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PROJECT NO. 52373

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

PROJECT NO. 52268

CALENDAR YEAR 2021 – WORKSHOP AGENDA ITEMS WITHOUT AN ASSOCIATED CONTROL NUMBER	**§**	**BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS**

COMMENTS OF NATIONAL GRID RENEWABLES DEVELOPMENT, LLC

TO THE HONORABLE PUBLIC UTILITY COMMISSION OF TEXAS:

National Grid Renewables Development, LLC ("NG Renewables") files these comments in response to the memorandum posing questions for comment filed in these proceedings by the Public Utility Commission of Texas ("Commission") on August 3, 2021.

I. Introduction

NG Renewables appreciates the Commission's efforts to ensure the reliability of the Electric Reliability Council of Texas ("ERCOT") region. To that end, NG Renewables offers the following comments to assist the Commission in its consideration of options to enhance the ERCOT market rules to mitigate the potential for extreme weather events to compromise grid reliability in the future. These comments are summarized in the executive summary set forth in Attachment B that is attached hereto.

The weather events of February 2021 (the "February events") presented significant operational challenges that required ERCOT to implement rolling outages on an unprecedented basis.[1] The Texas legislature and the Commission reacted to these events by undertaking appropriate reviews to identify effective solutions to safeguard against the recurrence of such conditions and related impacts.

The Commission is currently conducting workshops to discuss whether the current market design (specifically, the scope of ancillary services) is adequate given that such extreme events are becoming more frequent. ERCOT should have access to all the operational tools it needs to maintain reliability under the most extreme weather conditions. However, while reliability is the foremost concern, the Commission is also correct to be circumspect with respect to the creation of new services to avoid mandating unnecessary or ineffective rules that can have unintended consequences in terms of creating additional cost with little or no benefit and/or undermining market and / or operational efficiency.

[1] Similar but less extreme events and effects occurred in 2011 as well.

II. NG Renewables participates in several organized electricity market regions and is committed to supporting system operators and regulators in creating effective platforms that ensure reliability and facilitate economically efficient outcomes for end-users. NG Renewables has several large renewable energy projects under development in ERCOT and fully supports the efforts by the Texas legislature, the Commission, and ERCOT to reinforce electric system reliability. **Comments**

The primary cause of the February events was the failure of electric and natural gas equipment due to freezing temperatures and related inclement weather.[2] The resulting loss of generation created the unprecedented need for load shedding to prevent more significant uncontrolled system impacts. As the Commission and all interested parties are aware, the solution to this issue is appropriate weatherization of the relevant infrastructure. The Texas legislature and the Commission have taken actions to address this issue, which has resulted in a new proposed rule that requires the relevant resources in ERCOT to meet weatherization requirements in Phase I of the rule. The Commission will implement additional weatherization requirements in the second phase of the rule.[3]

NG Renewables supports enhancing infrastructure weatherization.[4] Over the past decade, weather anomalies have occurred not just in ERCOT, but in other regions of the country. These events have occurred in both winter and summer periods. Given these events, it is reasonable to assume the exception is trending more towards the norm and to act accordingly. Therefore, appropriate weatherization of key infrastructure is the most important step to take in mitigating the risks related to these weather trends.

In addition to weatherization, incremental benefits may be achieved via market rule enhancements (*e.g.*, new or revised reliability services) and/or transmission planning enhancements to maximize access to all generation under stressed system conditions (*e.g.*, relieving constraints that do not meet existing reliability or economic criteria). The current focus of the Commission workshops is the scope of reliability services. Accordingly, that is the focus of these comments.

Several approaches may be taken to provide incremental enhancements to the ERCOT system, but they can be generally assigned to two categories - ancillary services and capacity products.

The general categories of ancillary services include the following:[5]

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[2] Another significant cause was the nationwide demand for natural gas over the relevant period.

[3] Rulemaking to Establish Electric Weatherization Standards, PUCT Control No. 51840, issued August 26, 2021.

[4] NG Renewables submitted comments in the weatherization docket and believes rules consistent with its comments will facilitate effective weatherization protections. See NG Renewables comments in Project No. 51840 submitted on June 23, 2021, and July 30, 2021.

