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PROJECT NO. 51603

**REVIEW OF DISTRIBUTED ENERGY § PUBLIC UTILITY COMMISSION
RESOURCES §
§ OF TEXAS**

**ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.'S RESPONSES TO
COMMISSIONER QUESTIONS**

Electric Reliability Council of Texas, Inc. (ERCOT) submits the following Comments in response to questions posed by Commissioner McAdams as reflected and expanded in a Staff (Commission Staff) of the Public Utility Commission of Texas (Commission or PUC) memorandum in Project No. 51603 relative to Distributed Energy Resources (DER) issues. Commission Staff's memorandum set forth a June 15, 2022 deadline for interested parties to file responses to the questions. Accordingly, ERCOT's responses are timely filed.

I. INTRODUCTION AND BACKGROUND

On April 20, 2022, Commissioner McAdams issued a memorandum in Project No. 52373, *Review of Wholesale Market Design*, seeking responses from interested parties to certain questions relative to the greater utilization of DER including photovoltaics, energy storage, electric vehicles, backup generators, demand response, and related technologies. At the subsequent direction of the Commission, Commission Staff filed a memorandum on April 29, 2022 in Project No. 51603 requesting responses to Commissioner McAdams' questions by June 15, 2022. Commission Staff's memorandum also expands on Commissioner McAdams' questions, indicates that Project No. 51603 is intended to serve as a clearinghouse project to develop DER issues, and states that the commenting in this round is to serve as a general survey of DER issues and positions that will assist the Commission in identifying all of the relevant issues and scoping further inquiries in this area. Commission Staff's questions provide an important step towards the continued framing of DER issues that the Commission and interested stakeholders can address in an effort to find reasonable solutions to implement towards accomplishing greater DER participation in the ERCOT market that also assures a reliable ERCOT system. ERCOT supports the Commission's efforts to address DER issues in this project in addition to the ongoing efforts to address DER issues carried out through the ERCOT stakeholder process.

Currently, ERCOT rules and requirements applicable to setting a framework to address reliability and interconnection requirements pertaining to Distribution Generation Resources (DGR) and Distribution Energy Storage Resources (DESR) have recently been developed and implemented through Nodal Protocol, Operating Guide, Planning Guide, and Resource Registration Glossary revisions effective as of January 1, 2022.¹ These revisions establish appropriate rules for interconnection, modeling, coordination, and operation of DGR and DESR participation on the ERCOT system.² The Commission's efforts in this project can build upon these ERCOT actions both at the Commission and through the ERCOT stakeholder process to address a broader facet of DER issues including accomplishing greater DER entry to the ERCOT market and their reliability impacts to the grid.

Relative to greater DER penetration on and their impacts to the market and reliability of the ERCOT system, ERCOT has particular interest in enhancing its ability to have sufficient information from DERs to maintain situational awareness, ensure real-time reliability, and appropriately settle the market. Thus, ERCOT welcomes the Commission's questions inviting comment on these and other DER issues raised and to be identified and addressed in this project and at ERCOT. In support of these efforts, and with the anticipation that the Commission may hold technical workshops and take additional comments for greater analysis and consideration to robustly frame the DER issues, ERCOT provides the following responses and comments and an Executive Summary for the Commission's consideration.

II. ERCOT'S RESPONSES TO COMMISSION STAFF'S DER QUESTIONS

1. *Distribution planning and control: What planning and control processes and practices should the Commission consider for greater DER participation and grid resilience? Which entities should be involved in planning and control processes and practices?*

ERCOT agrees that the Commission should consider planning and control processes and practices that may be implemented towards greater DER participation and grid resilience.

¹ See NPRR 1016, *Clarify Requirements for Distribution Generation Resources (DGRs) and Distribution Energy Storage Resources (DESRs)*, NOGRR212, *Related to NPRR1016, Clarify Requirements for Distribution Generation Resources (DGRs) and Distribution Energy Storage Resources (DESRs)*, PGRR082, *Revise Section 5 and Establish Small Generation Interconnection Process*, and RRGR026, *Related to NPRR106, Clarify Requirements for Distribution Generation Resources (DGRs) and Distribution Energy Storage Resources (DESRs)*.

² Over the last several years, ERCOT has also engaged in a number of other efforts relative to DER-related issues. A listing of those matters is at slide 3 provided in [ERCOT - Unregistered DG Workshop \(Feb. 12, 2021\)](#).

