



Filing Receipt

Filing Date - 2024-02-27 04:40:23 PM

Control Number - 53911

Item Number - 72



TAYLOR
2705 West Lake Dr.
Taylor, Texas 76574
T: 512-248-3000
F: 512-225-7079

AUSTIN
8000 Metropolis Dr.
Bldg. E, Suite 100
Austin, Texas 78744
T: 512-225-7000
F: 512-225-7079

ercot.com

February 27, 2024

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

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

Dear Task Force Members:

Please find attached the Phase 2 Governing Document for the ADER Pilot Project, which was approved by the ERCOT Board of Directors on February 27, 2024.

Additionally, please find attached the ADER Phase 1 Report, which was presented to the ERCOT Board on February 27, 2024 as well. An earlier version of this document was discussed at the December 15, 2023 ADER Task Force meeting.

Sincerely,

/s/ Ryan King

Ryan King
Manager, Market Design
ryan.king@ercot.com

2705 West Lake Drive
Taylor, Texas 76574
(512) 248-6800
ercot.com

**Aggregate Distributed Energy Resource
Pilot Project Governing Document
Phase 2**

Approved at the February 27, 2024 meeting of the ERCOT Board of Directors

Table of Contents

1. Introduction.....	3
2. Purpose of the Pilot Project Phase 2	3
3. Phase 2 Pilot Project Timeline and Duration.....	4
4. Policy Questions to be Considered in Phase 2.....	4
5. Phase 2 of the Multi-phase Pilot Project.....	5
a. Background and Basic Program Parameters.....	5
b. Exceptions to ERCOT Rules	6
c. Eligibility and Qualification	7
d. Metering, Telemetry, and Market Submissions.....	11
e. Additional Data from the QSE Representing the ADER	15
f. Procurement and Deployment	15
g. Performance Evaluation and Compliance Metrics.....	15
h. Settlement and Cost Allocation	16
i. Evaluation and Analysis of Different ADER Participation Models for Phase 2	16
j. Program Costs.....	17
k. Reports	17
l. Construction	17
Appendix A.....	18
Appendix B.....	19

1. Introduction

On October 18, 2022, as authorized by 16 Texas Administrative Code (TAC) § 25.361(k), and as directed by the Public Utility Commission of Texas (PUCT), the ERCOT Board of Directors (Board) established a pilot project to evaluate the participation of Aggregate Distributed Energy Resources (ADERS) in the ERCOT wholesale market (Pilot Project). An ADER is a Resource consisting of multiple Premises or devices connected at the distribution system level that has the ability in aggregate to respond to ERCOT Dispatch Instructions. As described by the Commissioner Memorandum filed on July 13, 2022, in Project No. 51603, the Pilot Project is intended to answer, “questions related to how ADERs can support reliability, enhance the wholesale market, incentivize investment, potentially reduce transmission and distribution investments, and support better load management during emergencies.” The “Phase 1” Governing Document laid out the framework for the first phase of the Pilot Project and envisioned a multi-phase Pilot Project in which future revisions to this Governing Document would establish the details for the additional phases, with lessons learned from the early phases considered when designing additional phases for the Pilot Project. These additional phases would be intended to create opportunity to expand overall participation while maintaining the reliable operation of the transmission and distribution grid. All materials regarding the Pilot Project have been filed in Project No. 53911.

Participation in the Phase 1 of the Pilot Project began on August 22, 2023. On February 27, 2024, ERCOT staff filed a Phase 1 Report, as required by the Phase 1 Governing Document, in which ERCOT Staff and the ADER Task Force established in PUCT Project No. 53911 (Task Force) reviewed observations on Phase 1 and made recommendations to pursue in Phase 2.

This Phase 2 Governing Document revises the Phase 1 Governing Document to incorporate changes concerning Ancillary Service eligibility and telemetry validation procedures.

2. Purpose of the Pilot Project Phase 2

Phase 2 of the Pilot Project is intended to make incremental improvements and account for early lessons learned from Phase 1. As such, the general goals for this phase largely remain the same. The purpose of this phase of the Pilot Project is to:

1. Assess the operational benefits and challenges of heterogeneous Distributed Energy Resource (DER) aggregations which are net generation or net load and address those challenges to allow meaningful use of DER aggregation.
2. Understand the impact of having Ancillary Services and energy delivered by ADERs and assess how ADERs can best be used to support reliability.
3. Assess challenges to incentivizing competition and attract broad DER participation through Load Serving Entities (LSEs), while ensuring adequate customer protections are in place.
4. Allow Distribution Service Providers (DSPs), the Commission, and others to study distribution system impacts of ADERs which inject to the grid.
5. Evaluate the impacts to transmission system congestion management associated with the dispatch and settlement of ADERs at a zonal level.
6. Identify potential Pilot Project enhancements and study the need for and benefit of transitioning distribution-level aggregations to different levels of more granular dispatch and settlement and evaluate more complex use-cases and business models.

As in Phase 1 of this Pilot Project, Phase 2 is intended to provide a means for Premises with any combination of generation, energy storage technologies, or controllable load with the capability of 1 MW or less to participate in the ERCOT wholesale markets. This Pilot Project is not intended to investigate or propose changes to existing participation models, such as those for Distributed Generation Resources (DGRs), Distributed Energy Storage Resources (DESRs), Aggregate Load Resources (ALRs), or Settlement Only Distributed Generators (SODGs) greater than 1 MW. Aggregations of multiple Premises

that include only Load may already participate as ALRs and are not eligible to participate in this Pilot Project. Under Phase 2 of the Pilot Project:

- ADERs will be eligible, upon qualification, to provide ERCOT Contingency Reserve Service (ECRS) in addition to Non-Spinning Reserve Service (Non-Spin);
- Telemetry validation processes have been modified to reflect lessons learned in Phase 1;
- Other areas of the Pilot Project will continue to be monitored to inform Pilot design enhancements in future phases.

3. Phase 2 Pilot Project Timeline and Duration

The Pilot Project will continue until implementation of ERCOT market rules and systems are in place to accommodate participation by ADERs, considering any direction from the PUCT, or until ERCOT, following PUCT consultation, or the PUCT deems the Pilot Project unnecessary. ERCOT expects that the Pilot Project will need to continue for a minimum of two additional years from the formal adoption of the Phase 2 Governing Document, including any future phases, to allow for any incorporation of ERCOT system upgrades, testing of customer migration, and qualifying Resources for multiple ERCOT services, as determined to be allowable while maintaining grid reliability.

This Phase 2 Governing Document provides the necessary details for a second phase of the Pilot Project to continue the prompt and efficient implementation of an ADER program with minimum changes to ERCOT and DSP systems. Future phases may introduce additional design elements to help expand participation opportunities while still maintaining distribution and transmission grid reliability.

Subject to any ERCOT decision or PUCT directive to delay project implementation, Phase 2 of the Pilot Project will proceed according to the following timeline:

- February 27, 2024: Board approval of Phase 2 of the Pilot Project.
- Following a period of at least six months of Phase 2, ERCOT shall prepare a recommendation on whether Phase 2 should continue in order to gain more data, or whether moving to a Phase 3 of the Pilot Project is warranted.
- No later than the date of submission of the Phase 3 Governing Document to the Board for approval, the Task Force Task Force and ERCOT will prepare a Phase 2 Report and consider the possible closing of Phase 2.
- Quarterly: Task Force to draft quarterly reports and file them with the PUCT.

