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December 14, 2023

Public Utility Commission of Texas
ATTN: ADER Task Force
1701 N. Congress Ave.
Austin, Texas 78711

R: Project No. 53911, *Aggregate Distributed Energy Resource (ADER) ERCOT Pilot Project*

Dear Task Force Members:

Attached are materials that Electric Reliability Council of Texas, Inc. (ERCOT) intends to discuss at the December 15, 2023 ADER Task Force meeting. These materials include 1) a presentation on the status of Phase 1 of the Pilot Program and 2) a draft ADER Phase 1 Report. The Pilot Project Governing Document requires the ADER Task Force and ERCOT to prepare a report on Phase 1 of the Pilot Project either one year after the first wholesale offer from an ADER or simultaneously with submission of the Phase 2 Governing Document to the ERCOT Board for approval.

We look forward to the discussion at Friday's Task Force meeting.

Sincerely,

/s/ Katherine Gross

Katherine Gross
Sr. Corporate Counsel
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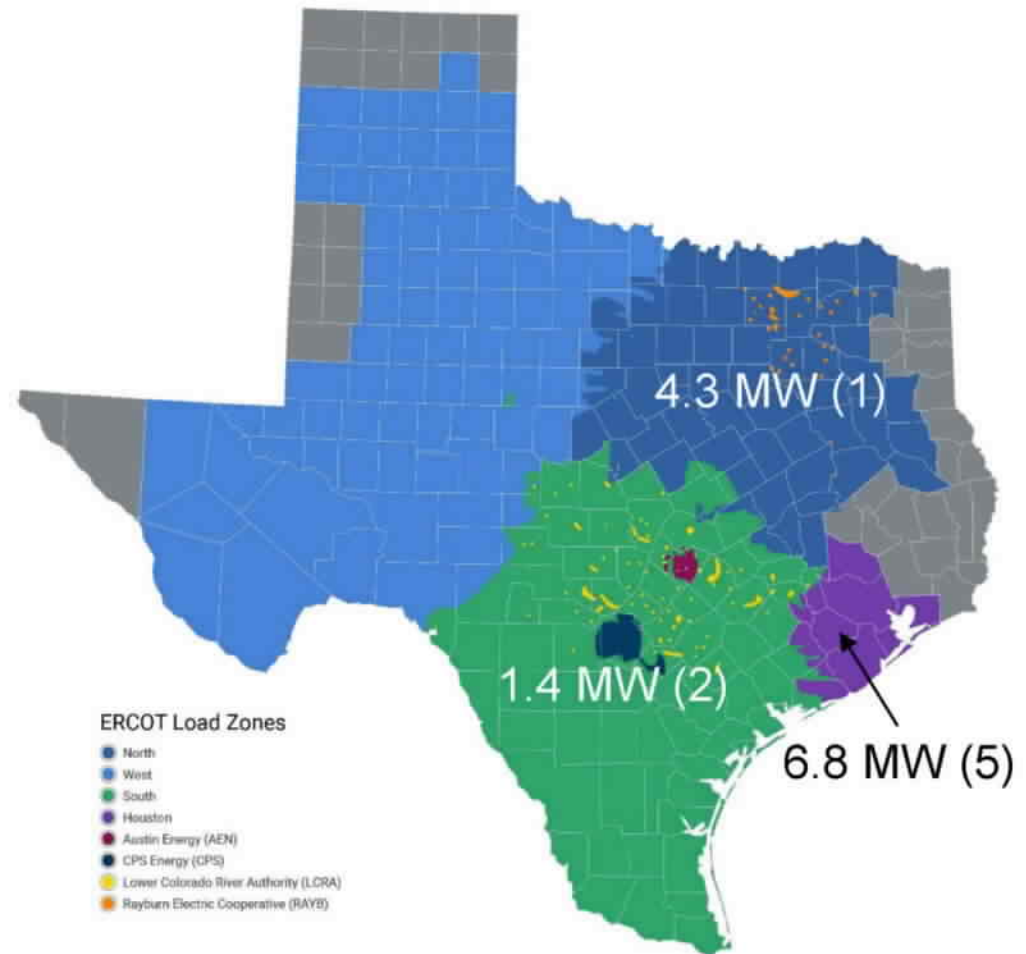
Update from ERCOT on Status of Phase 1 of Pilot Program

David Maggio
Principal, Market Design & Analytics

ADER Task Force Meeting
December 15, 2023

Pilot Project status overview

- There are currently 2 ADERs that have been qualified to participate in the wholesale electric market with participation starting in late August.
 - 9.4 MW capability for energy
 - 3.1 MW capability for Non-Spinning Reserve Service (Non-Spin)
- ERCOT has accepted six additional Details of the Aggregation (DOTA) forms. These potential ADERs are in various stages of registration and qualification and cannot fully participate at this time.
- Discussions on what a second phase of the pilot might look like have started. This presentation will share some initial observations and ERCOT staff's current thoughts on phase 2 changes and scope.



DOTA energy capability and ADER count for 8 ADERs with approved DOTA forms

Participation limits tracking as of December 14, 2023

		LZ_AEN	LZ_CPS	LZ_HOUSTON	LZ_LCRA	LZ_NORTH	LZ_RAYBN	LZ_SOUTH	LZ_WEST	ERCOT-WIDE
Energy	Limit (MW)	2.8	5.3	20.3	3.1	28.7	1.2	10.3	8.2	80.0
	Approved (MW)	0	0	6.8	0	4.3	0	1.4	0	12.5
	Unused (MW)	2.8	5.3	13.5	3.1	24.4	1.2	8.9	8.2	67.5
	% Full	0%	0%	34%	0%	15%	0%	14%	0%	16%
Non-Spin	Limit (MW)	1.4	2.7	10.1	1.6	14.3	0.6	5.2	4.1	40.0
	Approved (MW)	0	0	2.4	0	1.4	0	0.5	0	4.3
	Unused (MW)	1.4	2.7	7.7	1.6	12.9	0.6	4.7	4.1	35.7
	% Full	0%	0%	24%	0%	10%	0%	10%	0%	11%

Summary statistics for actively participating ADERs, as of December 1, 2023

Metric	Resource-interval count
SCED Intervals evaluated	58,532
SCED Intervals where the ADER was on-line	35,710
SCED Intervals with non-zero Non-Spin Responsibility	10,522
SCED Intervals with ADERs dispatched	862
SCED Intervals with ADERs deployed for Non-Spin	0

- Majority of energy-dispatch participation has been between hours beginning 6 and 20.
- Majority of Non-Spin provision has been between hours beginning 6 and 17.

