would not otherwise get built, when ERCOT determines such new resources are needed.

Under Vistra's proposal (which is more fully outlined in the attached LEI presentation):

- The DSR Product would be procured through a competitive auction, on a seasonal basis so that ERCOT can address changing system needs over the course of a year.
    - The auction would allow for ERCOT to procure the lowest cost options, enable competition between technologies, and allow participation by all qualified resources including eligible demand-side resources. This would also give resources the option of participating in energy and ancillary services markets or participating in DSR.

[21] Vistra does not believe that ERCOT would need a system change to implement its proposed ORDC changes, but defers to ERCOT.

- When committed by ERCOT, participating DSR resources would participate in the energy market at activation prices that they offered as part of the competitive auction process.

- The DSR Product would provide an availability payment. The availability payment would be based on a uniform market clearing price, in which all bidders would be paid the same price as the highest-cost bid that clears. ERCOT could use a demand curve for the auction to help moderate costs and mitigate market power concerns in the auction.
- Resources would have qualification requirements, such as the ability to ramp up within a specified time and sufficient fuel availability to continue to generate energy for a specified duration, if they are activated by ERCOT.
- ERCOT would develop a reasonable procurement target based on a reliability standard rooted in a probabilistic analysis of extreme events (e.g., like the Seasonal Assessment of Resource Adequacy (SARA)).
  - For example, if the improved ORDC provides a 6,500 MW supply cushion then the DSR would be constructed to provide ERCOT with an "insurance policy" above that quantity. In this way, the DSR product would insure against projected uncertainty in terms of weather, sudden changes in intermittent resource operations, etc. If ERCOT were to seek to hold 15,000 MW of supply cushion above expected peak demand, then the DSR procurement target would be 15,000 MW minus 6,500 MW, or 8,500 MW.
  - ERCOT would adjust the procurement target based on anticipated supply and net load conditions. This provides a critical toolset for the Commission and ERCOT, giving them the flexibility to adjust the level of insurance that they procure competitively, as the grid changes. With a constantly evolving grid, increased intermittent resources, and energy storage just beginning to enter the market, the Commission and ERCOT would have a readily accessible lever to manage the impact of these changes.
- ERCOT would commit DSR resources following the day-ahead market, and prior to real-time. This commitment should be in lieu of out-of-market actions to bring capacity online (e.g., RUC for capacity).

- To ensure that DSR resources are available only after other energy market supply offers are exhausted and that DSR resources do not interfere with energy prices, DSR resources would have to abide by an offer floor (through their activation offer price) and their capacity would be excluded in the calculation of ORDC adders.
- Performance payments and penalties would ensure that DSR providers properly capitalize and invest in their resources and that they are reasonably available for dispatch by ERCOT. DSR resources that perform would receive the energy price including applicable adders (when deployed), in addition to the availability payment.
    - Cost allocation for DSR could be based on who is benefitting from the "insurance" and who is causing the worsening reliability. Load would pay for the increased reliability benefit, but costs could also be shared by non-dispatchable resources that are causing the need for such insurance. Those costs could be offset by non-dispatchable resources if they choose to modify their asset to be dispatchable (for example, with co-location of a battery) and responsive loads that curtail consumption during system events requiring dispatch of DSR capacity.

The DSR Product would further the following public policy objectives:

- For consumers, it would help avoid widespread load shed during extreme system events and would do so in a "least cost" manner by relying on a competitive auction to procure these DSR resources. This ancillary service would also reduce the risk of overpaying for "gold-plated" insurance by flexibly relying on existing resources and adjusting as necessary, if the need for DSR Product declines with time. The DSR Product also holds the prospect of encouraging new resources designed specifically for periods of high demand
- For dispatchable generators, the DSR Product would provide a market-based source of revenue to cover fixed operating costs, and the competitive auction format would provide a level playing field for all qualifying dispatchable technologies, both new and existing.

- For ERCOT, the DSR Product would provide certainty around the quantity and cost of additional operating capacity to secure reliable system operations. The auction process should be relatively simple to administer (and could leverage from existing auction processes like that for Emergency Response Service and could be tied to existing probabilistic analyses like the SARA).

In short, in addition to the incremental and predictable revenue stream that Vistra's proposed modified ORDC would provide for most dispatchable generators, the DSR Product would allow additional peaking generators, who might otherwise mothball, retire, or not be built to remain in or enter the market to provide ERCOT with "insurance" in the event of low likelihood but high impact scarcity events.

## II. CONCLUSION

Vistra appreciates the opportunity to provide these comments for the Commission's consideration as it works to improve the ERCOT market design. Vistra looks forward to continued participation in this effort.

Dated September 30, 2021

Respectfully submitted,

Amanda Frazier

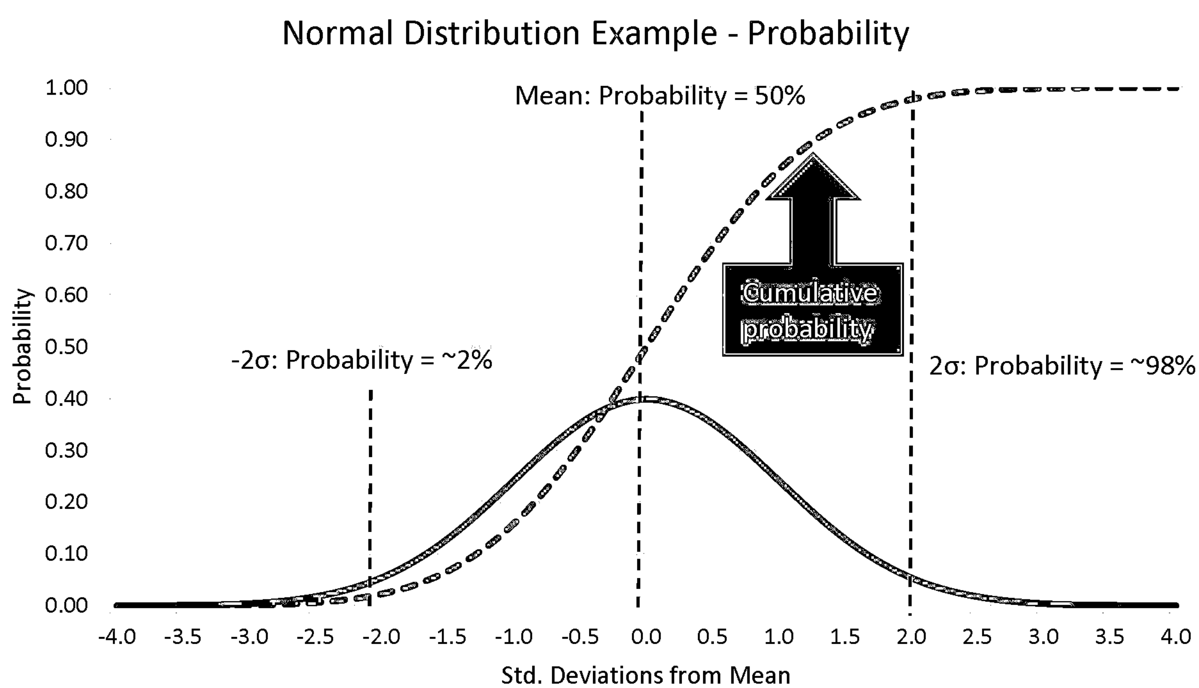
Amanda Frazier
State Bar No. 24032198
Senior Vice President, Regulatory Policy