[5] *Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities*, Order No. 888, FERC Stats. & Regs. ¶ 31,036 (1996) (cross referenced at 75 FERC ¶ 61,080), *order on reh'g*, Order No. 888-A, FERC Stats. & Regs. ¶ 31,048 (cross-referenced at 78 FERC ¶ 61,220), *order on reh'g*, Order No. 888-B, 81 FERC ¶ 61,248 (1997), *order on reh'g*, Order No. 888-C, 82 FERC ¶ 61,046 (1998), *aff'd in relevant part sub nom. Transmission Access Policy Study Group v. FERC*, 225 F.3d 667 (D.C. Cir. 2000), *aff'd sub nom. New York v. FERC*, 535 U.S. 1 (2002). *Preventing Undue Discrimination and Preference in Transmission Service*, Order No. 890, 118 FERC ¶ 61,119, *order on reh'g*, Order No. 890-A, 121 FERC ¶ 61,297 (2007), *order on reh'g*, Order No. 890-B, 123 FERC ¶ 61,299 (2008), *order on reh'g*, Order

- Scheduling and dispatch
- Reactive and voltage control
- Regulation (frequency control)
- Energy imbalance
- Operating reservice spinning and supplemental (generally 10 and 30 minute)
- Generator imbalance

Capacity products are typically related to long-term planning reserve margins, and their only relation to operations is ensuring a capacity portfolio that supports a 1 in 10 LOLE reliability margin. On an operational timeframe, that capacity is participating in the relevant energy and ancillary markets and supporting those services.[6]

As grid operations, generation resource functional characteristics, and capacity portfolios have evolved, grid regulators, system operators, and market participants have considered the benefits of incremental ancillary services with varying characteristics. For example, ramping products, or following reserves, can provide system balancing in real-time as gen-load imbalances occur to a degree beyond the capability of typical regulation service.[7]

Given the potential scope of new products and services, it is important to establish an appropriate set of principles to guide assessment of such products and their value. The following principles are instructive in that regard:

- Need – is there a legitimate reliability need
- Effectiveness – does the proposed product resolve or mitigate the issue effectively

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No. 890-C, 126 FERC ¶ 61,228, *order on clarification*, Order No. 890-D, 129 FERC ¶ 61,126 (2009). Black start service can also be considered an ancillary service.

[6] Operating reserves are, in essence, an operational timeframe capacity product. Intermediate capacity products (*e.g.*, seasonal) have been suggested in these proceedings.

[7] The Commission has noted the potential need for new services due to the increasing penetration of renewables on the ERCOT system. Ramping / following reserves is one such service. One service that the Commission has specifically noted a concern for is system inertia, which has been historically provided by synchronized spinning generation (typically fossil fuel resources). The Commission's concern is related to the increase in renewable generation and the potential reduction in synchronized spinning generation on the system and corresponding reduction in inertia. Technology advancements enable renewable resources to provide inertia. The Commission should consider market-based products for inertia to provide appropriate cost-effective provision of this service relative to need as it grows over time. Similarly, renewable resources can provide reactive power/voltage control and like other markets the Commission should consider compensating all resources for reactive power to facilitate ample resources for this service.

- Cost – is the proposed product cost-effective

- Market based vs. administrative – market-based solutions are preferable to administrative uplifted solutions in terms of cost and technology advancement

- Functionality-based – products should be driven by the functionality desired and not by resource type (this will further support cost effectiveness)

- Tangential impacts – a product should not have unintended deleterious effects / create disincentives for other resources in markets, this potentially undermines system operator access to maximum capacity in system operations

- Limit preferences – if a reliability service directly or indirectly limits the scope of resource types that can provide the service it should be limited to the maximum extent possible to maximize consistency with and support of the foregoing principles

Following the February Events and responses by the Texas legislature and the Commission, NG Renewables re-evaluated potential solutions that would better guarantee reliability should similar operational conditions occur in the future. NG Renewables analyzed potential options considering the principles noted above. This review resulted in the development of a new conceptual service that will offer reliability benefits under stressed system conditions and do so in a focused, effective, and efficient manner both from an operational and cost perspective.[8]

The proposed service is a real-time operational product that is practically exercised by ERCOT under the types of conditions experienced in February 2021.[9] The ramp up duration trigger for the product is a weather event. For example, if the forecast shows that a prospective two-week period presents the risk of a polar vortex, ERCOT would execute the procedures for increasing the duration need for the service. The service would be procured on a contemporaneous timeframe with real-time operations. Within the two-week period, in this example, ERCOT would base product procurement not on the 14-day basis, but rather on an hourly basis, with the duration timeframes limited to periods between 1 and 96 hours, determined based on a rolling hourly assessment by ERCOT. That assessment could show that weather conditions and related system conditions require the need for the service over a one, four, or up to ninety-six-hour period, and ERCOT would obtain the required mega-watts ("MWs") for that duration by establishing a pool of resources that qualified to provide the service. Procuring the service on a rolling, contemporaneous basis with real-time operations based on dynamic rolling forecasts mitigates the need for and cost of the service by limiting its use and procurement to only actual at-risk operational periods.