Evaluations and recommendations for Phase 2

- While data around participation of ADERs in the market has been somewhat limited, both in terms of amount of time and number of Resources, there is sufficient information to share initial thoughts and propose incremental changes for a Phase 2.
1. Telemetry validation processes and requirements
 - ERCOT staff is proposing amendments to the “Validation” section of the Governing Document based on flaws identified in Phase 1.
 - The concept is to have the validation analysis focused only on intervals in which the aggregated device/premise-level data is greater than 10% of the Resource’s requested energy capability.
 - E.g., for a +/- 1 MW ADER, only evaluate intervals where the aggregate injection or withdrawal exceeds 0.1 MW.
 - There will be a minimum number of intervals that must meet the criteria for evaluation to ensure the sample size is sufficient for the validation analysis.
 - Additional details are included in the draft report.

Evaluations and recommendations for Phase 2 cont.

2. Expanding Ancillary Service product eligibility to include ERCOT Contingency Reserve Service (ECRS)
 - ERCOT recommends expanding ECRS eligibility to include ADERs capable of meeting the requirements of providing this service, as defined within the ERCOT Protocol.
 - This has been requested by ADER participants and is an opportunity to increase their participation in the market, while allowing for continued monitoring by ERCOT and the participants through the Pilot Project.
 - Like Non-Spin, there will be a limit on the amount of ADER capability that can be qualified under the Pilot Project to provide ECRS in Phase 2.

Evaluations and recommendations for Phase 2 cont.

3. Continued review of compliance metrics for ADERs

- As noted in the Governing Document, ADERs use the ALR participation model under the Nodal Protocols, which includes the requirement that performance will be evaluated using the existing Controllable Load Resource Energy Deployment Performance (CLREDP) and Base Point Deviation processes for ALRs
- Those thresholds are:

Resource/Metric	Protocol Reference (\$)	X (%)	Y (MW)
Base Point Deviation, Over-Consumption, Controllable Load Resource	6.6.5.1.1.3	25	2
Base Point Deviation, Under-Consumption, Controllable Load Resource	6.6.5.1.1.4	15	2
Base Point Deviation, Over-Consumption, Controllable Load Resource with Ancillary Service responsibility	6.6.5.1.1.3	15	2
Base Point Deviation, Under-Consumption, Controllable Load Resource with Ancillary Service Responsibility	6.6.5.1.1.4	10	2
CLREDP	8.1.1.4.1(9)	25	2
CLREDP with Ancillary Service Responsibility	8.1.1.4.1(9)	15	2

- Under the current tolerances, ADERs smaller than 2 MW will always meet the stated performance criteria, which is clearly not the intent of having performance measures.
- ERCOT does not have a formal recommendation at this time. However, ERCOT recommends that the ADER Task Force and participants work together to consider whether an alternative dispatch compliance regime would be more appropriate, particularly for smaller ADERs.

Evaluations and recommendations for Phase 2 cont.

4. Alternative participation models for ADERs

- Under the current program rules, ADERs must be SCED-dispatchable to participate in the Pilot Project. This requirement may preclude the participation of some Resource types that are able to respond to ERCOT instruction but lack the ability to smoothly ramp over a 5-minute interval.
- It may be possible to increase ADER Pilot Project participation by considering enabling a participation framework for a “blocky” Resource type.
- Prior to making a formal recommendation on whether and how to proceed with enabling participation of this Resource type, ERCOT and stakeholders would need to consider the following:
 - To what extent is this Resource enabled to participate today? What barriers exist?
 - What system changes would be required to fully enable the participation of this Resource type and what would be the commitment in terms of cost, resourcing and time?
 - When and how could this work be accommodated given existing commitments?
 - What is the scope of potential benefit (e.g., in terms of additional Resources/MW capability that may be enabled) of developing this framework?

Evaluations and recommendations for Phase 2 cont.

5. Alternatives to dispatch using Load Zone shift factors

- Under the current participation model, ADERs are dispatched using Load Zone shift factors, and settled at their respective Load Zone price. The use of Load Zone shift factors may not be an accurate reflection of these Resources' impact on power system flow and, therefore, transmission congestion.
- ERCOT staff has begun evaluating an alternative method to calculate ADER shift factors, which is based on the electrical bus shift factor for each premise in the ADER weighted by the maximum injection capability of each premise and divided by the ADER's total maximum injection capability.
 - Initial results from the analysis are included in the draft report.
 - While maximum injection capability has been used up to this point, a long-term approach will have to account for the fact that there may not be "injection capability" for each of the premises or devices within the aggregation.
- Intuitively, the use of these "quasi-nodal" shift factors should result in improvements to overall congestion management. However, the current data indicate the impacts may be limited thus far.
- The recommendation for Phase 2 of the Pilot Project is to continue with the existing Load Zone shift factor paradigm and to continue to examine this issue for potential reliability risks and market inefficiencies.

Next Steps

- ERCOT has begun the process of developing a Phase 2 Governing Document, based on the recommendations in this presentation and the draft report.
 - Fundamentally, many of the drivers and questions for the Pilot Project remain the same.
 - Rather than creating an entirely new document, ERCOT will plan to implement recommended updates to the Pilot Project in the form of redline edits to the existing Phase 1 Governing Document.
- The intent is to collect feedback from the ADER Task Force and incorporate it into a final report and Phase 2 Governing Document that will be taken to the ERCOT Board in the early part of 2024.