1005 Congress Ave., Suite 750
Austin, TX 78701
512-349-6442 (phone)
amanda.frazier@vistracorp.com

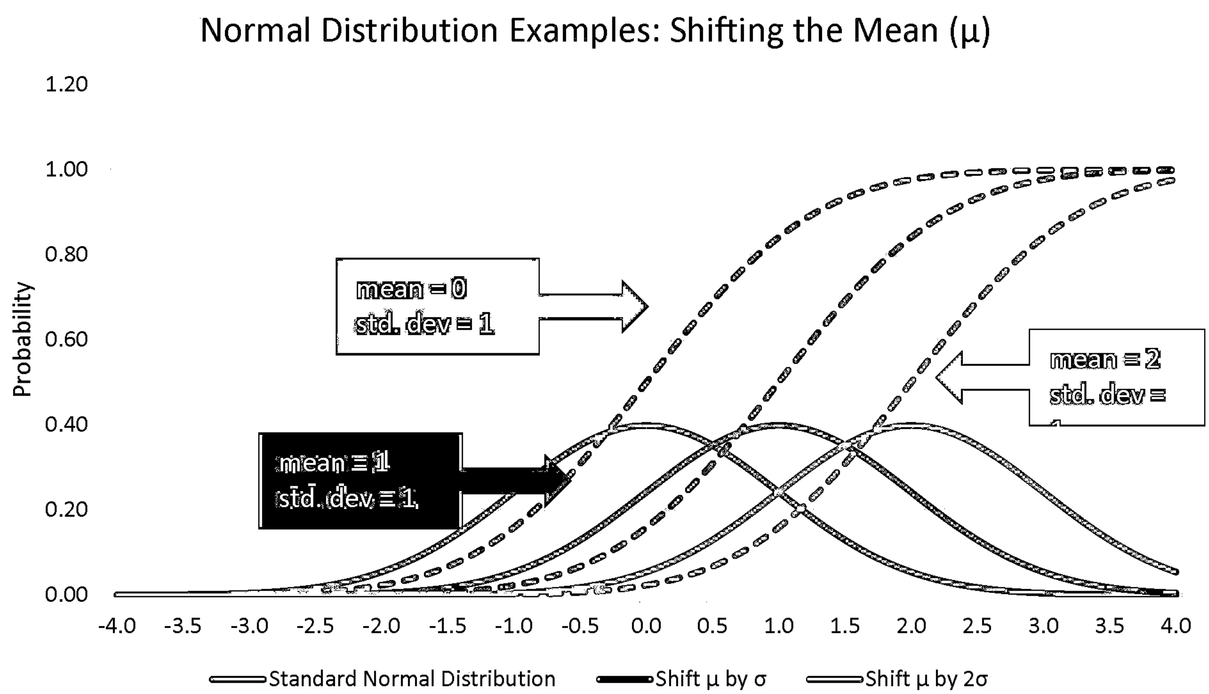
# APPENDIX 1

**APPENDIX 1**

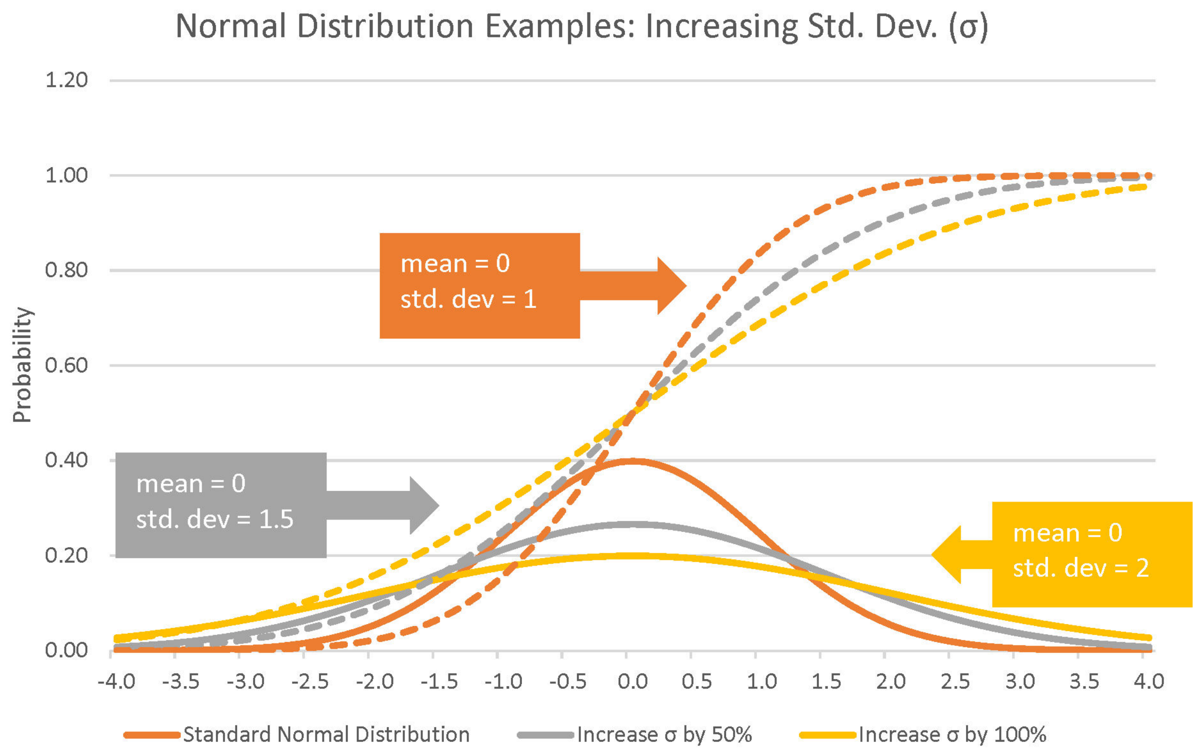
The Loss of Load Probability (LOLP) shape for the Operating Reserve Demand Curve (ORDC) is determined by specifying a normal probability distribution (a "bell curve"). The normal probability distribution is a common tool for estimating statistical probability, and one of its features is that it provides a well-defined shape that can be described using just two parameters: the mean and the standard deviation. The mean (typically denoted as the Greek letter mu, or μ) is simply the center point of the distribution – the average expected value. The standard deviation (typically denoted as the Greek letter sigma, or σ) is a measure of how far from the mean the individual observed data points fall – effectively the "width" of the distribution. With just those two inputs, the probability of a given data point can be calculated depending on how many standard deviations it is from the mean:



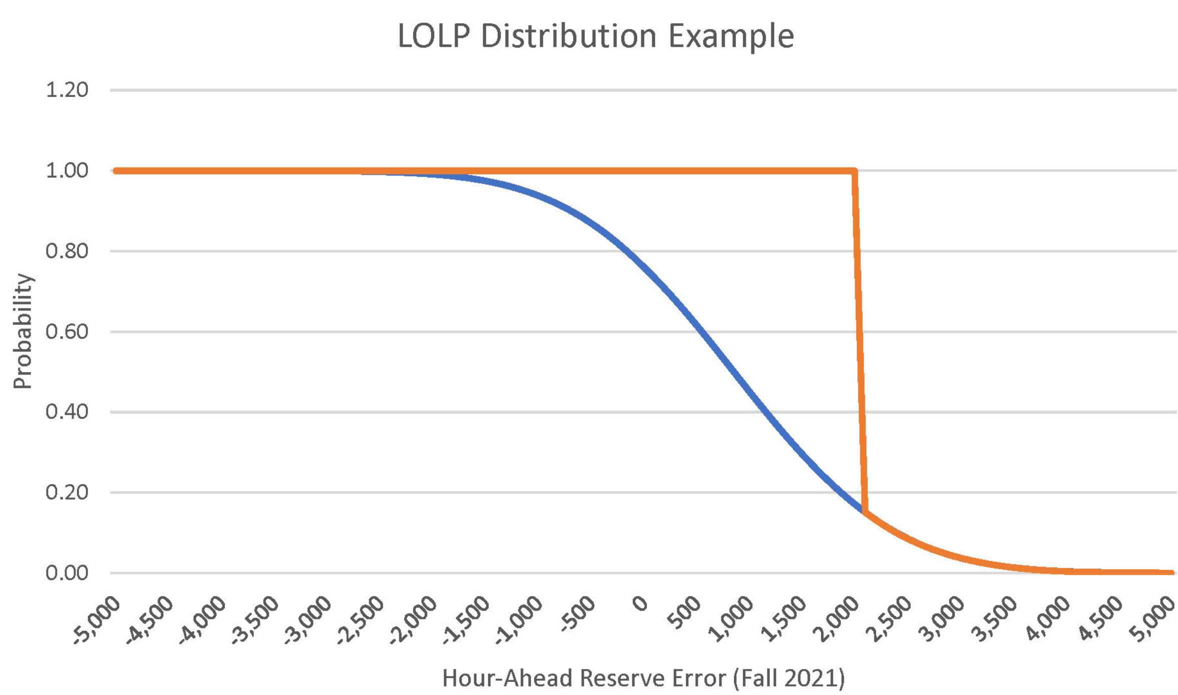

This feature is administratively and mathematically efficient to use; it is also simple to modify to reflect insights and interests in evaluating probabilities that are *based on* but *different from* historical observations (e.g., if there is reason to believe that past performance is not indicative of future results, or there is an interest in applying a more risk-averse or risk-tolerant projection than historical results would indicate). On simple way to modify the distribution is to shift it without changing its shape by augmenting the mean parameter (μ):




Similarly, the distribution's shape can be flattened (or made peakier) by increasing (or decreasing) the standard deviation parameter (σ) (note this results in wider "tails" on the curve, reflecting the broader distribution of outcomes around the mean):




The ORDC uses an LOLP that follows the shape of the hour-ahead reserve error's cumulative probability function until reserves hit MCL, at which point it jumps to 1 (or 100%):



# APPENDIX 2

London Economics International LLC

# Recommended market reforms for ERCOT given SB3 and announced policy goals

prepared at the request of

**Vistra**

September 30, 2021

Julia Frayer
Marie Fagan
Victor Chung
Javier Maquieyra

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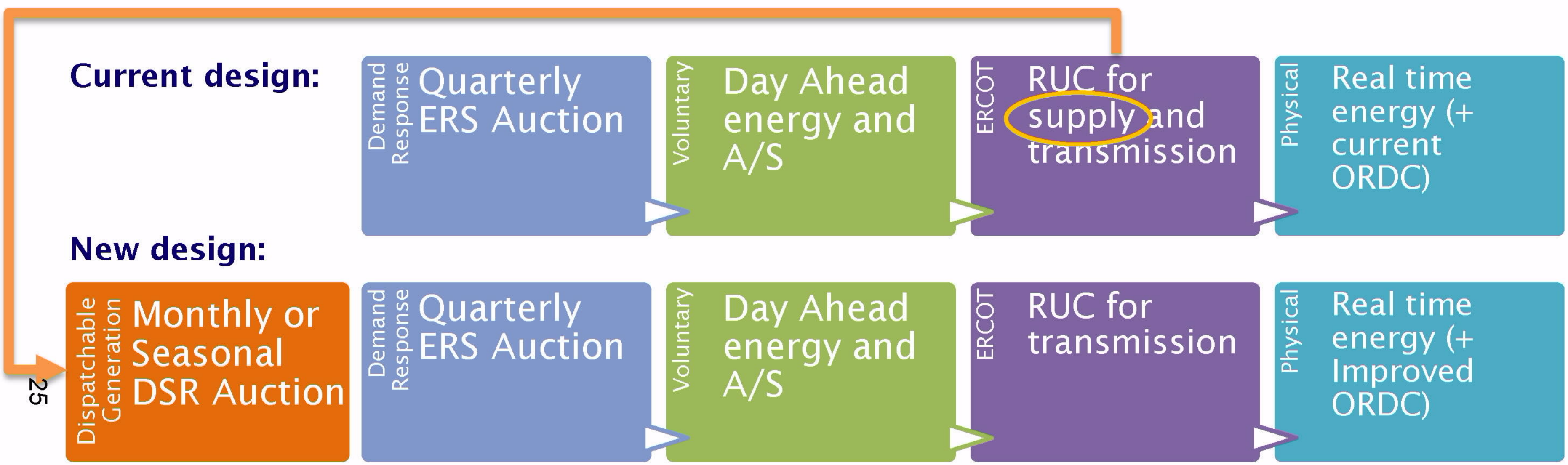
# LEI is proposing changes to the ORDC and a new forward market for dispatchable standby reserves