4. Policy Questions to be Considered in Phase 2

During Phase 2, the Task Force shall consider recommendations to the PUCT on the following issues, to be included in one of its quarterly reports to the PUCT:

- Device-level sub-meter data, power quality metering, or methods for independent certification of QSE-provided data: This Pilot Project will need to evaluate the need for and methods for collecting data from individual Premises or devices that can be used to validate ADER performance and compliance of ADERs, including for the provision of additional Ancillary Services. This may include requiring, for future Pilot Project phases, data recorders located on individual DERs and on the distribution system. If that is needed, who installs/owns these data recorders and how is the accuracy of data provided for performance and compliance guaranteed or certified?
- Provision of additional Ancillary Services: During Phase 2 of the Pilot Project, ERCOT will study the provision of ECRS by ADERs and will continue to work with the PUCT and stakeholders regarding the provision of additional Ancillary Services by Resources connected to the distribution

system. The approach taken for ADERs will be linked to broader discussions on this topic, under PUCT Project No. 51603, as it relates to all distribution-connected Resources.

- ADER modeling with alternative dispatch and pricing schemes: As part of this Pilot Project, ERCOT will evaluate a Logical Resource Node (LRN) concept and other alternative dispatch and pricing schemes. Specific to the LRN concept, implementation of this model approach will require the Settlement Meter location for each Premise to be identical to the Premise's telemetry location. If a Premise has only one Settlement Meter, then the telemetry location will be required to correspond to the Settlement Meter location. This implies that all native load behind the Settlement Meter will be settled at an LRN price. Among other issues, this scheme will require consideration of the consistency with 16 TAC § 25.501(h), which requires load to be settled at a zonal price. While this issue may be resolved by both placing a Settlement meter that measures only the ADER dispatchable component at the Premise and having the telemetry correspond to the dispatchable (device-level) component at the Premise, this will also raise the question of who would be responsible for installing, maintaining, and reading this separate Settlement meter.
- Additional ADER participation models to facilitate participation of a wider range of DERs in the ADER pilot, including "blocky" resources. Alternative telemetry requirements may be considered in the proposals.
- Potential rule or rule changes regarding interoperability standards and their application to devices participating in the ADER Pilot Project.

5. Phase 2 of the Multi-phase Pilot Project

a. Background and Basic Program Parameters

The second phase of the Pilot Project design will continue to minimize ERCOT and DSP required system changes and expedite an expanded Pilot Project. ERCOT expects to use lessons learned from this phase to evaluate further phases for the Pilot Project that could expand overall participation while ensuring the reliable operation of the electric grid. During the second phase of the Pilot Project, the registered ADER must always be seen in aggregate as a net consumer of energy by ERCOT, in terms of telemetry and other market submissions to ERCOT. However, it will be acceptable if individual Premises that are components of the aggregation are net injectors of energy and an ADER may provide a net injection on an aggregated basis. Details for the next phases will be determined and documented later.

- As in Phase 1, in Phase 2, an ADER will be modeled as a Load Resource and is an aggregation of Premises, where all the sites are located within a single Load Zone and have the same LSE and DSP. Each Premise within an ADER may be net load or net generation. The aggregation must have the capability to provide at least 100 kW of response (Demand response capability plus injection capability) and each Premise must provide 1 MW or less of response (Demand response capability plus injection capability). Premises or aggregations that are otherwise able to participate in the ERCOT market (e.g., as a DGR, DESR, SODG larger than 1 MW, or ALR) should not be included as part of an ADER. The ADER's performance should always be represented as a net Load for purposes of telemetry and other market submissions to ERCOT.
- For the initiation of Phase 2 of the Pilot Project, the total registered MW capacity of all the ADERs must be no greater than 80 MW system wide. These ADERs will be limited to providing no more than 40 MW of Non-Spinning Reserve (Non-Spin) system-wide and no more than 40 MW of ERCOT Contingency Reserve Service (ECRS) system-wide. As part of the "Details of the Aggregation" provided to ERCOT, the QSE shall indicate the anticipated MW capacity that is intended to be registered as well as an amount of Non-Spin and ECRS for which the QSE is intending to qualify the ADER. These ADER MW quantities will be evaluated against these

- ERCOT Pilot Project participation limits. Additionally, no QSE will be allowed to register more than 20% of these system-wide limits.
- To allow for participation to be dispersed across the ERCOT region, these system-wide limits will initially be ratio-shared by Load Zone, including Competitive and Non-Opt-In-Entity (NOIE) Load Zones, with a Load Zone's share based on net Load Zone demand coincident with ERCOT system peak for August 2022, as provided in the Demand and Energy Monthly Reports published by ERCOT.
 - These ERCOT Pilot Project participation limits will be enforced as part of ERCOT's review of a QSE's submission for participation.
 - When participation exceeds 80% of the limits described above, ERCOT shall review with the ADER Task Force any reliability concerns with potential increases in the ERCOT Pilot Project participation limits. ERCOT may increase any of the imposed participation limits, at its sole discretion and in consultation with the ADER Task Force, after evaluating performance during the Pilot Project. Such increases will not be considered amendments to this Governing Document, and therefore will not require approval by the ERCOT Board.
 - There may be other limitations on ADERs to be established by DSPs due to reliability concerns that will also be evaluated and addressed as the ADERs details are submitted to DSPs for their acknowledgement.

b. Exceptions to ERCOT Rules

As in the first phase of the Pilot Project, during the second phase of this Pilot Project, ADERs will be treated as ALRs for all purposes under the Protocols and will register and participate under the existing ALR participation model. ADERs must be registered and participate as ALRs except as follows:

- An ADER is allowed to have Premises that can inject energy into the distribution system, and an ADER may provide a net injection on an aggregated basis. A net injection from an ADER in response to an ERCOT Dispatch Instruction will be considered Demand response under the Protocols and other ERCOT rules. Any Premise with the potential to export energy beyond its Premise meter must have the correct meter profile code set, for meters in service territories where that is applicable, such that both the import and export channels of its Premise meter are provided to ERCOT.
- ADER withdrawal telemetry values must represent the sum of the consumption and export of each of the member Premises or devices plus any necessary MW offsets, as described in this Governing Document. Maximum Power Consumption and Low Power Consumption values must be modified to accommodate ADERs, as further provided in this Governing Document. An ADER using device-level telemetry must comply with the validation process for device-level telemetry provided in this document instead of existing validation rules.
- An ADER is not permitted to present statistical sampling for performance evaluation.
- The Resource Entity and QSE for the ADER are jointly responsible for maintaining ADER population information, as further described in subsection 5.c.3.
- ADERs will have Pilot Project-specific modeling and ERCOT Pilot Project participation limits.
- ERCOT will not use baseline evaluation for either qualification or performance validation purposes during the Pilot Project. Qualification and performance validation specific to the Pilot Project is described in subsection 5.c.4.
- Scheduled Power Consumption (SPC) +2 information will not be required to be provided for an ADER, as it is for an ALR.
- The telemetry validation procedures and metrics for ADERs are distinct from those for ALRs and are described in subsection 5.d.
- For Phase 2 of the Pilot Project, ADERs are allowed to, but will not be required to, provide Primary Frequency Response (PFR), as is required for ALRs. To encourage ADERs to provide frequency response, ERCOT will consider opportunities for ADERs with that capability to provide

Responsive Reserve Service (RR), subject to a system-wide cap. The system-wide cap will be sufficiently high to allow ERCOT to assess the adequacy of ADERs to provide frequency response from the distribution system without posing a threat to the reliability of the system. This opportunity is designed to create a path to a frequency response provision from all ADERs should the current exception, which is specific to Phases 1 and 2 not be granted for future phases. To foster an inclusive Pilot Project, ERCOT may develop different alternative participation models in future phases that will not require frequency response capability, such as a participation model in which the aggregation may provide some Ancillary Services but is not dispatchable by Security-Constrained Economic Dispatch (SCED). ERCOT may also consider ADERs providing PFR without the ability to be SCED-dispatchable as part of Phase 2 or future phases.

c. Eligibility and Qualification

As a condition for participation in Phase 2 of the Pilot Project, a QSE must meet the conditions described in this section. Note that the QSE associated with a proposed ADER must submit the information identified in c.1 and c.2 below, while the Resource Entity for the proposed ADER must submit the registration and qualification information in c.3 through c.5, below.