Aggregate Distributed Energy Resource (ADER) Pilot Phase 1 Report

DRAFT

2023

Table of Contents

Introduction 2

Background..... 3

 Purpose and Overview of the Pilot.....3

 Eligibility and Qualification Process4

 Market Participation and Compliance.....5

Analysis and Participation..... 6

 Pilot Participation.....6

 Summary Statistics for Actively Participating ADERs.....7

 Energy Market Participation.....8

 Ancillary Service Market Participation9

Overall Observations 10

Evaluations and Recommendations..... 11

 Telemetry Validation Processes and Requirements11

 Recommendation/Lessons-Learned.....12

 Expanding Eligibility to Provide Additional Ancillary Services13

 Recommendation/Lessons-Learned.....14

 Compliance Metrics14

 Recommendation/Lessons-Learned.....15

 Alternative Participation Frameworks15

 Recommendation/Lessons-Learned.....15

 Alternatives to Dispatch using Load Zone Shift Factors.....16

 Recommendation/Lessons-Learned.....21

Next Steps 22

Introduction

The Aggregate Distributed Energy Resource (ADER) Pilot Project was established under the directive of the Public Utility Commission of Texas (PUCT) and in accordance with 16 Texas Administrative Code (TAC) § 25.361(k). The purpose of this initiative, authorized by the Electric Reliability Council of Texas (ERCOT) Board of Directors, is to evaluate the integration of ADERs in the ERCOT wholesale market. The Governing Document for the ADER Pilot Project was unanimously approved by the PUCT on November 1, 2022. Since that time, ERCOT has accepted submissions from eight ADERs, two of which began participating in the real-time energy dispatch and Ancillary Service markets in August and September 2023, respectively.

An important requirement of this pilot is for ERCOT to provide a report which shall include a number of recommendations on various aspects of the ADER Pilot Project based on observations in Phase 1. Since the inception of the Pilot Project, ERCOT has worked closely with participants and the ADER Task Force members through various stages of the process, such as aggregation form submission, telemetry verification, and real-time participation. In the course of this work, ERCOT and stakeholders have made observations and recommendations based on lessons-learned. This report includes two primary components:

1. A summary review and analysis of participation thus far; and
2. Observations and recommendations based on participation and lessons-learned to help inform future phases of the Pilot Project, with a focus on near-term recommendations for a Phase 2.
 - ERCOT is proposing incremental changes for Phase 2 of the Pilot Program including:
 - Allowing ADERs to compete to provide ERCOT Contingency Reserve Service (ECRS) in addition to Non-Spinning Reserve Service (Non-Spin); and
 - Making amendments to the Telemetry Validation processes based on experience in Phase 1.

- ERCOT will continue to review and study several items included in Phase 1 into Phase 2 to inform recommendations for future phases.

Background

Purpose and Overview of the Pilot

The Governing Document¹ includes several stated objectives for the ADER Pilot including to:

- Assess operational benefits and challenges of ‘heterogeneous’ aggregations or resources which are net-generation or net-load;
- Understand ability and impact of ADERs providing Ancillary Services;
- Understand distribution system impacts of ADERs as well as impacts to transmission system congestion management; and
- Identify future enhancements by studying the efficacy of alternative distribution-level aggregations with more granular dispatch and settlement through the use and consideration of Logical Resource Nodes (LRNs).

The first phase of the Pilot Project was designed to minimize required ERCOT and Distribution System Provider (DSP) system changes to enable participation, with the opportunity to evaluate lessons-learned to incorporate into future enhancements, including potentially significant software changes. Key parameters of the Pilot Project are summarized below.

- ADERs will be modelled as a Controllable Load Resource (CLR) where individual Premises are aggregated within a single Load Zone and must have the same Load-Serving Entity (LSE) and DSP (though individual Premises may be a net-load or net-generation).

¹ <https://www.ercot.com/files/docs/2022/11/01/Item%208%20-%20Aggregate%20Distributed%20Energy%20Resource%20Pilot%20Project%20-%20Phase%201%20Governing%20Document.docx>

- The aggregation must have the capability to provide at least 100 kW of response.
- Total registered MW capacity of all ADERs will be capped at no greater than 80 MW system-wide with a 40 MW cap on the amount of Non-Spinning Reserve Service (Non-Spin) that can be provided by ADERs.
- No Qualified Scheduling Entity (QSE) will be allowed to register more than 20% of system-wide limits.
- The above limits may be adjusted by ERCOT at its discretion and based on observations over the course of Phase 1.

Eligibility and Qualification Process

The following is a summary of eligibility and qualification requirements and processes in Phase 1 (further details are available in the ADER Pilot Governing Document).

- QSEs representing an ADER must submit a Details of the Aggregation (DOTA) form which includes detailed information on the nature and location of individual Premises within the aggregation (e.g., unique meter and settlement identifications, device type and rated capacity).
- The DOTA form must also state the capacity that is intended to be registered with ERCOT as an ADER and the amount of Non-Spin for which the QSE is intending to qualify.
- The DSP, in conjunction with the Transmission Service Provider (TSP), will map each of the Premises to their respective Common Information Model (CIM) and include this in the DOTA submission.
- In addition to the DOTA submission, the QSE must submit forms signifying acknowledgement from the respective DSP and a Standard Form Market Participant Agreement. These forms are then submitted and reviewed by ERCOT.²
- Upon formal acceptance by ERCOT, the QSE will begin the process of registering a CLR with ERCOT.

² A detailed explanation of the ERCOT DOTA approval processes and procedures is available in subsection 5.c.1 of the Phase 1 Governing Document.

- The registered ADER must always telemeter as a net-consumer of energy (this may require using a static MW offset value set by ERCOT).
- If an individual Premise that is part of the ADER can inject into the distribution system, the profile code for the TDSP read meter at the Premise must be updated such that any exports at the Premise will be treated as negative load.
- Adjustments to DOTA forms may be submitted and reviewed and approved at any time subject to stated limitations under Phase 1.