- **Keeps an energy-only market design, but with improved Operating Reserve Demand Curve (“ORDC”) and new standby reserve product**
  - **Day-ahead (“DA”) market remains a voluntary forward financial market**; Real-time (“RT”) market remains a physical market
  - **Improved ORDC** will be capped at lower price levels than current Value of Loss Load (“VOLL”), but will pay more frequently
  - ERCOT will procure **Dispatchable Standby Reserves (a new product)** to retain sufficient levels of backup dispatchable supply, providing insurance for extreme events
- **Reforms are a win-win for ERCOT, generators, and consumers**
  - For ERCOT: Improve certainty around resources available for dispatch
  - For owners of dispatchable generation: Increase certainty in revenues and support new investments
  - For consumers: More reliability without destructive price spikes



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# The Texas Legislature and the Governor are seeking greater reliability and less volatility - more stability in market outcomes

"The commission shall … evaluate whether additional services are needed for reliability in the ERCOT power region while providing adequate incentives for dispatchable generation."

*Senate Bill 3, Section 14.(g)*

"The commission shall require [ERCOT] … to modify the design, procurement, and cost allocation of ancillary services for the region in a manner consistent with cost-causation principles and on a nondiscriminatory basis."

*Senate Bill 3, Section 14.(h)*

"The commission shall ensure… resources that provide [reliability or ancillary] services… are dispatchable and able to meet continuous operating requirements for the season in which the service is procured."

*Senate Bill 3, Section 18.(c).(1)*

"Streamline incentives within the ERCOT market to foster the development and maintenance of adequate and reliable sources of power, like natural gas, coal, and nuclear power."

*Gov. Abbott´s letter (07/06/21)*

"Allocate reliability costs to generation resources that cannot guarantee their own availability, such as wind or solar power."

*Gov. Abbott´s letter (07/06/21)*

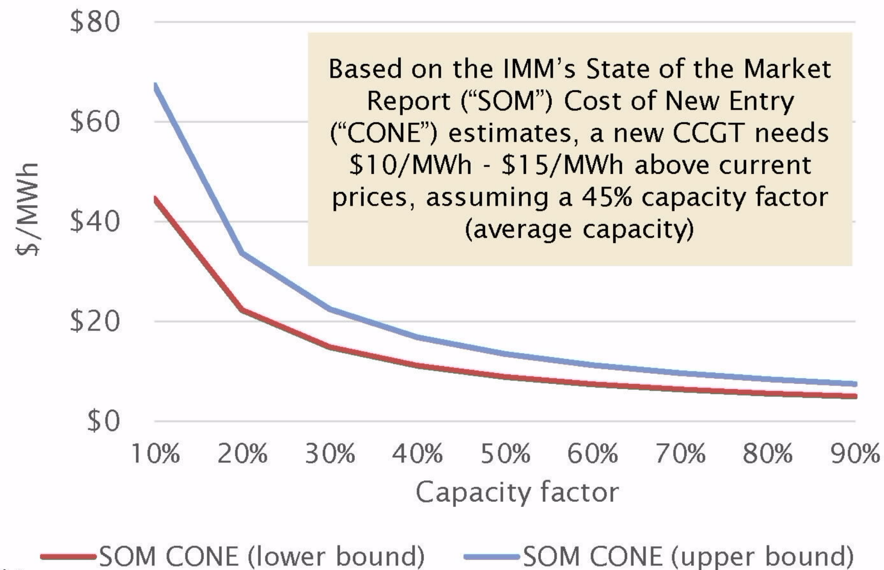
"Our electricity market used to focus on affordability and then reliability, but from now on reliability is the first focus over affordability."

*Chairman Lake, The Texan/news (7/22//21)*

# Storm Uri exposed the consequences of a market that lacks sufficient investment incentives

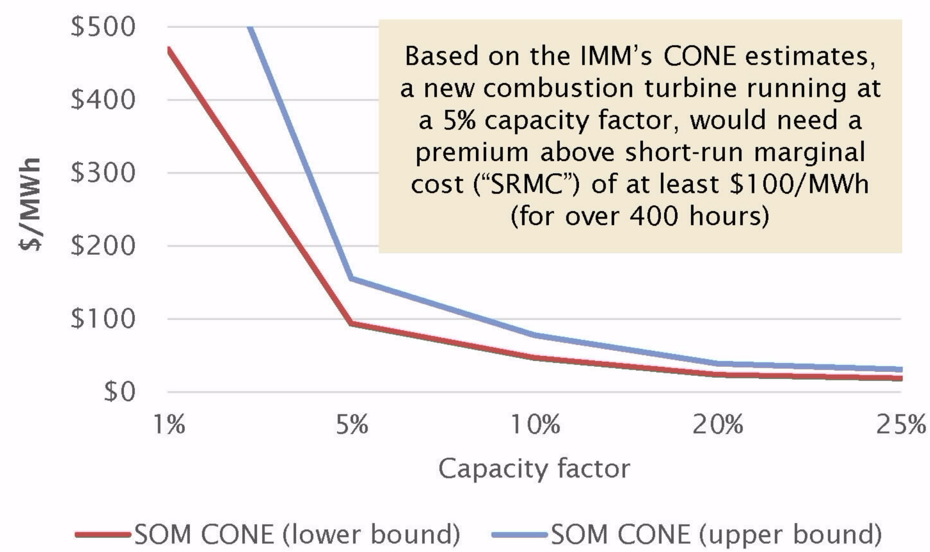
- **ERCOT's current market is not designed to deliver any predetermined level of reliability**
- **Under the current design, energy prices rise significantly above short run marginal cost only during extreme physical supply scarcity conditions**
  - current pricing is tied to reliability concerns
  - financing large capital projects based on rare and unpredictable events is challenging, as proven by lack of new dispatchable resources

## Missing money for new combined cycle gas turbine ("CCGT")




*Source: LEI preliminary calculations using historical operational data for ERCOT-based CCGTs sourced from third-party database and IMM State of the Market Report data.*

## Missing money for new gas peaker




*Source: LEI preliminary calculations based on SOM data.*

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# The current ORDC design creates more volatile and/or far lower payments than analogous capacity payments received by generators in other US power markets

- **Revenues paid by the ORDC are very volatile, and were less than $0.50/MWh in 3 of the last 8 years**
- **Investors require higher returns if facing volatile revenues**
- **Compared to other US markets, ERCOT's market had the poorest economics for investors for the past 8 years**

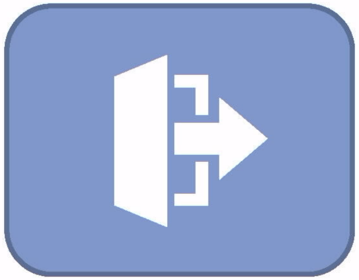
> - **Compared to PJM over an 8-year horizon, the average ORDC payment was 29% lower than capacity prices in PJM, while the annual variability of the ORDC was 94% higher**
> - **Compared to ISO-NE, the average ORDC payment was less than half the ISO-NE capacity payment, while the annual variability of the ORDC was 9% higher**

Historical ERCOT ORDC payments vs. capacity payments in other US markets ($/MWh)

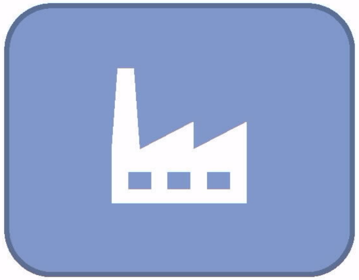
| | ERCOT | ISO-NE (ROS) | PJM |
|---|---|---|---|
| 2014 (Jun-Dec) | $ 0.20 | $ 2.02 | $ 0.58 |
| 2015 | $ 0.91 | $ 4.40 | $ 5.25 |
| 2016 | $ 0.21 | $ 4.70 | $ 5.67 |
| 2017 | $ 0.18 | $ 4.32 | $ 2.47 |
| 2018 | $ 1.33 | $ 9.62 | $ 5.00 |
| 2019 | $ 6.44 | $ 13.08 | $ 6.87 |
| 2020 | $ 1.91 | $ 9.63 | $ 4.17 |
| 2021 (Jan- Aug) | $ 11.58 | $ 4.84 | $ 2.13 |
| Average | $2.84 | $ 6.58 | $ 4.02 |
| Std. Deviation | $ 3.83 | $ 3.50 | $ 1.97 |

Note: 2014 and 2021 adjusted to reflect partial year data. ERCOT's data is based on historical RTORPA payments to reflect adders a generator that generates during scarcity hours would receive. ISO-NE and PJM capacity payments are levelized and converted to $/MWh.