1. QSE must provide written consent from DSP (See Appendix A)

- No DSP is required to participate in this program.
- To be eligible to participate in the ADER Pilot Project, a QSE must provide the following information to the applicable DSP that serves each of the Premises that make up the aggregation. The information should be submitted to the DSP on the “Details of the Aggregation” form posted on the [Pilot Projects page](#) of the ERCOT website (hereinafter, this information is referred to as “Details of the Aggregation”):
 - Premise unique identifier (name/ID);
 - An indication of whether the ADER telemetry contribution from the Premise is at its TDSP-read meter location or device location;
 - ESI ID (or unique meter identifier, if the ADER is in a NOIE territory) of the TDSP-read meter that measures consumed energy from the grid and/or injected energy into the grid at the Premise;
 - LSE associated with ESI ID or unique meter identifier; and
 - For each controllable device at a Premise that is part of the ADER:
 - The type of device (battery, rooftop solar, pool pump, synchronous generator, etc.);
 - The rated dispatchable range (kW) of the individual ADER components at this Premise (for example, the rated dispatchable range of the battery may be +/-5kW maximum discharge/charge; or 3kW maximum consumption for a pool pump);
 - For a Premise that has a battery as part of the ADER, maximum rated operating state of charge (kWh) and the minimum rated operating state of charge (kWh); and
 - Which, if any, communication standards the devices are certified to meet.
 - An attestation provided by the Resource Entity which includes:
 - that any inverter-based device is either certified to UL1741-SB or complies with the requirements of UL1741-SA and that the inverter settings are programmed to ride through frequency and voltage excursions in a manner consistent with requirements for DGRs and DESRs in ERCOT Nodal Operating Guide sections 2.6.2.1(2) and 2.9.2(3); and
 - that any synchronous generator relays are programmed to ride through frequency and voltage excursions in a manner consistent with requirements for DGRs in ERCOT Nodal Operating Guide sections 2.6.2.1(2) and 2.9.2(2).
 - The MW capacity that is intended to be registered with ERCOT as an ADER and the amount of Non-Spin and ECRS which the QSE is intending to qualify the ADER. An

ADER may include additional customer premises or devices as long as the capacity registered and Non-Spin and ECRS qualification amounts remain lower than these values.

- A flag indicating whether or not the ADER is able to provide PFR.
 - The information in the "Details of the Aggregation" form is Protected Information.
- Upon request by a QSE that is developing ADERs, a participating DSP must provide any relevant non-confidential information to support the commencement of the enrollment process for the Pilot Project and the addition of new metered Premises on an ongoing basis for the duration of the Pilot Project.
 - Upon receiving the "Details of the Aggregation," a DSP that has elected to participate in the Pilot Project shall review the "Details of the Aggregation" for feasibility of participation of the Premises in the proposed Resource on the distribution network. If the DSP has concerns with all or a portion of the ESI IDs or, for NOIEs, unique meter identifiers, listed in the "Details of the Aggregation," the DSP will notify the QSE. The DSP may, on a non-discriminatory basis, for reasons of safety, reliability, or regulatory impediments, reject all or a portion of the ESI IDs or unique meter identifiers listed in the "Details of the Aggregation." If the DSP chooses to reject all or a portion of the ESI IDs or unique meter identifiers listed in the "Details of the Aggregation," the DSP shall notify the QSE managing that ADER and provide the QSE the reason for the rejection.
 - As part of its review of an ADER, the DSP, in conjunction with the TSP, shall map each of the Premises that make up the ADER to their respective Common Information Model (CIM) Loads and add this information to the "Details of the Aggregation" as part of the DSP's response to the submission.
 - DSPs will respond to QSE submissions of "Details of the Aggregation" within ten Business Days. If additional time is needed to evaluate the ADER, then the DSP will provide notice to the QSE within ten Business Days, and will provide final review no later than 45 days from the submission.
 - The DSP may consent to the participation of the Premises identified in the "Details of the Aggregation," only by executing the "Distribution Service Provider Acknowledgment" (hereinafter, "DSP Acknowledgment"), Appendix A to this Governing Document, also available on the [Pilot Projects page](#) of the ERCOT website.
 - The DSP's execution of the DSP Acknowledgment shall be taken as the DSP's confirmation that the DSP provides delivery service to each of the Premises that are the subject of the request.
 - If any additions or removals have occurred for the month from each aggregation, the QSE will submit monthly updates to the DSP, as further described in subsection 5.c.3, which the DSP will review in the same manner as above.
2. QSE executes a supplement to the Standard Form Market Participant Agreement for Pilot Project participation (See Appendix B)
- In addition to obtaining the DSP's consent, the QSE representing a proposed ADER must execute a supplement to its Standard Form Market Participant Agreement and submit it to ERCOT for counter-signature. The "Supplement to the Standard Form Market Participant Agreement" (hereinafter "QSE Supplement"), Appendix B to this document, is available on the [Pilot Projects page](#) of the ERCOT website.
 - The "DSP Acknowledgment" and the "QSE Supplement," as well as the "Details of the Aggregation," as described above, shall be submitted as a package to ERCOT via e-mail to pilotprojects@ercot.com and copy the DSP and Resource Entity (RE). QSEs may request that a secure email account be created with ERCOT if using standard email is of concern.
 - Upon receiving the three documents noted above, ERCOT will review the documents. ERCOT may reject the submission for the following reasons:

- Accepting the submission would cause the program to exceed any ERCOT Pilot Project participation limits, as defined in subsection 5.a;
 - ESI IDs or unique meter identifiers included in the submission (evaluated at the time of submission):
 - Were already part of an accepted submission from a different QSE;
 - Are not associated with the submitting LSE;
 - Have a status of not active in the ERCOT database;
 - Do not have an interval data recorder meter type;
 - Are not in the ERCOT region;
 - Are participating in the ERS or a TDSP Load Management Programs;
 - Are duplicated within the QSE's submission; or
 - Are a Generation Resource.
 - The Load Zone information is incorrect;
 - Premises included in the ADER are otherwise able to participate in the ERCOT market in a similar manner using existing participation models; or
 - ERCOT determines that the ADER would otherwise not comply with the Protocols or this Governing Document.
- ERCOT shall accept or reject the submission within ten Business Days and respond to the QSE via email, and copy the DSP and Resource Entity (RE).
 - Upon receiving ERCOT's acceptance, the QSE shall, within 20 Business Days, register the ADER as a CLR with ERCOT.
3. Registration of the ADER:
- Following ERCOT's acceptance of the QSE's submission for a given ADER:
 - ERCOT shall provide the MW offset to be used to register as a CLR and operate as a net load under all circumstances, in terms of telemetry and other market submissions to ERCOT
 - The Resource Entity must register the ADER as a CLR with ERCOT using a load RARF, available [here](#).
 - The location of an ADER in the Network Model will be identified by its Resource Dispatch Asset Code and the associated CIM Load in the model. Consistent with current practice for distribution-level single-site Load Resources, the DSP, in collaboration with ERCOT and the interconnecting TSP, if necessary, will assign each ADER to a CIM Load.
 - The total response capability of all ADERs assigned to any single CIM Load shall be capped at 100% of the rating of the CIM Load. The rating of a CIM Load is defined as the value estimated by the ERCOT State Estimator for that CIM Load at the time of the ERCOT historic coincident peak Demand.
 - The telemetry and other market submissions for a registered ADER must always show the ADER as a net consumer of energy. This may require use of an offset, which will be a static MW value provided by ERCOT, as earlier described. Regardless of use of the MW offset, it will be acceptable if individual Premises that are components of the aggregation are net injectors of energy, based on TDSP metering at the Premises. In the future ERCOT plans to introduce an ADER participation model that can inject and withdraw in aggregate to and from the grid, in which the use of the MW offset would no longer be necessary.
 - Known limitations relevant to the DSP, such as Premise injection limitations, must be reflected in the registration of the ADER. Identified limitations on the distribution system will not explicitly be enforced by ERCOT's systems in awarding or dispatching the ADER.
 - The ADER shall be registered and associated with a QSE.
 - 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. For ADERs in a NOIE Load Zone, a similar process needs to be done in coordination with the NOIE DSP and, if applicable, the TSP serving that NOIE.
 - Changes to the population of the ADER must be managed as follows:

- The Resource Entity and the QSE are jointly responsible for maintaining ADER population information using an Excel spreadsheet form posted on ERCOT's website.
- ADER parameters will be established in the Network Model by the ADER's Resource Entity using the approved Resource Registration process. ADERs that are subject to dynamically changing populations may need to set their Resource Registration data parameters at levels that will accommodate potential growth so as to reduce the need for frequent Resource Registration updates. This accounting for potential growth during registration should be done in consultation with ERCOT staff.
- The QSE may add or subtract Premises from an ADER at any time so long as still operating within the caps established by this Governing Document. The QSE shall provide notice to each affected DSP of any changes to an ADER population by providing an updated "Details of Aggregation" form, which will be reviewed and confirmed by the relevant DSP prior to being included by the QSE in the ADER population.
 - Following the first month of having an active ADER, on the first day of each month, the QSE shall provide notice to each affected DSP any and all changes to the "Details of Aggregation" form by providing an updated "Details of Aggregation" form. This updated "Details of the Aggregation" form will include not only any Premises that are proposed to be added to or subtracted from the ADER, but will also retain the Premises that are unchanged from the last update, and will clearly note the Premises that are proposed to be added or subtracted.
 - Consistent with the timelines in subsection 5.c.1 above, the DSP will have the ability to accept or reject any proposed additions of Premises to a QSE's ADER. The DSP may reject any proposed additions for the same reasons described in subsection 5.c.1, and shall provide the reasons for any rejection as also described in that subsection.
 - The DSP's consent to the addition of any Premises to an ADER shall be documented by an email from the Authorized Representative to the submitting QSE. For each new Premise to which it consents, the DSP should add the appropriate Common Information Model (CIM) Load information to the "Details of Aggregation" form (as described in subsection 5.c.1), and return the "Details of Aggregation" form to the QSE. When the DSP returns the approved form to the QSE, it shall constitute a confirmation that the DSP serves each added Premise, and consents to the additional participation of these Premises in the Pilot Project. The QSE shall forward the DSP's email consenting to the changes to ERCOT, and email the updated "Details of Aggregation" form approved by the DSP to ERCOT. The affected DSP and Resource Entity (RE) should be copied on both of these emails from the QSE to ERCOT. QSEs may request that a secure email account be created with ERCOT if using standard email is of concern.
 - ERCOT will process the changes request by the QSE within five Business Days. ERCOT shall notify the QSE of the time and date the updated "Details of Aggregation" list has been validated by ERCOT.
- The QSE shall update appropriate telemetry values and market submissions when a change is made to the population. All Premises included in the list provided should be currently enrolled with the REP. Any future switches should be accounted for in the monthly update based on start and stop dates.
- The updates shall include start and stop dates for new Premises in the ADER and/or Premises that have left the ADER. If a Premise is vacated or the customer has/is being switched to a different REP, the Stop Date should reflect that date; and if a new customer later moves into that Premise and joins the ADER (or joins with a different REP), a new start date should be used.
- In competitive choice areas, QSEs will manage the ADER population by ESI ID, which ERCOT will then cross-reference to its internal systems. In the NOIE territories, QSEs

shall provide unique meter identifiers consistent with the requirements detailed elsewhere in this document.

4. Qualification

For purposes of ERCOT systems and all ERCOT rules, ADERs in the Pilot Project for Phase 2 will be considered ALRs, as that term is used in the ERCOT Protocols. Hence, registered ADERs must qualify as ALRs for the following:

- Participation in Security-Constrained Economic Dispatch (SCED), per Nodal Protocol Section 3.6.1, Load Resource Participation.

Non-Spinning Reserve (Non-Spin) and/or ERCOT Contingency Reserve Service (ECRS). In order to provide either service during the Pilot Project, both the ADER and the associated QSE must qualify to provide the service. During the second phase of the Pilot Project, Non-Spin and ECRS are the only Ancillary Services for which the ADER can qualify.

d. Metering, Telemetry, and Market Submissions

- Terminology:
 - Telemetry: Refers to the ADER bi-directional, Inter-Control Center Communications Protocol (ICCP) telemetry between QSE and ERCOT systems for the ADER as an aggregate.
 - Metering: Refers to the 15-minute Settlement Quality TDSP read meters at the individual Premises that make up the ADER.
 - Market Submissions: Refers to the ADER-related XML submissions that the QSE submits to and receives from ERCOT.
- ADER telemetry must meet the following requirements:
 - ADERs are considered ALRs for the purposes of this Pilot Project and must therefore comply with ALR metering and telemetry requirements.
 - A QSE representing an ADER must send Resource-level Real-Time telemetry to ERCOT every two seconds in accordance with Protocol Section 6.5.5.2, Operational Data Requirements; Nodal Operating Guide, Section 7, Telemetry and Communication, and the ERCOT Nodal ICCP Communication Handbook available on the ERCOT website. Telemetered data points are specific to the service being provided and are listed in detail in Protocol Section 6.5.5.2(5).
 - An ADER's telemetry must be an accurate representation of the aggregate values of all sites in the Resource. Those values may be based on device-level or Premise-level conditions or a combination of both. An offset value will be added to the aggregate values, if needed, to ensure the telemetry is always communicated to ERCOT as a net load. That offset value will be established between the QSE and ERCOT as part of the qualification process at a static level that will allow for some growth in the ADER. The offset may be adjusted over time but only with the mutual agreement between the QSE and ERCOT.
 - ADER telemetry values to ERCOT (Low Power Consumption (LPC), Maximum Power Consumption (MPC), Net Power Flow, etc.) must represent the sum of the corresponding values at the individual Premises or devices based on the approved "Details of the Aggregation" form submitted to ERCOT by the Pilot Project participant and must include any MW offset values provided by ERCOT. The difference between the value of the telemetered MPC and the value of the telemetered LPC for the ADER must equal the difference between the greatest possible injection quantity and the greatest possible withdrawal quantity.