The ADER must also go through a qualification process prior to being eligible to participate in the ERCOT energy and Ancillary Service markets. A key aspect of qualification relates to telemetry set-up and validation, which includes the following requirements:

- Providing Resource-level telemetry to ERCOT every two seconds. The telemetry must be an accurate representation of the aggregate values of all the sites in a Resource (and match those included the DOTA form).
- Telemetry values may be based on device-level or Premise-level quantities.
- Ramp rate telemetry should represent the weighted average of the ramp rates at the individual Premise or device based on the approved DOTA form.
- Telemetry of state-of-charge if the ADER includes energy storage devices.
- Premises are required to submit 15-minute interval meter data (or revenue quality meter data if within a Non-Opt-In Entity (NOIE) territory) for the purposes of validation.
- ERCOT will conduct its own validation process with the goal of ensuring that the telemetered data points provide an accurate representation of ADER performance. The validation process will look differently depending on whether it is being done at the Premise or device-level (and is discussed in further detail later in this report.)

Market Participation and Compliance

Upon completion of the qualification process, ADERs use the existing Aggregated Load Resource (ALR) participation framework to participate in the ERCOT-administered markets (including offering qualified MWs into the Day-Ahead Market (DAM) to provide Non-Spin).

- Deployment of ADERs either for Non-Spin or for energy is through Security-Constrained Economic Dispatch (SCED) in accordance with existing ALR requirements including dispatch and pricing using Load Zone shift factors.
- ADERs are registered as ALRs in ERCOT's system with performance evaluated using the existing CLR Energy Deployment Performance (CLREDP) Base Point Deviation and other related processes for CLRs (and included in applicable monthly performance reports).

Analysis and Participation

The following section provides summary statistics related to the participation of ADERs since the launch of Phase 1 of the Pilot Project.

The analysis in this report evaluates all SCED intervals starting on August 24, 2023, the first day of ADER participation in the real-time wholesale market and ending on December 1, 2023.

Pilot Participation

Two ADERs have successfully completed the entire registration, qualification, and validation process, and since August 24, 2023 have been participating in the wholesale energy market. The ADERs began participating in Non-Spin on August 25, 2023. These two ADERs are comprised of consumers with Tesla Powerwalls. Six additional ADERs have ERCOT-accepted DOTA forms in place and are at various stages in the registration and qualification process.

The table below shows the sum of the capacity of the eight ADERs that have requested to participate in the Pilot Project and have ERCOT-approved DOTA forms, as well as their relation to the caps for the Pilot Project. This data is as of December 1, 2023.

		LZ AEN	LZ CPS	LZ HOUSTON	LZ LCRA	LZ NORTH	LZ RAYBN	LZ SOUTH	LZ WEST	ERCOT-WIDE
Energy	Limit (MW)	2.8	5.3	20.3	3.1	28.7	1.2	10.3	8.2	80.0
	Approved (MW)	0	0	6.8	0	4.3	0	1.4	0	12.5
	Unused (MW)	2.8	5.3	13.5	3.1	24.4	1.2	8.9	8.2	67.5
	% Full	0%	0%	34%	0%	15%	0%	14%	0%	16%
Non-Spin	Limit (MW)	1.4	2.7	10.1	1.6	14.3	0.6	5.2	4.1	40.0
	Approved (MW)	0	0	2.4	0	1.4	0	0.5	0	4.3
	Unused (MW)	1.4	2.7	7.7	1.6	12.9	0.6	4.7	4.1	35.7
	% Full	0%	0%	24%	0%	10%	0%	10%	0%	11%

As part of the reporting requirements under subsection 5(k) of the Governing Document, a summary of certified communication standards for devices within the ADERs that are currently participating in the market is presented below for Phase 1 of the Pilot Project³:

Communication Standard	Number of Devices
IEEE 2030.5 (SEP2)	763

Summary Statistics for Actively Participating ADERs

There are two ways an ADER can participate in the ERCOT market during Phase 1: (1) by providing energy that is “dispatched” by ERCOT to meet forecasted system demand or (2) by carrying Non-Spin, which an ADER would be awarded in the Day-

³ Other potential ADERs currently at various stages of the registration process may have devices with different communications standards than those identified above. These will be reported in future updates as and when these Resources complete registration and begin participating.

Ahead Market, and which would only be “deployed” if ERCOT had a reliability need, based on the current triggers for deploying Non-Spin.

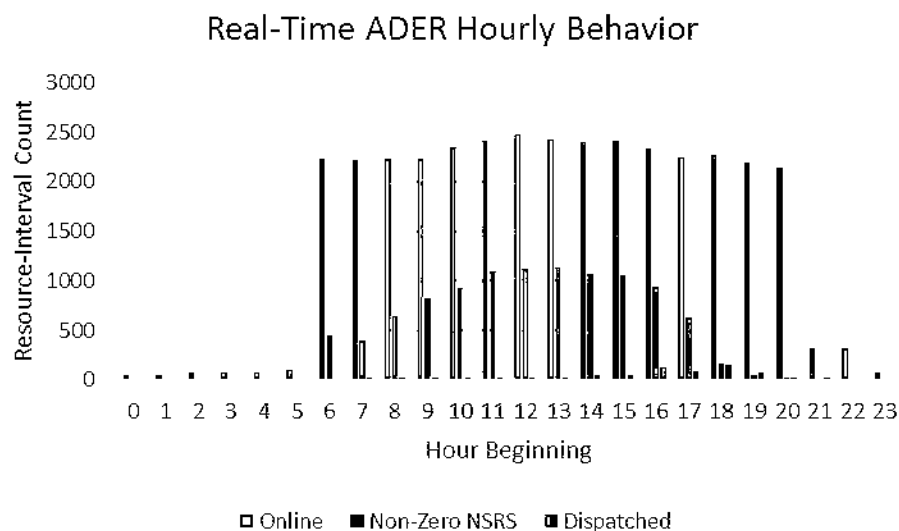
The below chart shows all of the SCED intervals covering the period between August 24, 2023, through December 1, 2023. These intervals are analyzed in more detail below.