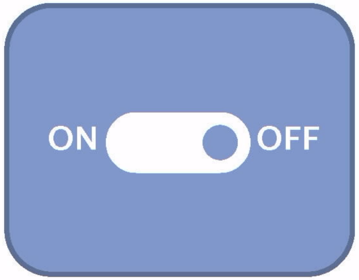
# The mandate from the Governor, Legislature, and PUCT requires more supply



**Retention of dispatchable resources**



**Investment in new dispatchable resources**




**Avoid load shed in the future**

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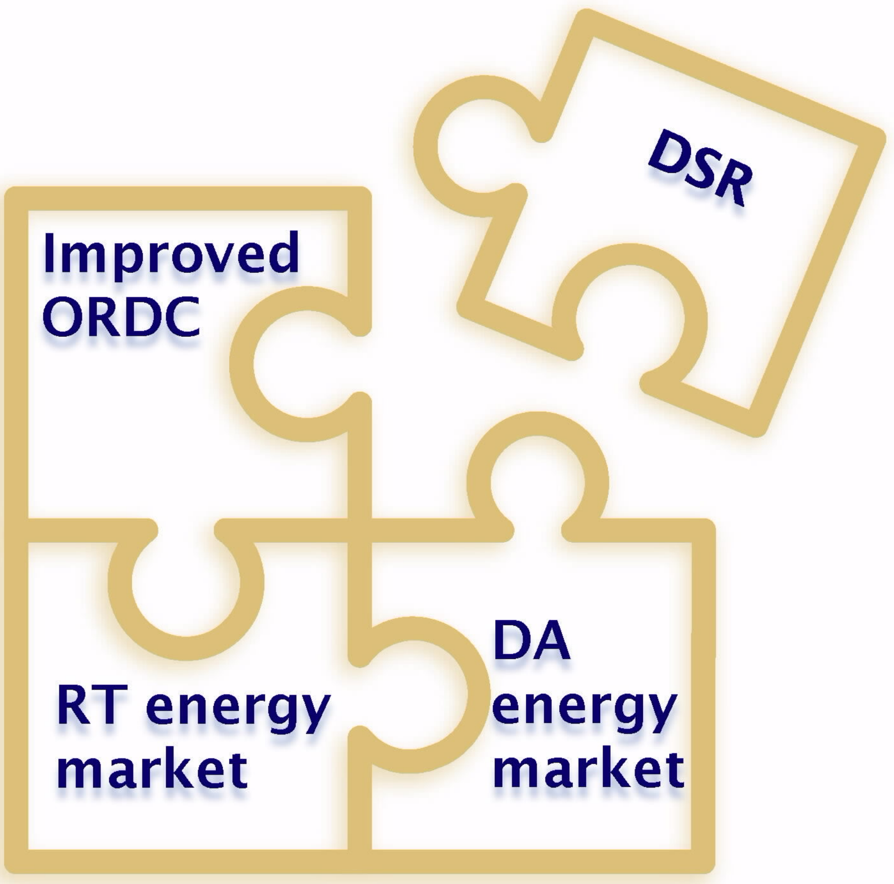
# Wholesale power market must be designed holistically, not piecemeal, otherwise reliability goals may not be met efficiently

- **Improved ORDC incentivizes existing dispatchable resources to remain in the market and supports new build**
  - Supply cushion for normal (or typical) tight supply situations, up to 6,500 MW or more
- **Dispatchable Standby Reserves product ("DSR") addresses low-probability emergencies**
  - Insurance product to address low-probability, high-impact events
- **Either one without the other leaves a gap in reliability**
  - ORDC ensures incentives are properly reflected in the energy market design
  - DSR provides competitively-priced insurance



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# The majority of resources will continue to participate in the energy market, while reserved capacity will be paid through the DSR

## DSR

## Real-time energy market with improved ORDC

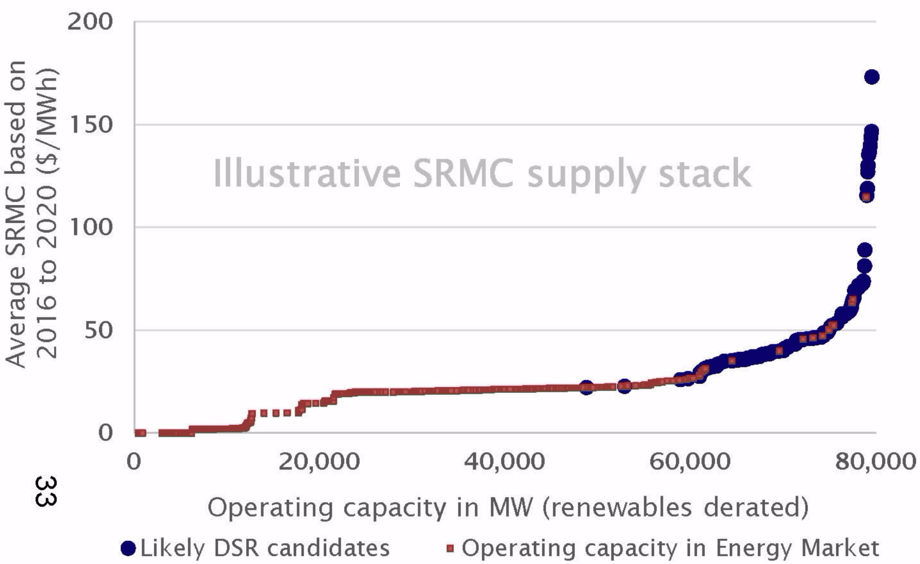
**Maintain dispatchable fleet in reserve**

*If the RT energy market has insufficient resources, ERCOT will dispatch DSR resources to meet energy needs*

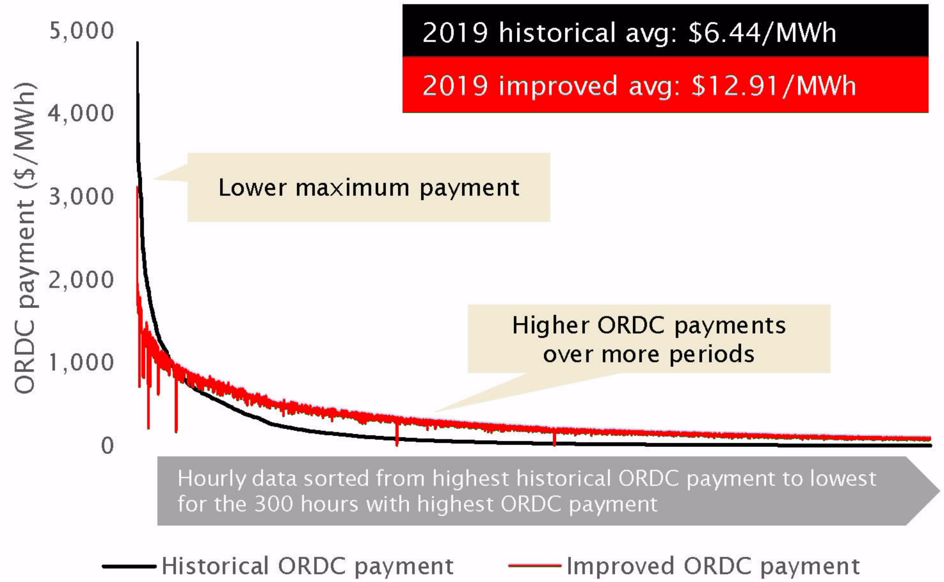
*Resources not typically needed for energy or ancillary services will participate in DSR auction. If they are awarded DSR product obligation, they must be ready to produce energy if called upon (activated) by ERCOT*

**Maintain and grow dispatchable fleet**

### Likely DSR resources are rarely used today in the energy market as they sit at the top of the stack




### Payments under improved ORDC would be spread out over more periods



# Improved ORDC and DSR would directly and indirectly create market conditions that promote investment in new dispatchable resources

*changing system conditions require* ***periodic review and shift of ORDC*** *to ensure expected ORDC payments are sufficient to retain and attract dispatchable generation*

Investment in dispatchable generation triggered by improved and stable energy market revenues

**ORDC changes announced**
*Improvement; as well as annual shifts*

Improved ORDC will provide economic signal for ample operating reserves and commercial opportunity for new dispatchable resources like CCGTs

ORDC changes raise forward market prices

*energy market expectations reflected in suppliers' decisions to continue to operate, mothball, or participate in DSR auction*

**DSR auction**
*ahead of RT market*

*DSR indirectly raises forward market expectations*

**RT market with improved ORDC,**
*validating forward market expectations; DSR product protects market from load shed*

DSR creates standby reserves that ERCOT may activate ahead of RT market to avoid load shed; reserving dispatchable capacity tightens supply cushion in energy market in some hours and further reinforces the expectation of higher ORDC payments