- ADER ramp rate telemetry to ERCOT must represent the weighted average of the ramp rates at the individual Premise or device based on the approved “Details of the Aggregation” form submitted to ERCOT by the Pilot Project participant. As part of the validation of ADER telemetry, QSEs participating in the Pilot Project shall provide time series data of the net MW at the Premise level and/or device-level.
- If the ADER includes energy storage devices, time series data on state-of-charge for the device will also be required.
- This data must be provided to ERCOT when requested, within a reasonable storage requirement timeframe. The data storage requirements and the mechanism of delivering this data to ERCOT will be determined later.
- ADER metering must meet the following requirements:
 - Premises in an ADER are required to have 15-minute interval meter data, whether ESI ID data from the competitive choice areas of ERCOT, or revenue-quality meter data within a NOIE territory. ERCOT will use this Premise-level interval meter data as the primary foundation of the telemetry validation process and as a secondary tool for event performance measurement and verification. For any Premises that export power to the distribution system, both the consumption data and export data must be provided to ERCOT.
 - Interval meter data must be time-stamped within appropriate standards in correlation with ERCOT 15-minute Settlement clock intervals, and shall be provided to ERCOT for Premises within the ADER through one of the following methods:
 - For ADERs in competitive choice areas of ERCOT, investor-owned Transmission and/or Distribution Service Providers (TDSPs) submit ESI ID-level Interval Data Recorder (IDR) or Advanced Metering System (AMS) data via the Texas Standard Electronic Transaction (TX SET) process (for IDR metering) or via the approved file format defined in Retail Market Guide, Section 9, Appendix G, ERCOT Specified File Format for Submission of Interval Data for AMS metering.
 - For ADERs in a NOIE service area, the NOIE shall submit IDR, AMS, or equivalent Premise-level meter data if associated with a non-Settlement ESI ID or a designated unique meter identifier. Such meters shall be maintained and read by the NOIE meter-reading entity. The data shall be submitted to ERCOT either via TX SET or in a format and transport method defined by ERCOT no later than 35 days after each corresponding Operating Day. NOIE Premise-level unique meter identifiers must use ESI ID-style nomenclature, in which the NOIE TDSP Department of Energy (DOE) code comprises the first digits of the identifier. The unique meter identifier must remain constant in perpetuity at the Premise.
 - A NOIE meter-reading entity shall validate Premise-level interval meter data; however, periods of time (intervals) with missing data should not be edited or estimated. For those premises with missing interval data, those intervals will not be included in the aggregate values and may result in failed telemetry validation. Ongoing telemetry validation and performance measurement and verification are dependent upon a NOIE making timely and accurate Premise-level meter data submissions. Failure to meet the data submission requirements may result in suspension of the ADER’s qualification to participate in the Pilot Project. An ADER that has been suspended for this reason may be reinstated only upon successful restoration of accurate and timely meter data submissions.
 - NOIEs shall archive Premise-level data sufficient to meet these requirements.
- Telemetry Validation
 - 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 of the ADER. This section describes the processes ERCOT will use to conduct validation for QSE telemetry,

with the goal of insuring that an ADER's telemetered data points provide a representation of ADER performance that meets reasonableness criteria consistent with good utility practice. With the submission of the "Details of the Aggregation" form the QSE must indicate whether the ADER telemetry contribution from each Premise in the aggregation is at the TDSP read meter location or device location.

- Premise-Level Telemetry
 - The ADER telemetry values are to be a reasonable representation of the aggregate sum of the import and export values of the ADER member Premises plus the established offset. ERCOT will aggregate the Premise-level 15-minute interval meter data to the ADER level and will compare this data to the QSE telemetry values for Net Real Power Consumption less offset, averaged over each 15-minute interval during the period being evaluated.
 - ERCOT will conduct this telemetry validation as part of the ADER qualification process and periodically during the term of the Pilot Project with each test encompassing all 15-minute Settlement intervals during the evaluation period. The telemetry must validate to meet all of the following conditions:
 - Condition 1: Only intervals where the aggregate premise-level data, averaged over each 15-minute settlement window, are greater than 10% of the Resource's requested energy capability will be evaluated as follows:
 - When the aggregate premise-level data shows as net injecting, the Resource's injections must exceed 10% of the Maximum Injection Capability, OR
 - When the aggregate premise-level data shows as net withdrawing, the Resource's withdrawals must exceed 10% of the Maximum Withdrawal Capability.
 - Condition 2: Of these intervals being evaluated, the telemetered value must be within 10% of the aggregate premise-level data averaged over each 15-minute Settlement interval.
 - Condition 3: During the 8-hour evaluation period, at least 50% of the intervals must meet condition 1 above.
- Device-Level Telemetry
 - If the ADER telemetry values represent the sum of the Devices under control, the QSE will be required to provide device-level sub-meter (data recorder) data for each site in the aggregation contributing to the device-level telemetry 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.
 - All of the following conditions must be met for Step 1:
 - Condition 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 as follows:
 - When the aggregate device-level data shows as net injecting, the Resource's injections must exceed 10% of the Maximum Injection Capability, OR

- When the aggregate device-level data shows as net withdrawing, the Resource's withdrawals must exceed 10% of the Maximum Withdrawal Capability.
- Condition 2: Of these intervals being evaluated, the telemetered value must be within 10% of the aggregate device-level data averaged over each 15-minute Settlement interval.
- Condition 3: During the 8-hour evaluation period, at least 50% of the intervals must meet condition 1 above.
- 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
- In addition to the telemetry validation as part of the qualification ERCOT may also perform additional periodic validation of the telemetry during the term of the Pilot Project. For Step 2 the SCED basepoint instruction will be used in lieu of an ERCOT initiated instruction.
- Telemetry composed of both Premise and Device-level data
 - If the ADER telemetry values represent a composition of both Premise-level and device-level data ERCOT will perform the following:
 - Step 1: Add the aggregate of the sub-meter (Data Recorder) data averaged over each 15-minute interval to the aggregate of the Premise-level meter data and compare it to the QSE telemetry values for Net Real Power Consumption, less offset, averaged over each 15-minute interval during the period being evaluated. The 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 averaged over each 15-minute interval during the period being evaluated.
 - All of the following conditions must be met for Step 1:
 - Condition 1: Only intervals where the aggregate premise/device-level data, averaged over each 15-minute Settlement window, are greater than 10% of the Resource's requested energy capability will be evaluated as follows:
 - When the aggregate premise/device-level data shows as net injecting, the Resource's injections must exceed 10% of the Maximum Injection Capability, OR
 - When the aggregate premise/device-level data shows as net withdrawing, the Resource's withdrawals must exceed 10% of the Maximum Withdrawal Capability.
 - Condition 2: Of these intervals being evaluated, the telemetered value must be within 10% of the aggregate premise/device-level data averaged over each 15-minute Settlement interval.
 - Condition 3: During the 8-hour evaluation period, at least 50% of the intervals must meet condition 1 above.
 - 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.

- In addition to the telemetry validation as part of the qualification, ERCOT may also perform additional periodic validation of the telemetry during the term of the Pilot Project. For Step 2 the SCED basepoint instruction will be used in lieu of an ERCOT initiated instruction.
- Regarding telemetry and other market submissions, an ADER providing Non-Spin or ECRS may not have an Ancillary Service Offer into the DAM for Non-Spin or ECRS or an Ancillary Service Resource Responsibility for Non-Spin or ECRS that exceeds the Non-Spin and ECRS MW amounts in the QSE submission signed by ERCOT.

e. Additional Data from the QSE Representing the ADER

1. The QSE shall provide allocation factors to ERCOT representing the fraction of the ERCOT-issued instruction to the ADER that is being provided by each particular metered Premise that is part of the aggregation. For Phase 2 of the Pilot Project, this information could be static, and does not need to be provided in Real-Time or for the entire period of participation in the Pilot Project. Data that is provided will be used in off-line simulations to simulate different dispatch and pricing schemes. This data must be provided to ERCOT when requested, within a reasonable storage requirement timeframe. The data storage requirements and the mechanism of delivering this data to ERCOT will be determined later.

f. Procurement and Deployment

ADER participation will be through existing ALR ERCOT market mechanisms.