Metric	Resource-Interval Count
SCED Intervals evaluated	58,532
SCED Intervals where the ADER was on-line	35,710
SCED Intervals with non-zero Non-Spin Responsibility	10,522
SCED Intervals with ADERs dispatched	862
SCED Intervals with ADERs deployed for Non-Spin	0

Energy Market Participation

Regarding energy dispatch, when an ADER’s Locational Marginal Price (LMP) exceeds their energy bid (i.e., their willingness to pay for electricity), ERCOT’s dispatch algorithm will dispatch the ADER by instructing them to reduce power consumption or inject more power. Out of all on-line intervals, ADERs received a basepoint instruction to reduce consumption ~2% of the time, meaning that it was generally more efficient to dispatch other Resources ~98% of the time.

The graph below breaks down the data by hour to reveal daily patterns in the ADERs' participation behavior. Normally, the ADERs were on-line from hour-beginning 6 to 20, (but would stop carrying Non-Spin, after hour-beginning 17). The ADERs were typically dispatched in the late afternoon during solar down-ramp hours when prices tended to be highest for the period analyzed.



Ancillary Service Market Participation

ADERS were carrying Non-Spin responsibility ~ **34%** of the time during on-line intervals. During the period evaluated, ERCOT operators usually deployed Non-Spin at the end of the solar ramp down in hours after hour beginning 18 -which was usually when the ADERs were no longer carrying Non-Spin. No ADERs have been instructed to deploy Non-Spin through November 2023.

QSEs are obligated to provide Ancillary Services based on their Ancillary Service awards and trades. In approximately 2% of intervals, the QSE for the ADERs was short of their Ancillary Service obligation. However, most of these instances occurred very early into their participation in the market and were subsequently addressed with ERCOT and the QSE working together to flag and identify the root causes of the issue. The purposes of a Pilot Project are to observe, learn, adjust, and improve over time as issues are identified and addressed, which is what happened in this case. It should also be noted that after the issues were addressed, the instance of short Ancillary Service obligation intervals has come

down significantly and are generally now in-line with participation of other Resources in the market.

Overall Observations

Based on the experience and lessons-learned since the initial launch of the ADER Pilot, ERCOT can note some overall observations before going into specific evaluations and recommendations. The experience of the first several months of this Pilot Project is that there is a steep collective learning curve when it comes to being able to successfully complete the processes and procedures that are required prior to ADERs being able to participate in the market. This is reflected in the fact that while several ADERs have initiated this process, only two have completed the qualification and telemetry validation thus far that are necessary to participate in the market as a Resource. As a result, the observations around participation of ADERs in the market has been somewhat limited, both in terms of amount of time and in terms of the number of Resources (and by extension, the number of basepoint and Ancillary Service deployments available). Additionally, for those Resources in the market today, their participation is likely to continue to evolve based on learning and gaining additional experience. This means that it may be somewhat premature at this point to draw fundamental conclusions based on the information available and therefore, a number of policy recommendations included for study in Phase 1 will need to remain in Phase 2 to allow additional participation, data and analysis to inform future recommended changes.⁴ At the same time, ERCOT does have some recommendations and commentary based on observations during this initial phase of the Pilot Project outlined further below.

⁴ This includes recommendations on additional data recorder requirements and the ability of ADERs to provide primary frequency response (no Resources participating to date have indicated this ability).

Evaluations and Recommendations

This section includes recommendations based on the experience with and observations of Phase 1 of the Pilot Project. The following areas are reviewed and considered with a brief explanation of the issue and a recommendation to either implement a change, or study the issue further:

- Telemetry validation processes and requirements
- Expanding eligibility to provide additional Ancillary Services
- Compliance metrics
- Alternative participation frameworks
- Alternatives to dispatch using Load Zone Shift Factors

Telemetry Validation Processes and Requirements

The objective of ADER telemetry validation is to create an acceptable standard that provides ERCOT Operations with assurance that the telemetered values from the QSE provide a reasonable representation of the physical characteristics and conditions of the ADER. The ADER Governing Document includes requirements for both Premise-level and device-level telemetry validation. To date, two ADERs have been qualified based on device-level telemetry; no ADERs have yet been qualified based on Premise-level telemetry.

For device-level telemetry, the Phase 1 process is as follows:

- If the ADER telemetry values represent the sum of the devices under control, for each site in the aggregation contributing to the device-level telemetry, the QSE will be required to provide device-level sub-meter (data recorder) data to ERCOT upon request. This device-level sub-meter (data recorder) data must meet the minimum specifications established by ERCOT. As part of the qualification process, ERCOT will use the following 2-step validation process for the QSEs device-level telemetry.

- Step 1: The ADER Net Power Consumption (NPC) telemetered values minus offset averaged over each 15-minute interval must be within 10% of the aggregate of the device-level sub-meter (data recorder) data, averaged over each 15-minute interval during the period being evaluated.
- Step 2: ERCOT will instruct the QSE to deploy the ADER to a mutually agreed value but one that represents a significant portion of its capability. This instruction will last for at least one full 15-minute settlement interval. The change in the telemetered NPC in response to the instruction must be within 10% of the total response observed in the aggregate Premise-level 15-minute interval meter data during each interval in the sustained response period.

During the validation process, the device-level sub-meter (data recorder) data was submitted as requested and was initially evaluated across a 24-hour period. After conducting the initial validation, ERCOT staff noticed that there were 15-minute intervals that failed to meet the validation requirements where a very small size of kWh measurement was being recorded. It was determined that it is not feasible or practical to maintain the telemetry validation error threshold requirements across an entire day when it was likely to include periods when the ADER was effectively idle with aggregate injection/consumption levels near 0. In order to facilitate a more representative evaluation, while still adhering to the language in the ADER Governing Document, the device-level telemetry was evaluated across a two-hour period (eight 15-minute intervals), which was selected in consultation with the QSE. This provided the opportunity to validate the device-level telemetry of the ADER more appropriately during a deployment. After making this adjustment, both ADERs evaluated successfully met the validation requirements.