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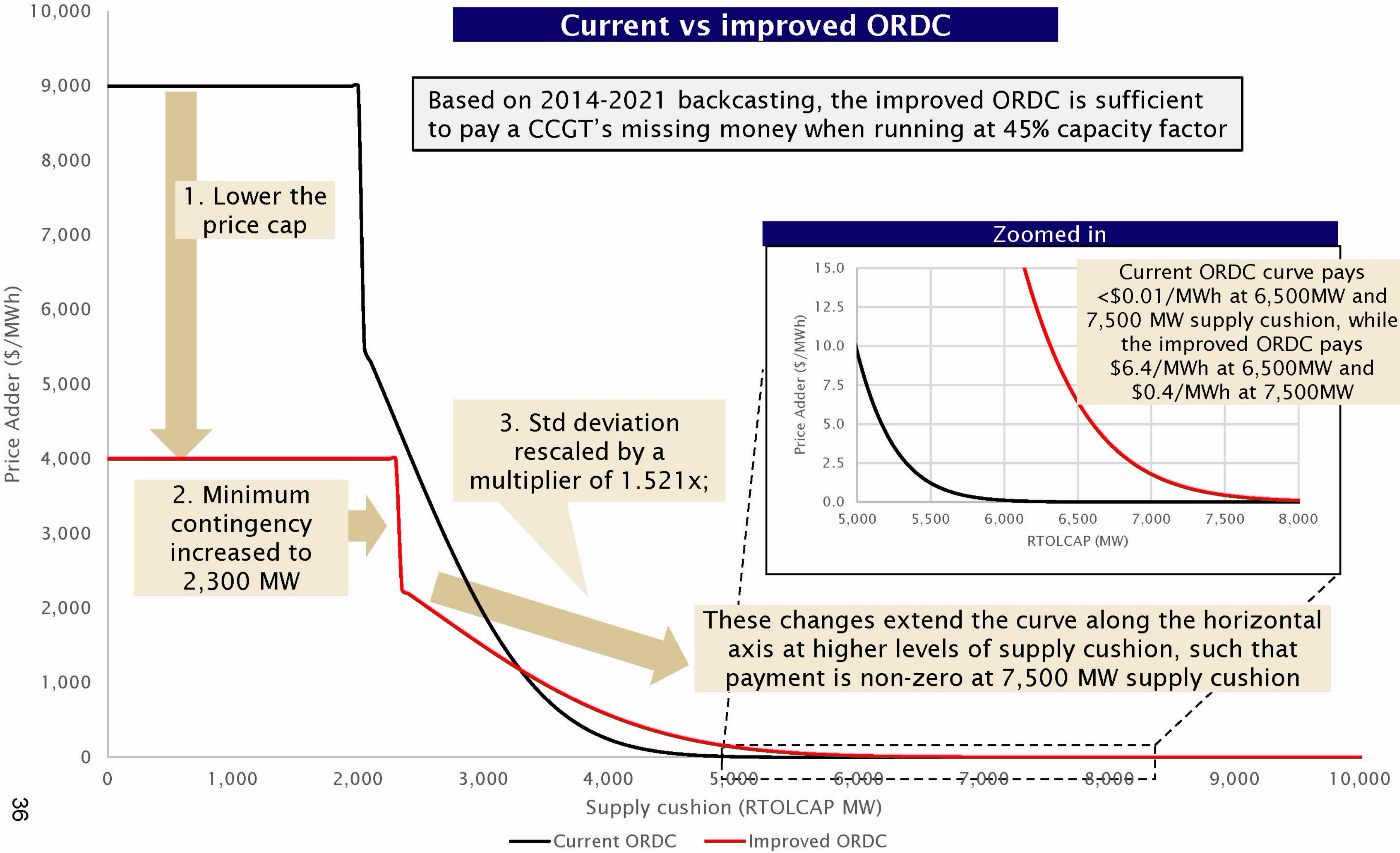
# Improved ORDC would have a lower offer cap but a longer tail, implying more frequent hourly payments under a variety of supply conditions




Note: For illustration, this graph assumes the value of RTOFFCAP is 33% of the RTOLCAP, based on the historical relationship. Mean of 874.83 and std. dev. of 1,204.85 (before multiplier) are used as the ORDC parameters

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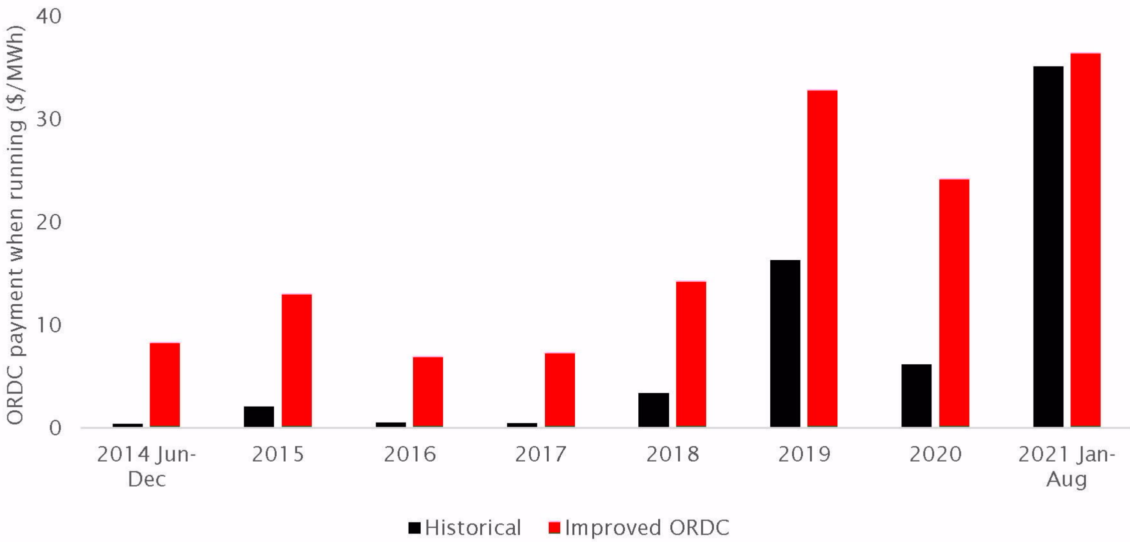
# Improved ORDC would increase and stabilize economic incentives for dispatchable supply like CCGTs

## Average ORDC payments to a typical CCGT running at 45% capacity factor ($/MWh, when running)




| $/MWh payment when running | Average | Yearly standard deviation | S.D. to average ratio |
|---|---|---|---|
| Current ORDC | 6.7 | 11.4 | 1.7x |
| Improved ORDC | 16.8 | 10.9 | 0.7x |

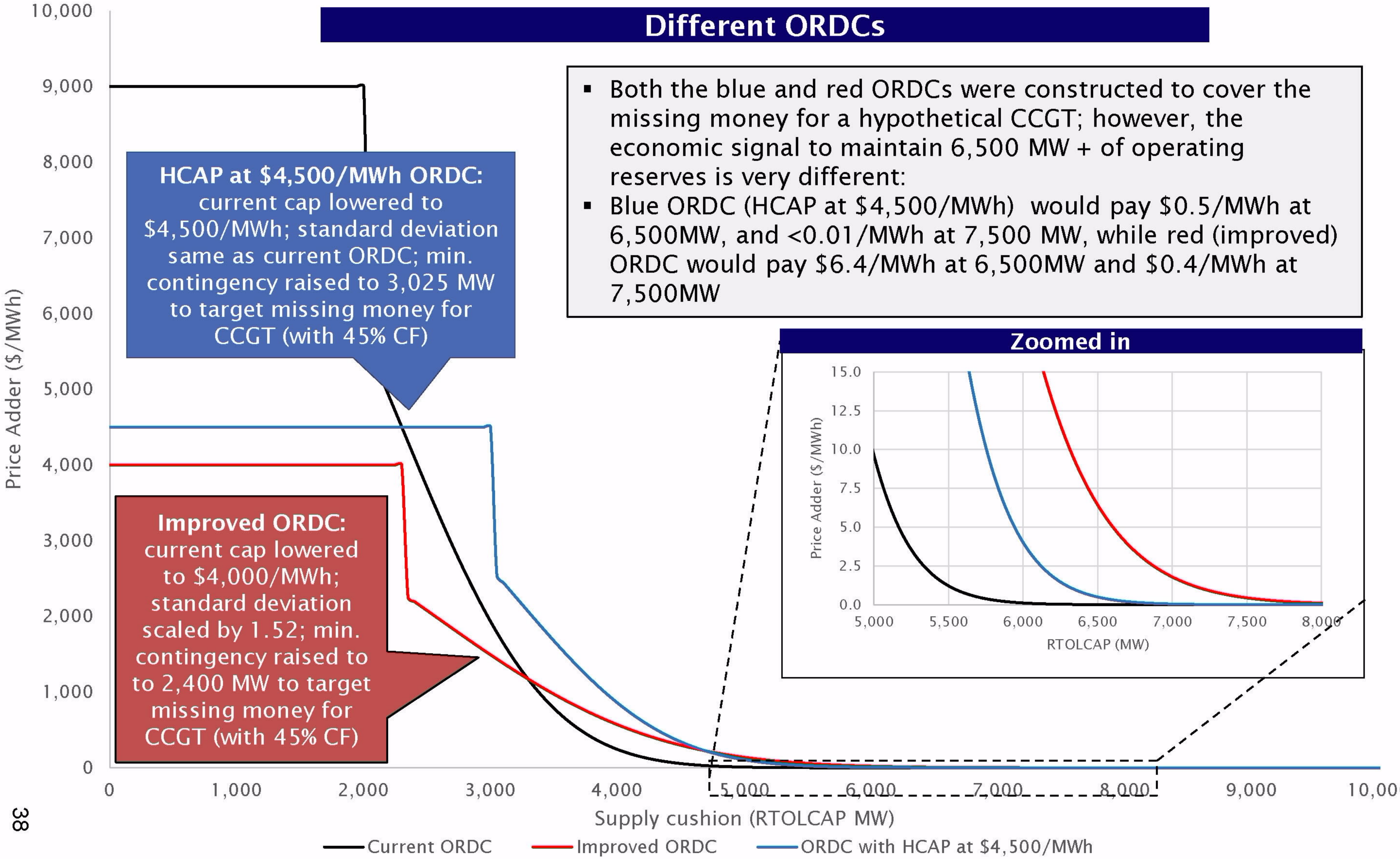
**Flatter ORDC curve exhibits lower volatility and as a result yields better outcomes**