1. ADERs qualified for Non-Spin and/or ECRS may be offered into the Day-Ahead Market (DAM) to provide Non-Spin and/or ECRS, as applicable, and will be cleared with other participating Resources, in accordance with existing ERCOT rules. Additionally, self-arranged or traded Non-Spin or ECRS may be provided by qualified ADERs. This Pilot Project is not intended to directly impact ERCOT's determination of Ancillary Service quantities to be procured. However, ERCOT at its sole discretion, may consider increases to Non-Spin and ECRS quantities, if deemed necessary, due to concerns regarding ADER performance.
2. Deployment of an ADER for Non-Spin, ECRS, or for energy through SCED, will be in accordance with ALR requirements and other ERCOT rules. This includes dispatch using Load Zone shift factors.

g. Performance Evaluation and Compliance Metrics

ADERs will be registered as ALRs in ERCOT systems. ADER performance will be evaluated using the existing CLREDP and Base Point Deviation processes for ALRs. The performance analysis results will be included in the monthly performance reports for CLRs. ERCOT may revoke an ADER's qualification to provide Non-Spin or ECRS if the ADER demonstrates a continuing failure to perform. As part of Phase 2, ERCOT staff, along with stakeholders, may consider whether the existing performance tolerances for measuring performance when dispatched are appropriate for Resources whose rated capacity may be less than the current 2 MW compliance deadband.

h. Settlement and Cost Allocation

Energy from ADERs will be settled in accordance with the ERCOT Nodal Protocols regarding ALR energy settlement, and the Load Zone price will be used for settlement of energy. In the event there are Premises within the ADER that inject into the distribution system, that injection will be treated as negative Load and the ERCOT energy settlement will value it as negative Load in the settlement for the QSE. The ADERs participating in the Pilot Project will be subject to other ERCOT settlement calculations for Resources as described in the ERCOT Nodal protocols including the Ancillary Service imbalance Settlement calculations.

i. Evaluation and Analysis of Different ADER Participation Models for Phase 2

This section outlines some of the studies that ERCOT will be conducting during Phase 2 of the Pilot Project:

- During the second phase of the Pilot Project, off-line studies using archived production data will be performed by ERCOT to analyze different dispatch and pricing schemes and their comparative effectiveness in managing congestion. These include dispatch and Settlement using:
 - Logical Resource Nodes (LRNs):
 - Dispatch with static allocation factors used to determine the LRN shift factor and pricing; and
 - Dispatch with dynamic allocation factors used to determine the LRN shift factor and pricing.
 - The process by which allocation factor data will be provided to ERCOT for each ADER will be determined later.
 - Smaller Load Zones.

These different ADER modeling approaches will be compared and trade-offs between accuracy and complexity will be evaluated.

- During the second phase of the Pilot Project, analysis should continue to be performed to evaluate the ability of ADERs to provide Primary Frequency Response (PFR), identify processes for verifying any PFR response from ADER, and understand how the provision of PFR by ADERs may impact, or be limited by, the distribution system. While ADERs are not explicitly required to provide PFR in Phase 2, ADERs that can provide PFR are requested to do so, as this participation will allow this needed analysis during Phase 2 of the Pilot Project to occur.
- Currently, ALRs are treated as SCED dispatchable. That will be the case for ADERs as well during Phase 2 of the Pilot Project. Additionally, ERCOT, in consultation with stakeholders, will evaluate the feasibility and the potential benefits of developing alternative participation models for ADERs, and enabling ADERs providing Non-Spin and/or ECRS using a step change or “blocky” response, similar to the manner in which Load Resources other than CLRs are able to provide Non-Spin and ECRS under existing ERCOT Protocols. This is likely to be the preferred participation model for any ADERs who are unable to provide PFR in Phase 2.
- During Phase 2 of the Pilot Project, ERCOT will continue to work with the PUCT and stakeholders regarding the provision of Ancillary Services by Resources connected to the electric distribution system. The approach taken for ADERs will be linked to broader discussions on this topic as it relates to all distribution-connected Resources.
- Pilot Project participants will collaborate with ERCOT to provide relevant data relating to these studies upon request. ERCOT will report back on the progress of these studies and availability of data from Pilot Project participants to the Task Force.

j. Program Costs

ERCOT does not anticipate any cost impacts attributable to Phase 2 of the Pilot Project. ERCOT anticipates that the approach discussed in this document will not require any changes to its existing software systems and that it will be able to absorb staffing impacts in its current Operations and Maintenance budget.

k. Reports

Based on Phase 2 evaluations, ERCOT will continue to review and report on the following:

- Recommendations for performance and compliance verification and metrics for ADERs, including additional data recorder requirements;
- Recommendations regarding alternative dispatch and pricing schemes for consideration in future phases of the Pilot Project, such as recommendations on the LRN concept;
- Recommendations regarding the potential for ADERs to participate in the ERCOT market in a manner similar to Load Resources other than Controllable Load Resources, possible Protocol language for “blocky” ADERs/ALRs, and new participation rules for being a “blocky” Ancillary Service-only provider;
- Recommendations for processes, Protocol language, or changes necessary to address feedback from TDSPs and Aggregators on the program;
- Size of participation in aggregate and by Load Zone; and
- How many devices are reported to have communication standards, and of those that do, what those standards are.

These reports and other information related to this Pilot Project will be stored on the [Pilot Projects page](#) on ERCOT’s website.

l. Construction

This Governing Document and appendices will be liberally construed to achieve the purposes of the Pilot Project. Except where explicitly provided in this Governing Document, capitalized terms will be given the meaning assigned by the ERCOT Protocols, provided that terms unique to ADERs shall be construed consistently with the requirements of this Governing Document for the purposes of the ADER Pilot Project. In the event of any conflict between this Governing Document and the ERCOT Protocols, Operating Guides, or any Other Binding Document, the Governing Document will govern, but only to the extent the conflict relates to the administration of this Pilot Project.

Appendix A

Distribution Service Provider Acknowledgment ERCOT Aggregate Distributed Energy Resource Pilot Project

This Acknowledgment is signed by an officer of the Distribution Service Provider (DSP) identified below.

By my signature, I confirm that the below-identified DSP has received from [QSE PARTICIPANT's NAME], a Qualified Scheduling Entity in the ERCOT Region ("QSE"), an initial "Details of the Aggregation" submittal as that term is defined in the "Aggregate Distributed Energy Resource Pilot Project Governing Document," and that the DSP provides delivery service to each of the Premises identified in the initial "Details of Aggregation," and that the DSP consents to the participation of those Premises in this Pilot Project. For any subsequent updates to the ADER population, the below-identified DSP confirms that it will verify that it provides delivery service to each of the Premises identified, and will consent to or exclude each Premise's participation in this Pilot Project. The DSP acknowledges that it understands the potential for simultaneous injection of power from each Premise into the DSP's system as a consequence of that participation.

I understand that the below-identified DSP may rescind this acknowledgment by providing 30 days' notice to the QSE and ERCOT, but that no termination of this acknowledgment will be effective before the end of any period for which ERCOT has already issued an award notification to QSE Participant.