Recommendation/Lessons-Learned

Overly restrictive performance criteria can lead to unintended outcomes that may represent a barrier to participation. ERCOT staff is proposing amendments to the Validation section of the Governing Document based on experience in Phase 1. These include the following:

1. Only intervals where the aggregate device-level data, averaged over each 15-minute settlement window, are greater than 10% of the Resource's requested energy capability will be evaluated:
 - When the aggregated device is net injecting, this evaluation will be based on the Maximum Injection Capability.
 - When the aggregated device is net withdrawing, this evaluation will be based on the Maximum Withdrawal Capability.
2. For the intervals being evaluated per step 1, the telemetered value must be within 10% of the aggregate device level averaged over each 15-minute settlement interval.
3. During a designated 8-hour evaluation period, at least 50% of the intervals must meet condition 1 above. This will result in at least sixteen 15-minute intervals during which performance can be assessed.

By shifting the focus to 10% of the maximum withdrawal/injection capacity, the ERCOT validation processes will provide a better representation of a Resource's capabilities. This will help to ensure that the telemetry provided is an accurate reflection of the aggregation of devices while avoiding failures in the validation process simply because of minimal aggregate activity at the devices during an interval. While we have not yet seen ADERs with Premise-level data going through this process, we see similar concerns arising and will also be proposing similar changes to that validation process as part of Phase 2.

Expanding Eligibility to Provide Additional Ancillary Services

Under the current Governing Document Rules, ADERs are only eligible (upon qualification) to provide Non-Spin, in terms of Ancillary Services. After the initiation of the Pilot Project, ERCOT launched a new daily procured Ancillary Service: the ERCOT Contingency Reserve Service (ECRS). ECRS is a service that may be deployed to restore frequency within 10 minutes of a significant frequency deviation to recover deployed Regulation Service, to help manage intra-hour net

load forecast uncertainty, and to make additional capacity available to SCED for dispatch. Resources providing ECRS must be able to respond within 10 minutes with capacity that can be sustained at a specified level for two consecutive hours. This new Ancillary Service product is generally open to all Resource types able to meet requirements but is not currently open to ADERs.

Recommendation/Lessons-Learned

ERCOT recommends expanding ECRS eligibility to include ADERs capable of meeting the requirements of providing this service, as defined within the ERCOT Protocol. This has been requested by ADER participants and is an opportunity to increase their participation in the market, while allowing for continued monitoring by ERCOT and the participants through the Pilot Project. Like Non-Spin, there will be a limit in the amount of ADER capability that can be qualified under the Pilot Project to provide ECRS in Phase 2.

Compliance Metrics

As noted in the Governing Document, ADERs use the ALR participation model under the Nodal Protocols, which includes the requirement that performance will be evaluated using the existing Controllable Load Resource Energy Deployment Performance (CLREDP) and Base Point Deviation processes for ALRs. Under the Nodal Protocols, CLRs are afforded a 'deviation tolerance' during these evaluations. The tolerance thresholds are posted on ercot.com and summarized in the table below.

Resource/Metric	Protocol Reference (§)	X (%)	Y (MW)
Base Point Deviation, Over-Consumption, Controllable Load Resource	6.6.5.1.1.3	25	2
Base Point Deviation, Under-Consumption, Controllable Load Resource	6.6.5.1.1.4	15	2
Base Point Deviation, Over-Consumption, Controllable Load Resource with Ancillary Service responsibility	6.6.5.1.1.3	15	2
Base Point Deviation, Under-Consumption, Controllable Load Resource with Ancillary Service Responsibility	6.6.5.1.1.4	10	2
CLREDP	8.1.1.4.1(9)	25	2
CLREDP with Ancillary Service Responsibility	8.1.1.4.1(9)	15	2

These initial tolerances were fair and reasonable given the type and size of Load Resources participating in the wholesale market at the time of their adoption but are less rational when it comes to smaller Resources. It is likely that ADERs will be, at least initially, much smaller than the traditional Load Resources that have been part of the market. Under the current tolerances, ADERs smaller than 2 MW will always meet the stated performance criteria, even if they were to completely ignore basepoint instructions, because their maximum output is below the 2 MW threshold for performance.

Recommendation/Lessons-Learned

ERCOT does not have a formal recommendation at this time on changes to address this issue. However, ERCOT recommends that the ADER Task Force and participants work together to consider whether an alternative dispatch compliance regime would be more appropriate to measure the performance of <2 MW Load Resources is warranted. A future recommendation will be informed by additional Resource participation and dispatch data.

Alternative Participation Frameworks

Under the current program rules, ADERs must be SCED-dispatchable to participate in the Pilot Project. This requirement may preclude the participation of some Resource types that are able to respond but lack the ability to smoothly ramp over a 5-minute interval. So-called “blocky” Resources may exhibit more of a step change in injection or consumption (e.g., due to opening a breaker, starting of a small generator, etc.) at a site or group of sites rather than a linear ramp. It may be possible to increase ADER Pilot Project participation by considering enabling a participation framework for this kind of “blocky” Resource type.

Recommendation/Lessons-Learned

Prior to making a formal recommendation on whether and how to proceed with enabling participation of this Resource type, ERCOT and stakeholders would need to consider the following:

- To what extent is this Resource enabled to participate today? What barriers exist?
- What system changes would be required to fully enable the participation of this Resource type and what would be the commitment in terms of cost, resourcing and time?
- When and how could this work be accommodated given existing commitments?
- What is the scope of potential benefit (e.g., in terms of additional Resources/MW capability that may be enabled) of developing this framework?

While this should be continued to be explored, no specific changes are being recommended by ERCOT for Phase 2 of the Pilot Project. This will allow for more discussion on this issue through the ADER Task Force.

Alternatives to Dispatch using Load Zone Shift Factors

Under the ALR participation model, ADERs are dispatched using Load Zone shift factors, and settled at their respective Load Zone price. The use of Load Zone shift factors may not be an accurate reflection of these Resources' impact on power system flow and, therefore, their impact on transmission constraints being managed by ERCOT through the market.