*Note: When backcasting changes to the ORDC and estimated ORDC payments, LEI did not consider potential changes to dispatch resulting from the procurement of resources in the DSR auction*

▸ **Multiple objectives will be met with the improved ORDC:**

- Stability: A flatter ORDC curve can still support CCGTs, and results in lower volatility on a year-to-year basis; a flatter ORDC curve will also avoid extreme RT price spikes
- Reliability: Pays more to dispatchable resources that operate in the energy market

# An alternative ORDC with a price cap of $4,500 and a higher minimum contingency level would not economically motivate ERCOT's desired levels of operating reserves




Note: For illustration, this graph assumes the value of RTOFFCAP is 33% of the RTOLCAP, based on the historical relationship. Mean of 874.83 and std. dev. of 1,204.85 (before multiplier) are used as the ORDC parameters

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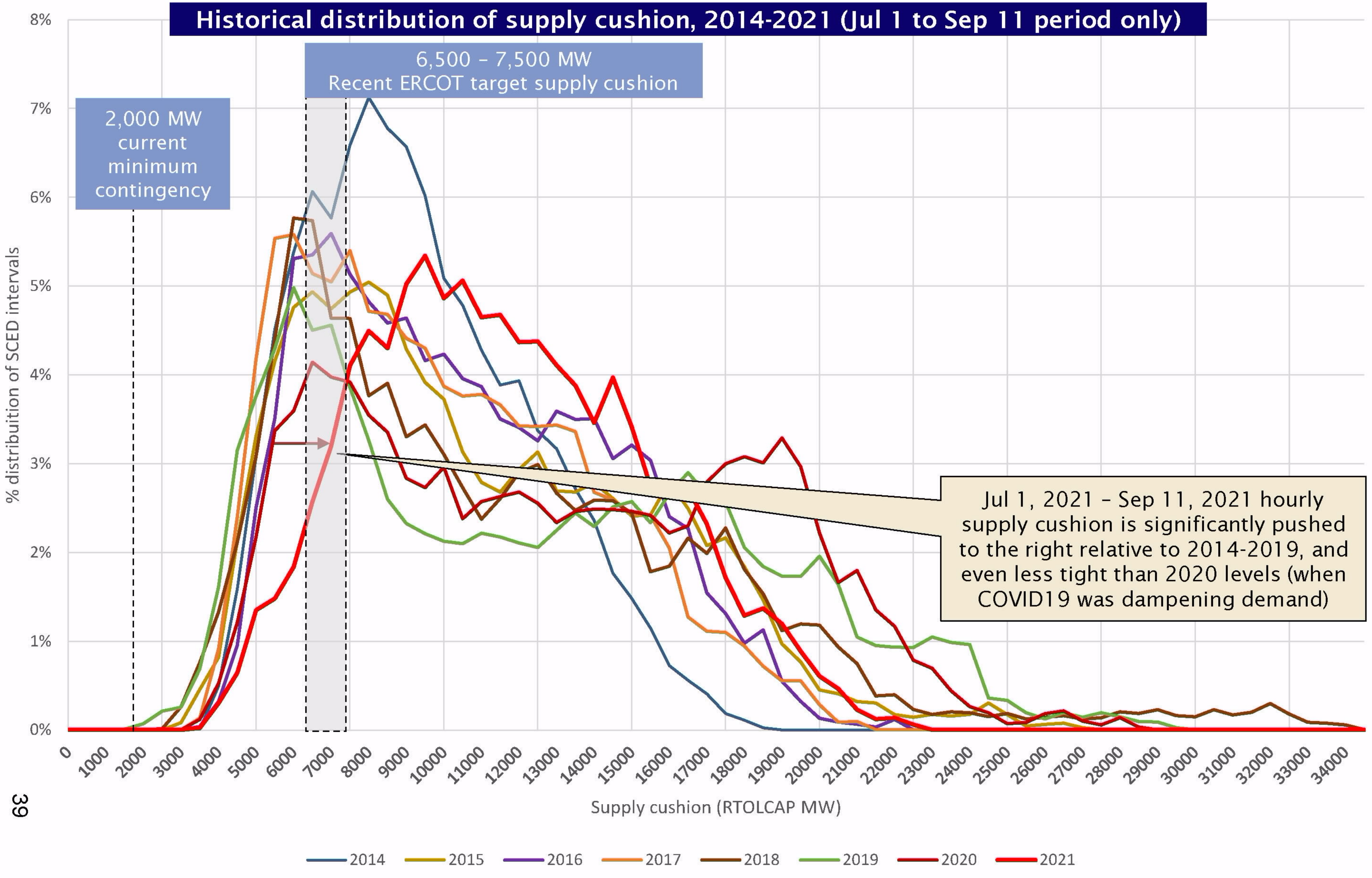
# Since July 2021, the increased use of RUC to manage the supply cushion reduced the probability of an ORDC payment under current design

## Historical distribution of supply cushion, 2014-2021 (Jul 1 to Sep 11 period only)



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# Improved ORDC would have restored the economic signal and motivated ample reserves through in-market dynamics

- **The improved ORDC restores the total summertime payment amounts to the levels before ERCOT took action to bring on additional operating reserves**
  - Average ORDC payment for 2014 to 2020 between Jul 1 – Sep 11 was $5.5/MWh (before ERCOT's operational change to carry additional operating reserves)
  - The improved ORDC would have paid $5.7/MWh between Jul 1 – Sep 11, 2021
  - The alternative curve with HCAP at $4,500 would have paid $4.9/MWh during the same period
  - The current ORDC paid on average $0.2/MWh during the same period

**Frequency of varying levels of ORDC payments under different ORDCs: July 1 – September 11, 2021**

| # of SCED intervals with ORDC payments: | Current ORDC | HCAP at $4,500/MWh | Improved ORDC |
|---|---|---|---|
| > $0 (but not at $0) | 2,060 | 8,643 | 14,546 |
| > $1 | 422 | 1,177 | 2,117 |
| > $5 | 186 | 903 | 1,373 |
| > $10 | 116 | 775 | 1,114 |
| > $50 | 10 | 416 | 655 |
| > $100 | 0 | 268 | 380 |
| > $500 | 0 | 49 | 18 |
| > $1000 | 0 | 3 | 0 |
| % of non-zero intervals | 10% | 40% | 68% |
| **Average ORDC payment ($/MWh)** | **$0.2** | **$4.9** | **$5.7** |

- **PUCT's goal of incentivizing new investments is less likely to be achievable using alternative curves compared to using the improved ORDC curve if ERCOT continues to target 6,500 MW to 7,500 MW of operating reserves**

*Note: When backcasting changes to the ORDC and estimated ORDC payments, LEI did not consider the potential impact of the DSR.*

# Improved ORDC can support new CCGTs at the lowest total cost to consumers and at the lowest volatility

- **The improved ORDC curve achieves reliability goals at the lowest total cost to consumers and at the lowest volatility**
- **Moving away from the current ORDC also shifts the economic incentives to emphasize dispatchable resources like CCGTs over renewables**
  - Wind resources will earn on average about 25% of what CCGTs earn on a per kW-year basis
  - And with increasing solar PV penetration in the future, the expected ORDC payment to solar PV will decline further due to inherent coincidence of solar PV production and ample supply cushions
- **As supply and demand conditions change over time, ERCOT will need to shift the ORDC to preserve the economic incentives for new capacity and operating reserves**

**Historical backcast of outcomes under different ORDCs (using 2014-2021 market conditions)**

| ORDC curve | Range of annual ORDC payments | ORDC payment to existing CCGT | CCGT ORDC payment-to-volatility ratio | ORDC payment to existing wind | ORDC payment to existing solar |
|---|---|---|---|---|---|
| *Unit* | *(Min – Max), $m* | *Annual average $/kW-year* | *ratio* | *Annual average $/kW-year* | *Annual average $/kW-year* |
| **Current** | $55 - $3,860 | $18.5 | 1.06 | $3.7 | $10.4 |
| **HCAP at $4,500/MWh** | $731 - $8,140 | 46.1 (+27.5) | 0.72 | 10.2 (+6.5) | 33.8 (+23.4) |
| **Improved** | $1,078 - $7,062 | 44.7 (+26.2) | 0.57 | 10.9 (+7.2) | 32.6 (+22.2) |

*Note: When backcasting changes to the ORDC and estimated ORDC payments, LEI did not consider the potential impact of the DSR.*

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# Improving the ORDC provides benefits to consumers by shifting the economic signal to dispatchable generation, and achieves the objectives set forth by policymakers

## Consumers

- Lower price cap in ORDC will tamp down spikes in energy costs
- More stable ORDC payments will increase generation investment and improve reliability

## Dispatchable generators

- Expected payments under the improved ORDC will be more frequent, predictable, and stable

## ERCOT

- ERCOT will no longer need to procure operating reserves through manual intervention to achieve desired levels of operating reserves
- Improved reliability eases system stress
- ORDC changes are quick to implement

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# ERCOT needs backup supplies to address emergency events

**Auction for procurement of Dispatchable Standby Reserve Product would allow ERCOT to competitively procure dispatchable operating capacity ahead of the RT market**