ERCOT and the North American Reliability Corporation (NERC) have both generated several publications addressing DER market and reliability issues. In its publications, ERCOT has previously identified DER issues and concerns including a number of technical and structural barriers to the entry of DER to the ERCOT market and system. ERCOT's 2015 *Concept Paper on Distributed Energy Resources in the ERCOT Region*³ (2015 DER Concept Paper) addressing market participation as of 2015 identifies many of the concepts that either have been or are still being implemented to address those issues. Among those are Nodal pricing (NPRR917), DGR framework (NPRR 1016), and wholesale storage load (WSL) for Settlement Only Distribution Energy Storage Systems (NPRR995). Among the technical and structural barriers identified in the 2015 DER Concept Paper are some of the items outlined in Commission Staff's set of questions in this project:

1. Lack of control mechanisms to manage the output of large numbers of DERs and avoid over/under-generation and potential damage to transmission/distribution facilities;
2. Lack of a robust monitoring infrastructure to know what impact these facilities are having on the electrical system in real-time;
3. Lack of consistent mechanisms, study processes and tariffs for interconnecting DER facilities across different TDSP service areas;
4. Lack of a mechanism to directly equate DER activity with reduced T&D costs, which could enhance the DER business case; and,
5. Lack of a mechanism to incorporate DERs into Nodal price formation.

ERCOT's 2017 *Distributed Energy Resources (DERs), Reliability Impacts and Recommended Changes* paper,⁴ identifies several areas of concern with significant growth in DERs that either have been or are still being implemented. Among those are Real-time visibility (NPRR866), Real-time telemetry (NPRR1077), DGR participation with Nodal pricing (NPRR1016), detailed static DER data (NPRR891 and Senate Bill 3) and the adoption of the ride-through

³ See, *ERCOT Concept Paper on Distributed Energy Resources in the ERCOT Region (Aug. 19, 2015)* submitted to the Distributed Resource Energy & Ancillaries Market (DREAM) Task Force on August 19, 2015.

⁴ See *ERCOT Distributed Energy Resources (DERs), Reliability Impacts and Recommended Changes Version 1 (March 22, 2017)*.

characteristics specified in IEEE1547-2018 (to be determined).

Additionally, the NERC System Planning Impacts from Distributed Energy Resources Working Group (SPIDERWG) has issued several papers and reliability guidelines regarding the impacts from the growth of DERs.⁵ Within these papers and guidelines, NERC also addresses the entities it believes should be involved in planning and control processes and practices. Since System planning is a key function required for reliable operation of the bulk power system, there are also a number of reliability guidelines and technical reference documents that provide recommended methods for inclusion of DERs. EPRI has also produced a whitepaper titled *TSO-DSO Coordination Functions for DER*, which also includes the interactions required between all of the various organizations (ISO/TSO/DSO/DER Aggregator and DER Owner) when DERs participate in the wholesale markets.⁶ The EPRI paper covers aspects of the registration, planning, market operations and real-time dispatch in great detail, which helps highlight the complexity of the topic.

- i. *What are the different utilization and participation formats for existing DERs on distribution networks?*

There are currently a number of different utilization and participation formats for existing DERS on the various distribution networks that ERCOT has compiled in several produced reports. ERCOT's Resource Definition Task Force developed a detailed matrix on the

⁵ See the following NERC publications:
DER Data collection for Modeling in Transmission Studies:
https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Reliability_Guideline_DER_Data_Collection_for_Modeling.pdf
DER Modeling: https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Reliability_Guideline_DER_Modeling_Parameters_-_2017-08-18_-_FINAL.pdf;
DER Parameterization in DER A model:
https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Reliability_Guideline_DER_A_Parameterization.pdf;
Modeling DER in Dynamic Load Models:
https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Reliability_Guideline_Modeling_DER_in_Dynamic_Load_Models_-_FINAL.pdf;
Model Verification of Aggregate DER Models used in Planning Studies:
https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Reliability_Guideline%20DER_Model_Verification_of_Aggregate_DER_Models_used_in_Planning_Studies.pdf

⁶ See [EPRI TSO-DSO Coordination Functions for DER \(Jan. 7, 2022\)](#). Please note that “DSO” is not a term or concept used in ERCOT.