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[8] The proposed service was developed by NG Renewables staff, and we recognize that there may be opportunities to improve and / or build off the concept and look forward to working with the Commission, ERCOT, the IMM and other interested stakeholders in discussing the proposal and opportunities to enhance it and/or create similar options that provide a focused response to the types of issues experienced in February 2021 that also minimize costs to consumers.

[9] A detailed overview of the proposed service is provided in Attachment A to these comments. NG Renewables characterizes the proposal as the Duration At-Risk Reliability Service.

The foregoing discussion provides a conceptual overview of the Duration At-Risk Reliability Service being proposed herein in terms of its structure. In practice, the service would work as follows during real-time operations: Each hour ERCOT would determine the need for the service in terms of duration. For example, based on the forecast ERCOT may decide it is needed for the next 4-hour period. All resources that qualify for the service would form the pool of resources available to ERCOT. Qualification would be based on the hourly COP for a resource – if a resource is showing it is available in its hourly COP for the 4-hour period (in this example) then the resource qualifies for the service. The resource's MW qualification is based on its lowest MW value in its COP for the four period (this MW qualification limit facilitates availability and performance).

With respect to payment, Duration At-Risk Reliability Service would be funded by the $5K-$9K ORDC increment. The payment would be allocated based on performance in each relevant 5-minute SCED interval. The hourly assessment and need determinations are "forecasts" and the definition of the Duration At-Risk Reliability Service pool is, in essence, a capacity pool formed to give ERCOT a more reliable reliability tool.[10] However, qualification for the pool does not result in payment. Payment is made based on performance in each 5-minute SCED interval over the relevant Duration At-Risk Reliability Service determined duration period – if a resource qualifies for a relevant 4-hour period and performs in each 5-minute interval during that period it is paid accordingly. Again, the payment is funded by the $5K - $9K ORDC revenues for the corresponding 5-minute SCED interval in which a qualified resource performs. The payment is proportional relative to the number of qualified resources that perform in the interval. For example, if there are 20 qualified resources that all perform in a relevant interval and the ORDC revenues are $100, each resource would get $5.

With respect to cost, the proposed service is consistent with the Commission's goal of minimizing cost impacts in the market redesign proceeding. The cost of the service would be funded by the $5K to $9K increment of ORDC revenues. Thus, the service would not result in new costs to consumers relative to the existing market structure. Relative to the proposed payment approach for the Duration at Risk Reliability Service, it should be noted that lowering the ORDC price cap from $9K to another number – $4.5K has been discussed. If this were to occur it would affect the funding mechanism for the proposed service. The funding mechanism could be adjusted accordingly relative to the new number; in which case the cost of the service would be lower than current costs. Alternatively, a new funding mechanism could be considered. If the Commission believes this service has merit, the most effective and cost-efficient way to implement it is to maintain the ORDC price cap at $9K. This provides funding for the product via the $5K - $9K increment of those revenues and mitigates potential cost impacts to consumers because it is funded by costs already built into the current market structure. New revenue requirements for new products are unknown, even if the new service is designed to be limited and low cost. A cost structure as proposed for the Duration At-Risk Reliability Service product ensures that there will be no incremental cost impacts to consumers.

We note that during the workshop discussions, several comments were made expressing concern with the $9K cap due to the potential penalty exposure for non-performance during relevant events. The

[10] As discussed, it is more reliable because the resources in the pool are defined on a dynamic rolling basis in line with real-time operations based on their corresponding COP status for the relevant at-risk period, as determined by ERCOT hourly.

funding mechanism proposed herein would effectively address that concern by limiting generator revenues for ORDC to $5K. The remaining $5K - $9K increment would not go to ORDC payments but rather would pay for the new service.