**Provides ERCOT with backup resources that can be available to provide energy as needed during system supply shortfall events – DSR will give ERCOT visibility and certainty around operable capacity with dispatchable capabilities**

**DSR provides an availability payment to dispatchable resources that would not otherwise receive sufficient revenues in the energy market**

**Analogous to an insurance policy; policymakers can decide what level of insurance they are willing to pay for**

## DSR product definition matches ERCOT's needs

- Provided in terms of MW; commitment for 1 month (or 1 season); must be able to ramp up on ERCOT's instruction and maintain specific amount of energy production over a material period of time (numbers of hours/days to be determined by ERCOT)
- Resource providers commit to ensuring resources can operate at ERCOT's instruction during the term and not to offer those MWs into the energy and A/S market below a floor price
- Technology agnostic; can allow for demand response; can allow new entry or already-operating resources to compete

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# The DSR design incorporates the six types of features which must be addressed for any new product

**1) Product definition** Operable capacity, in MW (capacity and energy; penalty for non-performance to ensure energy is there when needed)

**2) Eligibility** Resources offering DSR must be dispatchable (and able to ramp up when activated by ERCOT); resources have a defined offer floor

**3) Time frame for procurement** Auction for near-term (seasonal or monthly) provides flexibility for ERCOT, and predictable revenues for eligible resources

**4) Auction structure and clearing rules** Two-part, sealed bid, uniform clearing prices *(see details in a later slide)*

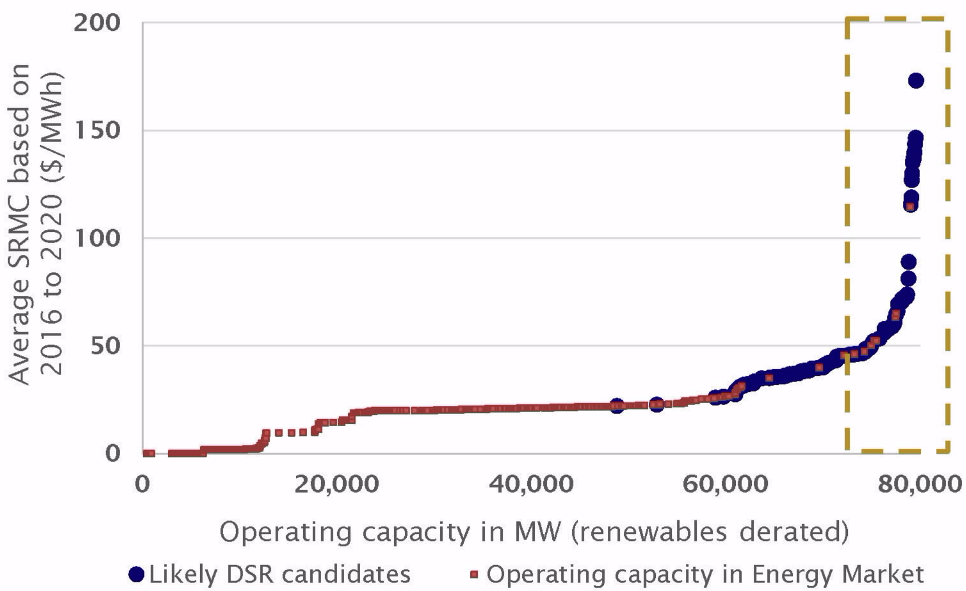
**5) Activation conditions and offer floor** DSR resources committed after DA market and ahead of RT market; RT energy prices are recalculated to levels as if DSR resources had not been dispatched (similar to adjustments made for the ERS program today) *(see details in a later slide)*

**6) Demand** ERCOT to use downward-sloping demand curve *(see details in a later slide)*

# Bidders will self-select to participate in the auction, and ERCOT has more than enough potential eligible capacity to provide DSR and still cover energy demand for 95.4% of hours

- Eligibility criteria are defined by the product definition; in addition, a DSR resource must forgo participating directly in energy and A/S market, by offering energy above a minimum floor
- The energy offer floor determined by ERCOT will ensure DSR capacity is not deployed prematurely
- Assuming a procurement target of 10,000 MW in a DSR auction, 66,147 MW of operating capacity would still be available in the energy market – estimated hourly load plus 6,500 MW of operating reserves would exceed planned outage-adjusted operating capacity remaining in the energy market only 4.6% of hours (assuming 2019 high summer demand conditions)

## Illustrative energy market supply curve




Note: Private network generation and intertie resources included as price-taking capacity.

Source: LEI calculations using ERCOT market data and third-party data provider.

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# LEI recommends a simple, single round auction for DSR, where eligible bidders would submit a two-part offer

**Auction details: ERCOT clears the auction with availability offers on a uniform clearing price basis and uses the activation offers on an "as bid" basis to ensure allocative efficiency**

**Uniform clearing price**: Each bidder who clears the auction is paid the same availability price as the highest-cost offer selected

**As-bid activation**: Each bidder who clears the auction may be activated by ERCOT to produce energy based on its activation offer

**A two-part offer essentially creates a call option, which ERCOT can then exercise when it needs DSR resources to operate**

| Part 1 | Part 2 |
| --- | --- |
| **Part 1 of offer is the availability price, which will be paid to DSR resources that clear auction (*similar to a premium for a call option*)** | **Part 2 of offer is the activation price which will be used in the energy market (*similar to a strike price for a call option*)** |

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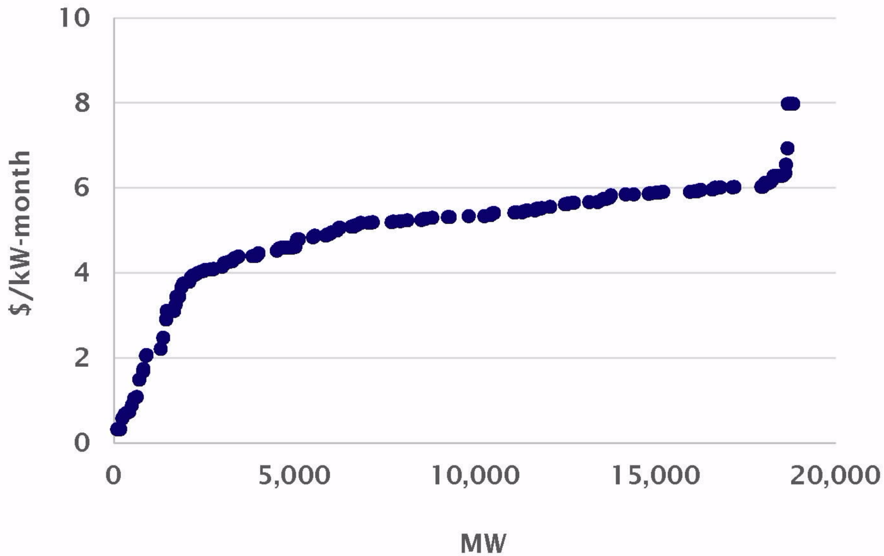
# Part 1 of the offer is an availability offer to remunerate fixed costs; Part 2 is the activation offer

## Part 1 (availability) offer




Source: Illustrative availability offer curve based on historical ERCOT market data and estimates of fixed O&M costs and foregone energy profits

*DSR availability offers could include:*

- fixed O&M costs
- weatherization costs
- fuel firming costs
- expected energy market profits forgone when the resource is on standby
- Other relevant costs

## Part 2 (activation) offer

### Part 2 of the offer serves several important purposes

1) each bidder's activation offer must be equal to or larger than the energy offer floor set by ERCOT

2) providing bidders with an opportunity to set the activation offer gives bidder flexibility to trade off its availability offer and activation offer, and encourages various technologies (with varying fixed versus marginal cost relationships) to participate; both elements make the DSR auction more competitive

3) activation offers will allow ERCOT to easily and efficiently determine activation order of DSR resources in RT energy market

# When DSR resources are activated, they should be paid the same price as other dispatched resources in the RT energy market

**Activation payments to DSR resources:** Full energy price plus any performance penalties

**Full price of energy = system lambda + ORDC adder + Reliability Deployment adder + congestion component**

- **may reduce the availability-related costs of DSR auction; pass through of full price of energy should result in lower availability offers, since resources can expect high earnings if dispatched**
- **more of the cost of the DSR product will be in energy market (and this makes it more financially hedgeable for industrial customers and REPs)**
- **will allow DSR resources maximum energy earnings, which aligns compensation with the risk of performance penalties**

## Interaction of DSR resources with energy market

Warning: DSR capacity should not be considered in calculation of system lambda or ORDC adders; otherwise, energy prices will be suppressed

Performance penalties: ERCOT will monitor performance when a DSR resource is activated; magnitude of performance penalties to be sized to deter non-performance

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# DSR procurement quantity (demand) depends on the amount of insurance regulators want, above and beyond the operating reserves that the improved ORDC will economically motivate

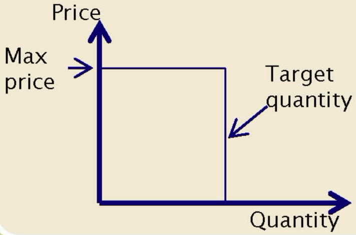
- **PUCT will have options to determine a reliability standard, and decide the level of insurance coverage they want against more extreme conditions**
  - Could use ERCOT SARA scenarios and their associated probabilities
  - Policymakers will balance tradeoff between extent of coverage versus cost
- **DSR resources would be additional resources available to ERCOT, above and beyond the operating reserves that offer into the energy market given the improved ORDC**
  - ERCOT was procuring up to 7,000 MW out-of-market using RUC in summer 2021 – the improved ORDC would give strong economic signal for such reserves
  - For example, if the improved ORDC attracts 6,500 MW of operating reserves, and PUCT wants an insurance policy covering 16,500 MW above expected peak load , then the DSR auction should target procurement of 10,000 MW (16,500 - 6,500)
- **Framework for designing a demand curve**
  - Select reference volumes at high and low end
  - Select a slope which reflects willingness to pay

| Case | SARA scenarios (Summer 2021) | Procurement target (MW) |
|---|---|---|
| 1 | Expected Peak Load/ Expected Generation Outages/ Expected Wind Output | 3,642 |
| 2 | Expected Peak Load/ High Generation Outages/ Expected Wind Output | 6,243 |
| 3 | High Peak Load/ Expected Generation Outages/ Expected Wind Output | 6,576 |
| 4 | Expected Peak Load/ Expected Generation Outages/ Low Wind Output | 10,219 |
| 5 | High Peak Load/ High Generation Outages/ Low Wind Output/ Expected Solar Output | 15,754 |
| 6 | High Peak Load/ High Generation Outages/ Low Wind Output/ Low Solar Output | 19,877 |
| 7 | Extreme Peak Load/ Extreme Generation Outages/ Low Wind Output/ Low Solar Output | 26,389 |

Source: ERCOT – SARA (Summer 2021).