Generation framework in 2018 that includes Distributed Generation (DG).⁷ This framework was expanded in 2019 to include Energy Storage Systems (including distribution connected batteries), and responsive Loads (including distribution connected demand response).⁸ ERCOT notes that some distribution-connected responsive Loads can be included in any of the Load framework categories.

Subsequent to the categorizations described in the compilations above, ERCOT produced a short video in June 2020 that outlines and summarizes this entire framework of the various resources that, although ERCOT does not have a defined term for DER, together represent ERCOT's understanding of "DER" as presented in Commissioner McAdams' and Commission Staff's questions.⁹ Also, ERCOT produces annual reports on the growth of both DG and Demand Response. The most recent annual report on DG can be found on the ERCOT Supply Analysis Working Group (SAWG) website, as well as the growth in Settlement Only Distributed Generation (SODG).¹⁰ In addition, ERCOT compiles and provides forward looking solar PV growth projections.¹¹ Additionally, DG (which includes Energy Storage systems) may participate in the ERCOT market depending on their registration per the Resource Framework. Currently, there are 274 MW of DGR/DESRs fully participating in the ERCOT wholesale market as well as approximately 1 GW of SODG.

ERCOT also produces annually two separate reports on Demand Response. The first is the Annual Demand Response in the ERCOT Region report¹² that quantifies the amount of Demand Response participating in programs administered by ERCOT and also those administered by regulated distribution utilities and Load Serving Entities. An additional report on Emergency Response Service (ERS) submitted to the Commission in Project No. 52933

⁷ See *ERCOT's 2018 Existing Resource Definition Framework*.

⁸ See *ERCOT Resources Definition Task Force Resources Framework Proposal (Apr. 11, 2019)*.

⁹ See ERCOT's video titled video *Distributed Generation and Demand Response in ERCOT* (June 4, 2020) at <https://youtu.be/xL2HeYTBt0>.

¹⁰ See *ERCOT Distribution Generation Review, Includes Registered and Unregistered DG (Apr. 4, 2022)*.

¹¹ See *ERCOT 2021 Update to Rooftop Solar PV Growth Projections (May 18, 2021)*.

¹² The annual reports may be accessed at the following link: *Annual Report on Demand Response in the ERCOT Region*.

annually captures participation by aggregations of DERs in this program.¹³

The two Demand Response Services administered by ERCOT, Load Resources (LRs) and Emergency Response Service (ERS), allow participation from both transmission and distribution connected sites. Participation from LRs in ERCOT's energy and ancillary services was established in 2002, which allow participation from registered loads. They could participate as either a non-controllable load (load with under-frequency relay) or as controllable load (loads that can follow energy base-point instructions). In 2013 through NPRR555, controllable load participation was expanded to include Aggregate Load Resources which allowed for participation of aggregations of residential and commercial sites in an Ancillary service. Based on information provided in the Annual Report of Demand Response at the end of 2021, ERCOT had 655 LRs qualified to participate in ERCOT energy and ancillary service markets. These resources have a combined interruptible capability of approximately 7,724 MWs. While the ratio of the number of distribution to transmission connected sites is 5/1 about 30%-35% of the interruptible capability is distribution connected. In other words, roughly 2500 MW of distributed connected Load Resources are qualified to provide AS. It should be noted that due to various system requirements, the maximum participation from non-controllable loads is limited to about 1/3 of the registered capacity to participate during any hour in the Responsive Reserve Service market. Recently however, other services have been opened up to the non-controllable loads. ERS was originally developed in 2007 and allows participation by non-Resources. Originally established for interruptible loads, the program was modified in 2012 to allow participation from both DG and controllable loads participate in this Demand Response program. This program provides approximately 1000 MW of demand response for ERCOT. While a vast majority of the sites participating in ERS are distribution connected due to large residential aggregations, approximately 70% of the approximately 1000 MWs is distribution connected. Of this 70%, almost half is provided by distributed generation.

Additionally, TDSPs have additional demand response programs (TDSP Load Management programs) at the Retail level that compete with ERCOT's ERS at the Wholesale level.

¹³ See Project No. 52933, ERCOT's Annual Report on Emergency Response Service (2021 report filed, Apr. 15, 2022, Item 11 on Interchange).

ii. Should the current size limit on unregistered distributed resources be reconsidered?