ERCOT staff evaluated an alternative method to calculate ADER shift factors by using a capacity-weighted average of each of the ADER premise's electrical bus shift factors. This will be referred to in this report as the "Quasi-Nodal shift factor." Since the Quasi-Nodal shift factor calculation considers the shift factors of individual Premises, given their relative connection to the transmission system, ERCOT believes it could be a more accurate representation of an ADER's impact on congestion. The analysis in this section compares the differences between the Load Zone shift factor and Quasi-Nodal shift factor to understand their relative scope and magnitude. The difference between the Load Zone shift factor and Quasi-Nodal shift factor on a given constraint for a particular SCED-interval will be

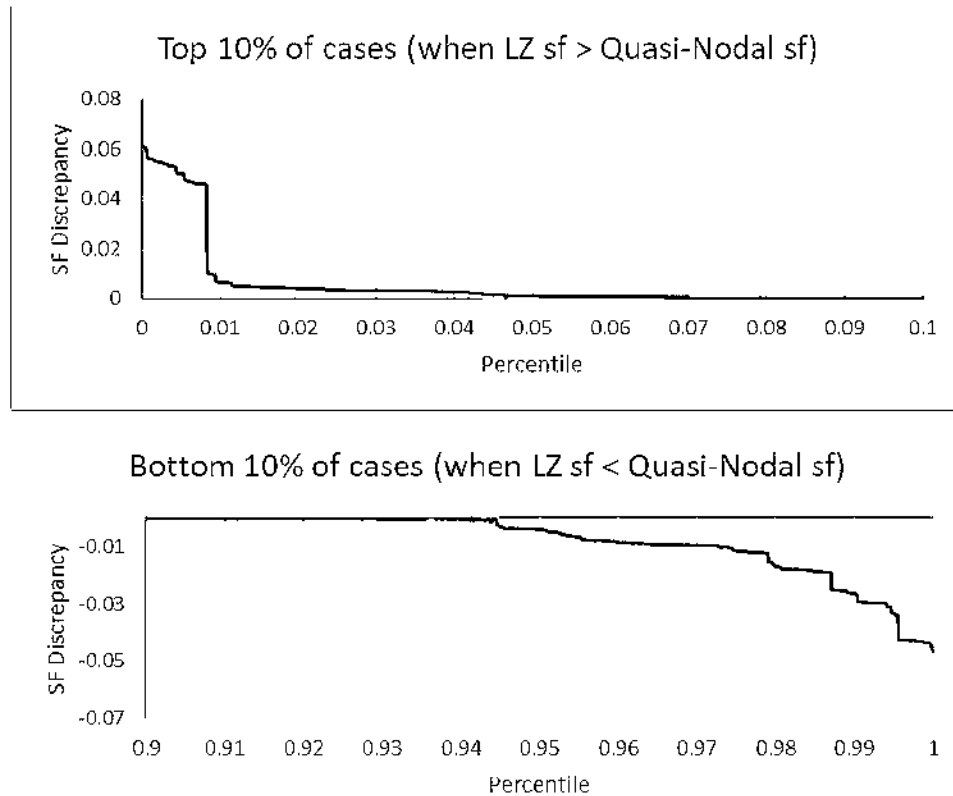
referred to as the “shift factor discrepancy”. (Shift Factor Discrepancy = Load Zone shift factor – Quasi-Nodal shift factor.)

The set of figures shown below describes the frequency of occurrence of shift factor discrepancies. The analysis considers all active constraints during the 800 SCED intervals with the highest congestion rent between August 23, 2023, and November 7, 2023.

The graphs shown below are duration curves with the axes adjusted to show the magnitude and frequency of occurrences for the top 10% and bottom 10% of largest shift factor discrepancies for Resource #1 out of all constraint-intervals evaluated. For Resource #1, shift factor discrepancies with a magnitude greater than 0.02 occurred during less than 3% of all constraint-intervals evaluated.

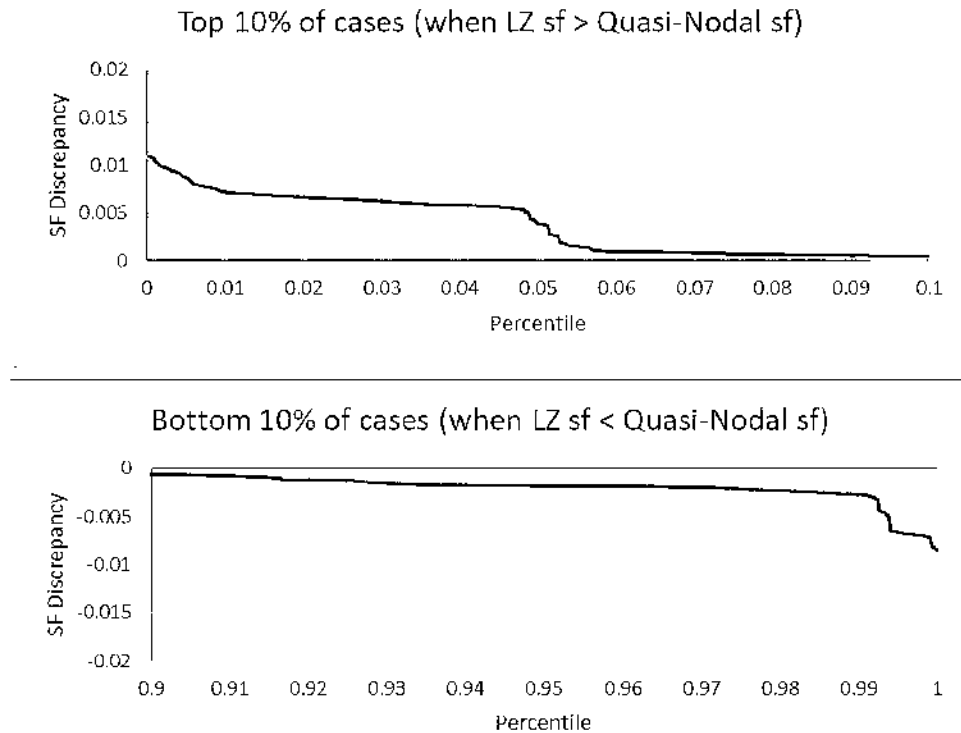
The largest shift factor discrepancy found was 6.1% (Load Zone shift factor = -0.04, Quasi Nodal shift factor = -0.11). The implications of this specific scenario are that the Load Zone shift factor used in the market likely understated the magnitude by which Resource #1 could have been utilized to help resolve a constraint.⁵

⁵ For greater clarity, a negative sign shift factor indicates this resource would ‘help’ resolve congestion whereas a positive sign shift factor indicates this resource would ‘hurt’ or exacerbate congestion.