Qualification for the service would be based on the hourly Commercial Operating Plans ("COPs") for resources and prior requirements defined by ERCOT. This would facilitate reliable performance because the hourly COPs are contemporaneous with real-time operations. The COPs are also dynamic and reflect changes in availability in a timely manner in alignment with ERCOT's procurement of the service and real-time operations, which further assures performance when needed. To further mitigate risk associated with performance/availability, procurement would be based on a relatively short timeframe (minimum 4-hour / max 96-hour period), and the MWs procured would be based on the lowest MW value in the COP over the relevant period. Finally, to maximize the value in terms of available MWs/resources and minimize costs, both generation and load can provide this service.

Another benefit of the proposed service is that it is consistent with the goal of maximizing the number of resources available to ERCOT. In early discussions around possible changes to the market, the idea of limiting the ability of renewable resources to provide ORDC was discussed. This proposal mitigates the need to remove that capacity and its attendant reliability value from ORDC by providing a complementary service that offers another way to ensure reliable and stable operations, but one is better suited to how renewable resources perform. Creating this complementary service mitigates the perceived risk related to renewables providing ORDC (*i.e.*, risk that renewables will be unavailable when called) because the new service shrinks the timing of the procurement from the more blunt ORDC timeframe to the contemporaneous real-time rolling procurement based on the contemporaneous and dynamic COP values, which are aligned with the timing of the service need and procurement. Similarly, the design of the new service allows for renewables to participate because it removes the timing disconnects between a blunt operating reserve procurement (relative to when it is needed) and aligns the procurement with need and actual resource capability (as reflected in its daily, rolling COP). Furthermore, demand response can provide the service.

Collectively, the design maximizes the scope of resources available to the system operator while simultaneously minimizing cost by maximizing the liquidity of the market capable of providing the service. And, as noted, because it is funded by the $5K - $9K ORDC increment it would not result in any incremental costs to consumers (based on current market design).

The service would also allow ERCOT to identify the timeframe when extreme, longer duration issues could limit the ability of some resources (*e.g.*, oil and gas production) to participate in ERS. Therefore, instead of removing them completely from the ERS process, they would only be removed both quantifiably and financially during these longer duration events (*e.g.*, 96 hours in winter).

Finally, it is expected that limited system changes would be needed to implement the service, thereby providing timely attainment of the reliability benefits when compared with new services that would require significant system upgrades.

The proposed service described above is just one of many options the Commission will likely have before it as it considers potential changes to the ERCOT market design. As discussed herein, NG Renewables believes its proposal has potential value to assist the Commission and ERCOT in maintaining system reliability under future stressed conditions, including the types of weather events experienced in the winters of 2011 and 2021. NG Renewables looks forward to working with the Commission, ERCOT, the IMM and other stakeholders in considering its proposal and other beneficial options that may be available, and to that end offers itself as a resource if the Commission has any questions related to these comments.

Sincerely,

Matt Morais

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ATTACHMENT A – NG RENEWABLES PROPOSED SERVICE OVERVIEW

Description

- To maintain reliability in the ERCOT region during long duration events, ERCOT will procure firm reliability obligations from loads and resources with qualified duration capability
- ERCOT will provide a rolling 2-week period with the level of duration required by ERCOT to maintain reliability to the ERCOT system based on a more frequent procurement of the service contemporaneous with real-time operations on a rolling basis over the two-week period
- For instance, most times it would have a 4-hour duration requirement, but if events like February 2021 happen again, ERCOT could increase the duration to 96 hours

Qualification

- For renewable resources ERCOT will use the forecast provided by the vendors
- This forecast will be updated prior to the hour. A solar or wind resource will be qualified based on their forecasted ability to deliver "firm" capacity
- Therefore, if for the next 4 hours a unit's COP amount is 100, 80, 60, and 40 MWs, the resource would be qualified for 40 MWs (the least of the hours of the duration)
- Natural gas fired resources will be required to provide to ERCOT documentation of firm natural gas deliveries over the required duration capability period
- Coal fired resources will be required to provide to ERCOT documentation of firm coal at the plant over the required duration capability period
- Nuclear resources will be required to provide to ERCOT documentation of firm fuel over the required duration capability period
- Storage facilities will be required to provide firm charging to cover the required duration capability period (i.e., a one hour 100 MW battery would be able to provide 25 MW of firm capability over a 4-hour period – and under a 96-hour duration requirement, a 100 MW battery would only be able to qualify to provide 1 MW)
- Loads can provide the service to maximize resource options and MWs available to the system operator and minimize costs via competition

Funding

- Funding for this new AS product will come from the ORDC payments for the values of $5,000 to ORDC cap (currently $9,000)
- This will not create any new costs relative to the current market structure
- All qualified capacity within SCED interval will share the revenue above $5,000
- Resources who are qualified and do not deliver the capacity they were qualified will pay a penalty 3 times the potential revenue
- This additional "revenue" will be shared by the resources and loads that delivered their required amount.