DSP: _____

Officer Signature: _____

Printed Name: _____

Title: _____

Date: _____

Appendix B

**Supplement to the Standard Form Market Participant Agreement
Between
[Name of QSE]
and
Electric Reliability Council of Texas, Inc.**

This Supplement to the Standard Form Market Participant Agreement ("Supplement"), effective as of [START DATE TO BE ENTERED BY ERCOT] ("Start Date"), is entered into by and between [PARTICIPANT's NAME], a Qualified Scheduling Entity in the ERCOT Region ("QSE" or "QSE Participant"), and Electric Reliability Council of Texas, Inc., a Texas non-profit corporation ("ERCOT").¹

Recitals

WHEREAS:

- A. The Public Utility Commission of Texas ("PUCT") has authorized ERCOT to conduct pilot projects in 16 Texas Administrative Code § 25.361(k);
- B. The ERCOT Board has approved an Aggregate Distributed Energy Resource (ADER) pilot project ("Pilot Project"), as described in the Governing Document for Aggregate Distributed Energy Resource Pilot Project ("Governing Document");
- C. Specific terms used in this Supplement that are defined in the Governing Document have the meanings assigned to them in that document;
- D. QSE Participant is a QSE in the ERCOT Region and has executed a Standard Form Market Participant Agreement ("Market Participant Agreement") with ERCOT;
- E. QSE Participant wishes to submit bids and/or offers from ADERs; and
- F. The Parties enter into this Supplement in order to establish the terms and conditions by which ERCOT and QSE Participant will discharge their respective duties and responsibilities with respect to the ADER Pilot Project.

Agreements

NOW, THEREFORE, in consideration of the mutual covenants and promises contained herein, ERCOT and QSE Participant (the "Parties") hereby agree as follows:

- A. All terms and conditions of the Market Participant Agreement between QSE Participant and ERCOT remain in full force and effect.
- B. QSE Participant and ERCOT will abide by and comply with the rules of the ADER Pilot Project set out in the Governing Document.
- C. Any Party may terminate this Supplement to the Market Participant Agreement by providing 30 days' notice to the other Parties; however, no termination of this Supplement will be effective before the end of any period for which ERCOT has already issued an award notification to Participant.

¹ Unless otherwise indicated, capitalized terms in this Supplement have the meanings ascribed to them in the ERCOT Protocols.

Aggregate Distributed Energy Resource (ADER) Pilot Phase 1 Report

February 8, 2024

Table of Contents

Introduction.....	2
Background	3
Purpose and Overview of the Pilot.....	3
Eligibility and Qualification Process.....	4
Market Participation and Compliance	5
Analysis and Participation	6
Pilot Participation.....	6
Summary Statistics for Actively Participating ADERs.....	8
Energy Market Participation.....	9
Ancillary Service Market Participation.....	9
Overall Observations.....	10
Evaluations and Recommendations.....	11
Telemetry Validation Processes and Requirements.....	11
Recommendation/Lessons-Learned	13
Expanding Eligibility to Provide Additional Ancillary Services	14
Recommendation/Lessons-Learned	14
Compliance Metrics	15
Recommendation/Lessons-Learned	15
Alternative Participation Frameworks	16
Recommendation/Lessons-Learned	16
Alternatives to Dispatch using Load Zone Shift Factors	17
Recommendation/Lessons-Learned	22
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 nine 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 January 31, 2024.

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. Seven 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 nine 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 February 1, 2024.

		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	7	0	4.3	0	1.4	0	12.7
	Unused (MW)	2.8	5.3	13.3	3.1	24.4	1.2	8.9	8.2	67.3
	% Full	0%	0%	35%	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

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.

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

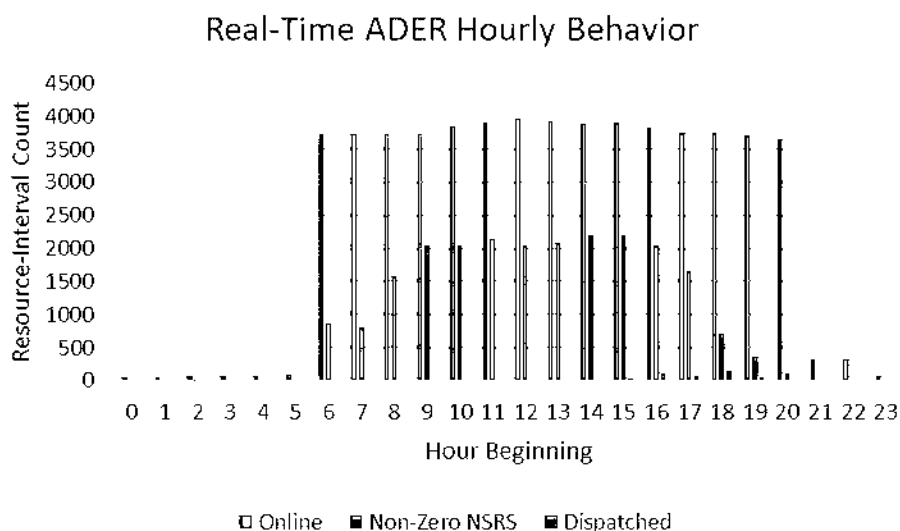
The below chart shows all of the SCED intervals covering the period between August 24, 2023, through January 31, 2024. These intervals are analyzed in more detail below.

Metric	Resource-Interval Count
SCED Intervals evaluated	94,500
SCED Intervals where the ADER was on-line	58,186
SCED Intervals with non-zero Non-Spin Responsibility	22,944
SCED Intervals with ADERs dispatched	514
SCED Intervals with ADERs deployed for Non-Spin	40

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 ~1% of the time, meaning that it was generally more efficient to dispatch other Resources ~99% of the time.

The graph below breaks down the data by hour to reveal daily patterns in the ADERs' participation behavior. Initially, the ADERs were on-line from hour-beginning 6 to 20, but would stop carrying Non-Spin, after hour-beginning 17. However, this behavior has been changing over time. 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 ~ 39% of the time during on-line intervals. Both ADER resources received a Non-Spin deployment for 20 SCED intervals each on the morning of 01/22/2024. This is the only time they have received a Non-Spin deployment since they have been fully operational.

QSEs are obligated to provide Ancillary Services based on their Ancillary Service awards and trades. In approximately 0.7% 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

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).

same time, ERCOT does have some recommendations and commentary based on observations during this initial phase of the Pilot Project outlined further below.

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.)

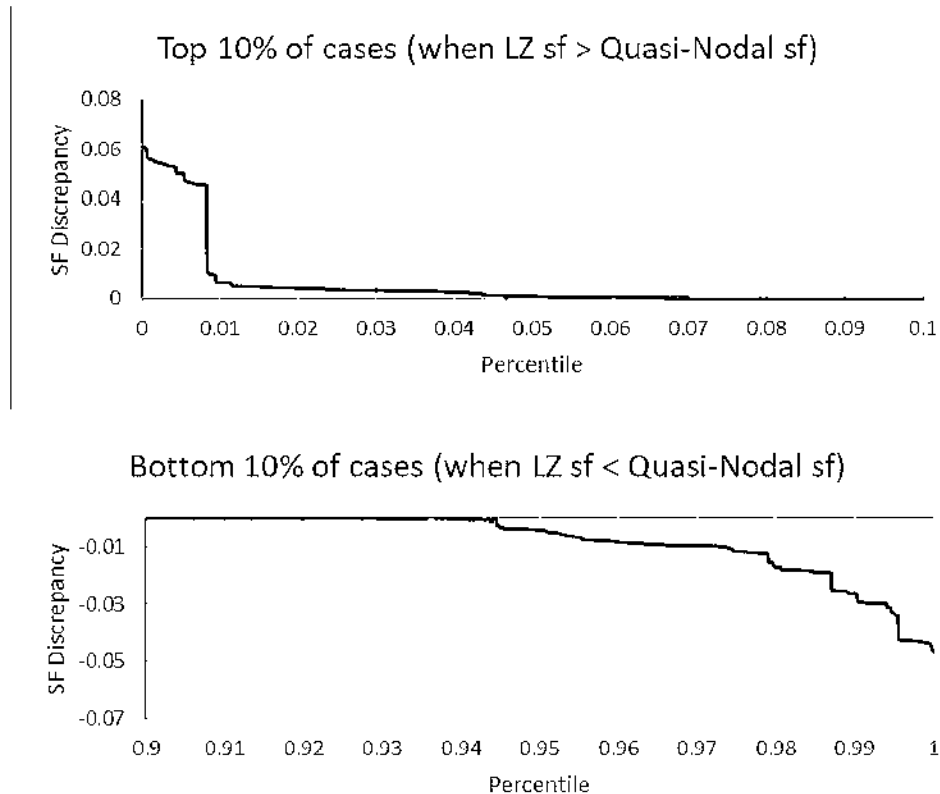
The set of figures shown below describes the frequency of occurrence of shift factor discrepancies. The analysis considers all active constraints during the 800 SCED intervals with the highest congestion rent between August 23, 2023, and November 7, 2023.