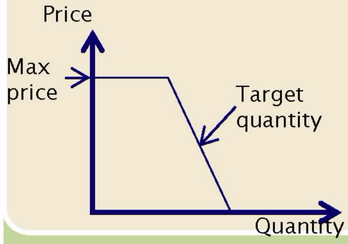
**LEI recommends a downward-sloping, convex demand curve (see next slide) for the DSR auction, to achieve long-term reliability and mitigate market power in DSR auction**

# Convex demand curve provides high price signal when market is tight, but does not lead to as volatile prices as a vertical curve (e.g., fixed procurement target)



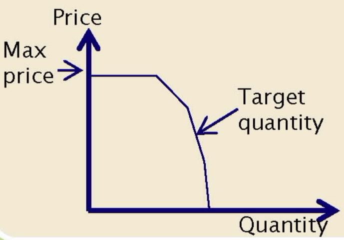

## Vertical

- Vertical demand curve can lead to volatile prices
- No incentive to invest until the market is short of target
- Small need can be overwhelmed by the size of a single plant



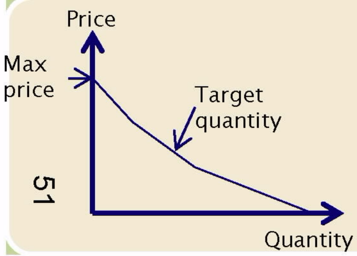

## Linear

- DSR resources can earn availability payments when market is not at 100% target
- But the increment of payment is the same whether the market is at 100% target or above/below target




## Concave

- Dis-incentivizes over-investment, because prices drop off steeply to the right of the target (where supply would exceed demand)




## Convex

- Provides steeper price increases to the left of target quantity (a relatively large incentive when supply is short of demand) and reduces volatility when supply exceeds demand

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# Allocation of DSR costs should be determined based on principles of cost causation and beneficiary pays

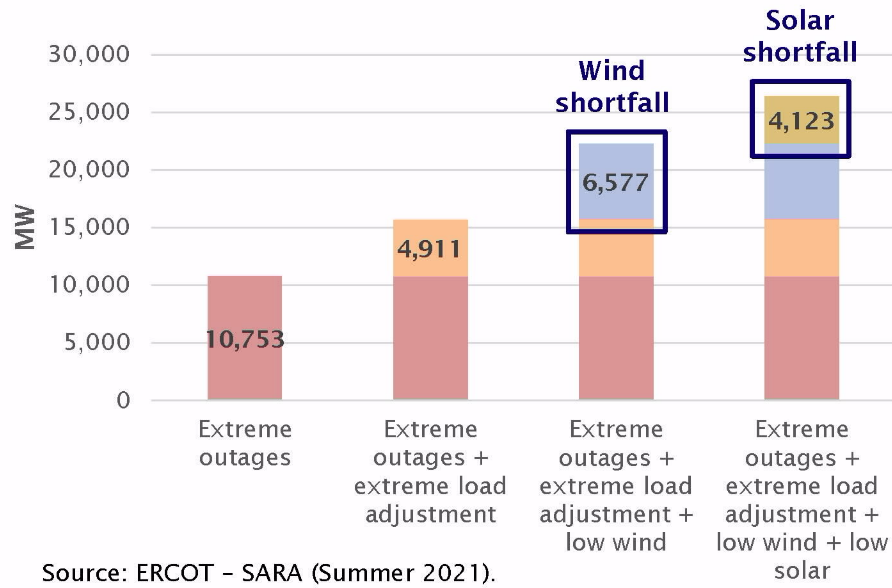
**Cost allocation:** Allocation of costs of DSR to beneficiaries (load) and catalyzers (resources that cause/aggravate energy shortfalls in system stress events)

## ▶ Beneficiary pays principle

- ▶ DSR is an insurance-like product, load is benefiting from improved reliability; therefore, as a beneficiary, load should be responsible for costs of procuring DSR capacity

## ▶ Cost causation principle

- ▶ Some generation resources – as evidenced in SARA – are contributing to supply gaps and thereby worsening system reliability; therefore, these resources should be responsible for some portion of DSR procurement




Source: ERCOT – SARA (Summer 2021).

- ▶ **Cost allocation should be based on energy consumption, and tied to energy market performance during events that require activation of DSR, so that beneficiaries and catalyzers have an economic incentive to manage their cost exposure and potentially self-insure**
  - ▶ **non-dispatchable resources that adapt their asset to be dispatchable (for example, with co-location of energy storage system) can reduce their cost allocation share**
  - ▶ **responsive load can either opt-in and participate in the DSR auction (self-supply) or curtail consumption during system events requiring dispatch of DSR capacity**

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# DSR reinforces the core objective of system reliability and does so in a cost-effective manner by harnessing the power of a competitive auction, and benefits the spectrum of market participants

## Consumers

- Avoids widespread load shed during extreme system events
- Competitive market ensures that the insurance procured from DSR is least-cost
- Reduces risk of overpaying for gold-plated insurance in the form of an out-of-market procurement of a new fleet of spare plants

## Dispatchable generators

- Market-based source of revenue to cover fixed operating costs
- Auction design creates level playing field and allows all dispatchable technologies to compete, including new and existing

## ERCOT

- Forward seasonal (or monthly) auction will give ERCOT certainty around quantity (and cost) of additional operating capacity to secure reliable operations
- When existing spare dispatchable capacity is exhausted, DSR will provide ERCOT with market-based means to signal need for new dispatchable resources
- Although a new product, DSR is straightforward to implement, as it leverages existing institutional capabilities at ERCOT (e.g., ERS auction, SARA, etc.)

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# Table of contents

# List of acronyms

| Acronym | Description |
|---|---|
| A/S | Ancillary Service |
| CCGT | Combined Cycle Gas Turbine |
| CF | Capacity Factor |
| CONE | Cost of New Entry |
| DA | Day-Ahead |
| DSR | Dispatchable Standby Reserves Product |
| ERCOT | Electric Reliability Council of Texas |
| ERS | Emergency Response Service |
| HCAP | High System-wide Offer Cap |
| IMM | Independent Market Monitor |
| ISO-NE | ISO New England |
| kW | Kilowatt |
| LEI | London Economic International, LLC |
| MW | Megawatt |
| O&M | Operations and Maintenance |
| ORDC | Operating Reserve Demand Curve |
| PJM | PJM Interconnection |

| Acronym | Description |
|---|---|
| PUCT | Public Utility Commission of Texas |
| PV | Photovoltaic |
| REP | Retail Electric Provider |
| ROS | Rest of System |
| RT | Real-Time |
| RTOFFCAP | Real-Time Off-line Reserve Capacity |
| RTOLCAP | Real-Time On-line Reserve Capacity |
| RTORPA | Real-Time On-line Reserve Price Adder |
| RUC | Reliability Unit Commitment |
| SARA | Seasonal Assessment of Resource Adequacy |
| SB3 | Senate Bill 3 |
| SCED | Security Constrained Economic Dispatch |
| SD | Standard Deviation |
| SOM | State of the Market |
| SRMC | Short-Run Marginal Cost |
| US | United States |
| VOLL | Value of Loss Load |

# LEI is active worldwide across multiple practice areas serving the energy sector and other infrastructure industries

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- **Exhaustive sector knowledge and a suite of state-of-the-art proprietary quantitative modeling tools**
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  - Valuation and economic appraisal
  - Due diligence support
  - Cost of capital database
  - Contract configuration matrices

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  - Market power
  - Tax valuations
  - Contract frustration

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- **Creating detailed market simulations to identify beneficiaries and quantify costs and benefits from proposed distribution and transmission lines**
  - Valuing D&TS
  - Transmission tariff design
  - Procurement process and contract design

### Renewable Energy

- **Renewable energy policy design, procurement, modeling, and asset valuation**
  - Solar, wind, biomass, and small hydro
  - Demand response
  - Cogeneration
  - Energy efficiency
  - Micro-grids
  - Emissions credits trading
  - Energy storage technologies

### Procurement

- **Designing, administering, monitoring, and evaluating competitive procurement processes**
  - Auction theory and design
  - Process management
  - Document drafting and stakeholder management