Examples of how the proposed service would work are provided below for summer and winter periods.

The examples provided below illustrate how the product would work in practice in terms of qualification and payment. All values in the examples are assumptions based on general experience with the ERCOT system. The two examples show a summer and winter scenario.

The key takeaways from the examples are the qualification of resources and associate MWs across the day and the payment for the service. With respect to qualification, the tables highlight the difference between intermittent resources and fossil/nuclear. The tables show that fossil qualification remains consistent across the day and intermittent qualification for Duration At-Risk Reliability Service aligns with and is limited by their availability, as reflected in typical performance profiles in the tables. With respect to batteries, the examples show that the qualification is consistent across the day, but the MW amounts are limited based on the discharge duration of the batteries and total MWs on the system.[11]

The tables also illustrate how payment would work in practice and highlight that the qualified resources are only paid when the $5 - $9K ORDC revenues are realized. In those hours the relevant ORDC price is multiplied by the actual load to determine the amount of Duration At-Risk Reliability Service funding. This is then divided by the number of qualified MWs, which sets the payment amount per MW. As discussed, payment is based on performance during relevant 5-minute SCED intervals.

[11] The examples assume 1000 MW of 1-hour batteries and 1000 MW of 2-hour batteries and no 4-hour batteries. For a 4-hour Duration At-Risk Reliability Service duration interval the batteries would be limited to providing hourly amounts to meet the 4-hour period relative to their capabilities; the 1000 MW of 1-hour would be allocated across the 4-hour Duration At-Risk Reliability Service duration, so only 250 MW would qualify for each hour. Similarly, for the 2-hour 1000 MW battery capability on the system, because it is 2-hour, the 1000MW would be allocated accordingly to meet the 4-hour Duration At-Risk Reliability Service duration, so 500 MW per in each hour.

Example of Current Qualified Duration Plan (Summer) with 4-hour duration requirement

Current Duration Qualified Plan

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Qualified																								
Nuclear	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Coal	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600
Natural Gas	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Wind	15,000	14,000	13,000	12,000	10,000	8,000	4,000	2,000	2,000	2,000	1,000	1,000	1,000	1,500	2,000	3,000	4,000	5,000	8,000	10,000	12,000	13,000	14,000	15,000
Solar	0	0	0	0	0	0	100	500	1,000	2,000	3,000	4,000	4,000	4,000	3,000	2,000	1,000	500	100	0	0	0	0	0
Batteries																								
1 hour	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
2 hour	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
4 hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loads (Voluntary Reduction)	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Total Qualified	79,350	78,350	77,350	76,350	74,350	72,350	68,450	66,850	67,350	68,350	68,350	69,350	69,350	69,850	69,350	69,350	69,350	69,850	72,450	74,350	76,350	77,350	78,350	79,350
Requirement	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Potential Load Shed At Risk	650	1,650	2,650	3,650	5,650	7,650	11,550	13,150	12,650	11,650	11,650	10,650	10,650	10,150	10,650	10,650	10,650	10,150	7,550	5,650	3,650	2,650	1,650	650
Non-Qualified																								
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Natural Gas	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Wind	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Batteries																								
1 hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loads	25,000	27,000	29,000	31,000	33,000	35,000	37,000	39,000	41,000	43,000	45,000	47,000	49,000	51,000	53,000	55,000	57,000	55,000	52,000	49,000	45,000	40,000	35,000	30,000
Payment																								
Actual Load	45,000	47,000	49,000	51,000	53,000	55,000	57,000	59,000	61,000	63,000	65,000	67,000	69,000	71,000	73,000	75,000	77,000	75,000	72,000	69,000	65,000	60,000	55,000	50,000
ORDC Price	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$100.00	$500.00	$1,000.00	$2,000.00	$7,000.00	$9,000.00	$7,000.00	$1,000.00	$500.00	$100.00	$0.00	$0.00
Payments per Qualified MW	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,162.94	$4,441.24	$2,147.46	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Example of Current Qualified Duration Plan (Winter) with 4-hour duration requirement