Resource #1 – Instances of constraint-intervals ordered by shift factor discrepancy, top and bottom 10% of cases

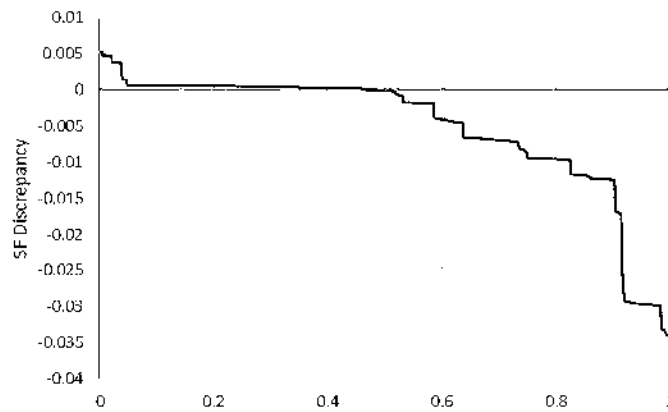
Similarly, the following graphs are duration curves with the axes adjusted to show the magnitude and frequency of occurrence for the top 10% and bottom 10% of largest shift factor discrepancies for Resource #2 out of all constraint-intervals evaluated. Resource #2's largest shift factor discrepancy was only 0.011.

Resource #2 – Instances of constraint-intervals ordered by shift factor discrepancy, top and bottom 10% of cases



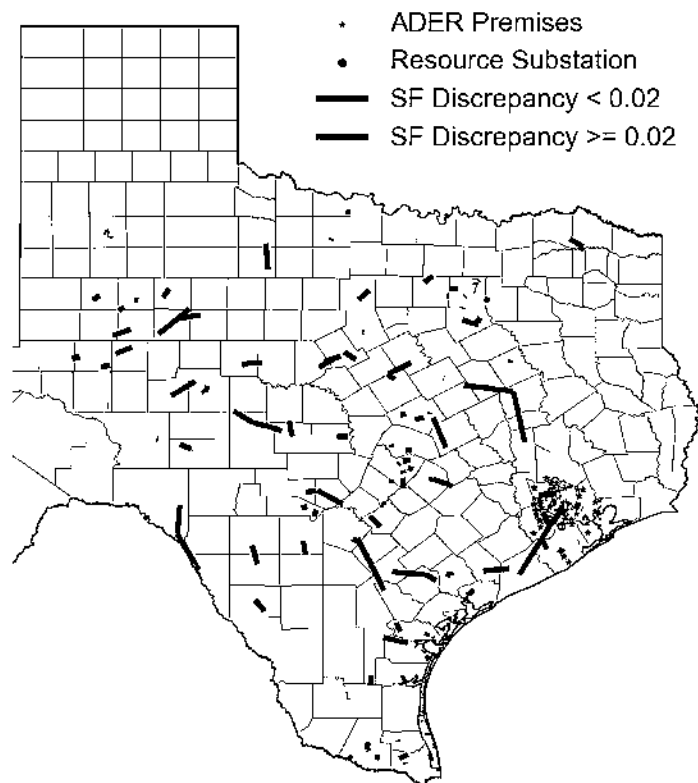
One potentially concerning scenario is when the Load Zone shift factor and Quasi-Nodal shift factor have different signs (one is positive and the other is negative). This could lead to SCED dispatching Resources in a way that would exacerbate the congestion instead of improving it. Instances of ADER Load Zone shift factors and Quasi-Nodal shift factors having opposite signs occurred in about 5.6% of the constraint-intervals analyzed. The size of the differences of these intervals are shown in the graph below.

Instances of constraint-intervals with opposite signs ordered by shift factor discrepancy for both ADERs



The map below shows the geographic location of all constraints evaluated. There is a clear correlation between the location of constraints with large shift factor discrepancies (> 0.02) and the cluster of Premises. If the cluster of Premises is close to the constraint, the ADER is more likely to have a significant impact on the constraint. Because of this, different methodologies to calculate shift factors will result in larger variations for these constraints. On the other hand, constraints further away from the cluster of premises will not be impacted as significantly by the ADER. The methodology chosen to calculate shift factors for these constraints are less consequential.

Resource #1: Map of ADER Premises vs constraints with large shift factor discrepancies



Recommendation/Lessons-Learned

Intuitively, the use of Quasi-Nodal shift factors should result in improvements to overall congestion management, even if the current data indicate the impacts may be limited thus far. The location of individual Premises is a key factor, as discrepancies in shift factors typically occur when a constraint is close-to or within the cluster of Premises. The recommendation for Phase 2 of the Pilot Project is to continue with the existing Load Zone shift factor paradigm and to continue to examine this issue for potential reliability risks and market inefficiencies.

Next Steps

ERCOT intends to begin the process of developing a Phase 2 Governing Document, based on the recommendations in this Report. Rather than creating an entirely new document, ERCOT will plan to implement recommended updates to the Pilot Project in the form of redline edits to the existing Phase 1 Governing Document.

ERCOT looks forward to continuing to work together with ADER Task Force Members and participants to help to advance the role and value of ADERs under the Pilot Project.