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

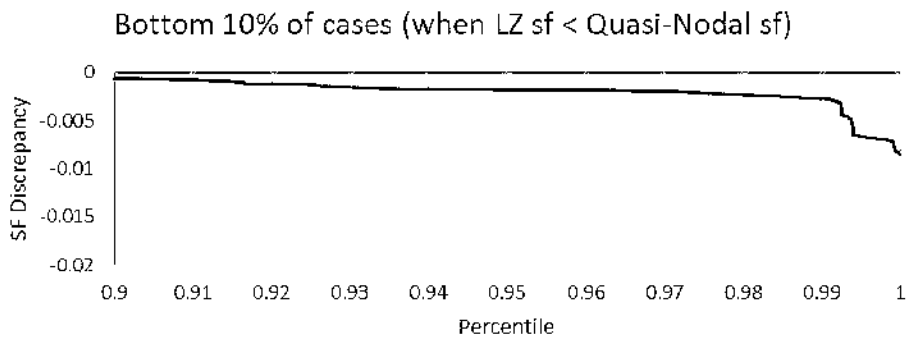
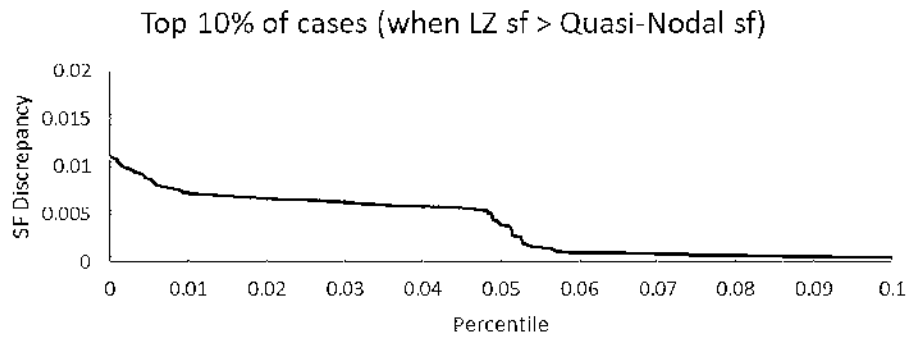
Resource #1 – Instances of constraint-intervals ordered by shift factor discrepancy, top and bottom 10% of cases



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.

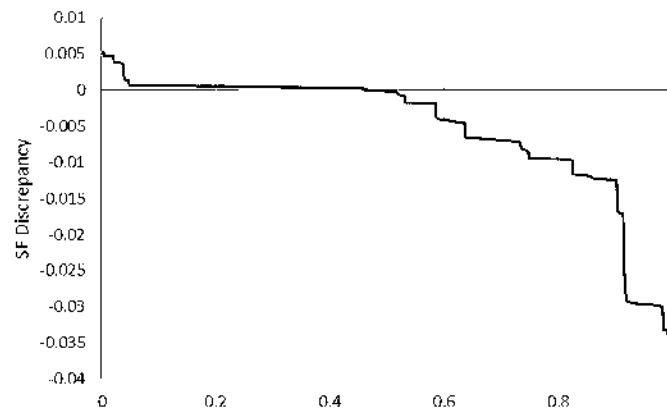
Similarly, the following graphs are duration curves with the axes adjusted to show the magnitude and frequency of occurrence for the top 10% and bottom 10% of largest shift factor discrepancies for Resource #2 out of all constraint-intervals evaluated. Resource #2's largest shift factor discrepancy was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

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



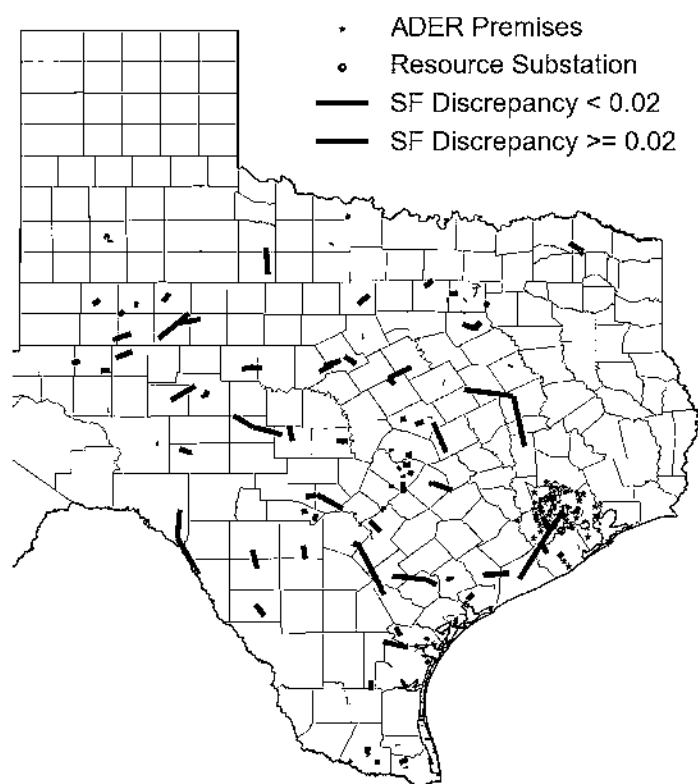
One potentially concerning scenario is when the Load Zone shift factor and Quasi-Nodal shift factor have different signs (one is positive and the other is negative). This could lead to SCED dispatching Resources in a way that would exacerbate the congestion instead of improving it. Instances of ADER 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 and the Task Force have developed a Phase 2 Governing Document, based on the recommendations in this Report. Rather than creating an entirely new document, the Phase 2 Governing Document shows 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.

- D. Otherwise, this Supplement to the Market Participant Agreement will terminate upon the completion of all obligations incurred under the terms of the Governing Document.
- E. This Supplement to the Market Participant Agreement may be executed in two or more counterparts, each of which is deemed an original, but all constitute one and the same instrument.

SIGNED, ACCEPTED, AND AGREED TO by each undersigned signatory who, by signature hereto, represents and warrants that he or she has full power and authority to execute this Supplement.

Electric Reliability Council of Texas, Inc.:

By: _____

Printed Name: _____

Title: _____

Date: _____

QSE Participant:

By: _____

Printed Name: _____

Title: _____

Date: _____

Attached to this Agreement, QSE Participant shall include the "Details of the Aggregation," as that term is defined in the "Aggregate Distributed Energy Resource Pilot Project Governing Document."