Current Duration Qualified Plan

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Qualified																								
Nuclear	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Coal	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600
Natural Gas	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Wind	15,000	14,000	13,000	12,000	10,000	8,000	4,000	2,000	2,000	2,000	1,000	1,000	1,000	1,500	2,000	3,000	4,000	5,000	8,000	10,000	12,000	13,000	14,000	15,000
Solar	0	0	0	0	0	0	100	500	1,000	2,000	3,000	4,000	4,000	4,000	3,000	2,000	1,000	500	100	0	0	0	0	0
Batteries																								
1 hour	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
2 hour	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
4 hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loads (Voluntary Reduction)	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Total Qualified	79,350	78,350	77,350	76,350	74,350	72,350	68,450	66,850	67,350	68,350	68,350	69,350	69,350	69,850	69,350	69,350	69,350	69,850	72,450	74,350	76,350	77,350	78,350	79,350
Requirement	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Potential Load Shed At Risk	650	1,650	2,650	3,650	5,650	7,650	11,550	13,150	12,650	11,650	11,650	10,650	10,650	10,150	10,650	10,650	10,650	10,150	7,550	5,650	3,650	2,650	1,650	650
Non-Qualified																								
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Natural Gas	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Wind	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Batteries																								
1 hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loads	38,000	40,000	45,000	50,000	55,000	60,000	65,000	60,000	55,000	50,000	45,000	43,000	41,000	39,000	37,000	40,000	41,000	42,000	43,000	44,000	45,000	46,000	47,000	48,000
Payment																								
Actual Load	58,000	60,000	65,000	70,000	75,000	80,000	85,000	80,000	75,000	70,000	65,000	63,000	61,000	59,000	57,000	60,000	61,000	62,000	63,000	64,000	65,000	66,000	67,000	68,000
ORDC Price	$0.00	$100.00	$500.00	$1,000.00	$2,000.00	$7,000.00	$9,000.00	$7,000.00	$1,000.00	$500.00	$100.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Payments per Qualified MW	$0.00	$0.00	$0.00	$0.00	$0.00	$2,211.47	$4,967.13	$2,393.42	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

ATTACHMENT B – EXECUTIVE SUMMARY

- Name of Proposed Service - Duration At-Risk Reliability Service (DARRS)
- Goal of DARRS – provide a focused reliability tool relative to real-time operations and at-risk periods related to weather events / other stressed system conditions that does not result in incremental cost to consumers and mitigates penalty risk to resources relative to the $9K ORDC cap exposure
- DARRS structure / function
    - Resources elect to participate in the service
    - Procured by ERCOT on an hourly basis relative to at-risk periods – (1) ERCOT IDs a broad at-risk period based on forecast (e.g., 2-weeks); (2) ERCOT implements DARRS on dynamic rolling basis relative to actual conditions during real-time operations for ERCOT determined duration period (4 hours up to 96 hours); (3) ERCOT identifies the pool of qualified resources for the DARRS service
    - DARRS qualification – based on hourly COP status for a resource that aligns with ERCOT DARRS assessments (see above bullet) / resource is limited to providing the service at the lowest MW value in its COP for the relevant period
    - DARRS payment – funding is from the $5K - $9K increment of ORDC revenues when/if that threshold is reached / ERCOT resource qualification determines the "capacity" pool for the relevant duration period, but payment is based on performance during each 5-minute SCED interval during the DARRS duration period for which a resource is qualified – ORDC $5K - $9K revenues from relevant intervals (if threshold is reached) funds the resources – proportional based on pool of revenues and MWs
    - Penalties – if a resource elects to participate and fails to perform during a duration period for which it qualifies it would be subject to a 3x penalty (based on DARRS payment for the relevant interval)
- DARRS value
    - Focused real-time operational product relative to expected at-risk periods based on forecasts but procurement/payment/use relatively limited by implementing it relative to real-time operations / real-time system conditions
    - Cost – product utilizes an existing market cost so there are no new costs for consumers relative to the current structure
    - Maximizes capacity available to ERCOT for DARRs and existing ancillary services because all types of resources are eligible to qualify for the service including demand response