ERCOT has identified 1MW as the desired minimum threshold for all Unregistered Distributed Generation to be included in the ERCOT Network model.

2. *Transmission and distribution modification: What equipment, processes, and standards need to be implemented to allow for further DER participation?*

ERCOT suggests that certain processes and standards can be adopted and implemented to support greater DER participation. For example, ERCOT presented to the ERCOT Reliability and Operations Subcommittee in June 2020 its recommendation for adoption of IEEE1547-2018 that addresses ride-through requirements to support voltage stability and meet reliability needs at higher penetrations of DER. Also, ERCOT has adopted some frequency and voltage settings from IEEE1547-2018 as part of the requirements for registration as a DGR/DESR as addressed in NPRR1016 and NOGRR212. Additionally, NERC SPIDERWG has also issued a reliability guideline recommending the adoption of IEEE1547-2018 finding that it significantly enhanced the performance and functional capability of DERs connecting specifically to primary and secondary distribution systems.¹⁴

3. *Cost quantification: How much transmission and distribution investment will be necessary and what methods would be available to recuperate costs? And should we consider new methods of cost allocation and recovery for DER-related infrastructure enhancements?*

ERCOT has no comment on this question at this time.

i. What market signals, if any, should be considered related to DERs aimed at providing grid services?

ERCOT suggests the Commission and interested stakeholders deliberately review and consider if the current framework has any gaps in market signals related to DERs.

4. *Data accessibility: What data would improve supply side dynamics and encourage targeted development? What information would be useful to establish a current baseline and assess future market potential? What accessibility and information security concerns should be considered?*

ERCOT's recommends adoption of IEEE1547-2018 to implement its standards that enhance DER participation. ERCOT would be enabled to utilize any data or communication

¹⁴ See *NERC Reliability Guideline – Bulk Power System Reliability Perspectives on the Adoption of IEEE 1547-2018 (March 2020)*.

pathways supported under IEEE1547-2018 interoperability, which should be provided to the interconnecting utility. Additionally, the communication paths should meet NERC/CIP requirements.

i. What level of information should entities responsible for planning and control of DERs have access to for long-term planning purposes?

In coordination with the NERC modeling guidelines outlined in response to Question 1 above, ERCOT Planning presented to the Planning Working Group (PLWG) in October of 2020, a near term roadmap for incorporating DER in ERCOT planning models.¹⁵ Additionally, ERCOT presented the long-term roadmap for incorporating DER in ERCOT models at the Unregistered DG Workshop held in March 2021.¹⁶ The long-term roadmap requires disaggregated DER data to be provided to ERCOT for inclusion in the ERCOT network model for use by ERCOT planning, forecasting and operations. Senate Bill 3 has since also added requirements for DG owners to register their systems with ERCOT and provide information necessary for the interconnection of the distributed generation, but processes for how the data will be provided to ERCOT have not yet been developed.¹⁷ ERCOT is interested in consideration of a potential process in which the TDSP acts as agent for the interconnecting customer to provide the pertinent information to be submitted to ERCOT. Such process will create greater efficiencies and consistency in the information reported to and received by ERCOT and the TDSPs.

5. *Other related questions*

i. Should the Commission consider classifying various DER types? If so, on what basis should DERs be classified? For example, size, performance, characteristics, or some other attribute? (E.g., rooftop solar PV, distribution connected energy storage, microgrids)

Many ERCOT DER types and classifications have been developed based on size and

¹⁵See Update on ERCOT Proposals for DER in Planning Models (Oct. 2020 RPG/PLWG).

¹⁶See Planning Data Requirements - Unregistered DG Workshop (Mar. 30, 2021).

¹⁷ PURA §39.9165 (b) mandates ERCOT as the independent organization certified under PURA §39.151 to “require an owner or operator of distributed generation to register with the organization and interconnecting transmission and distribution utility information necessary for the interconnection of the distributed generator.” While PURA §39.9165 (c) provides that these reporting requirements do not apply to distributed generation serving residential property, ERCOT sees value in also receiving information relative to residential distributed generation interconnections as it improves ERCOT’s visibility of such assets on the system towards assuring grid resilience.

performance characteristics established in the Commission’s Substantive Rules. Additionally, ERCOT’s 2015 DER Concept Paper distinguished between “dispatchable” vs “non-dispatchable” resources. Changing classifications from those currently established may present a barrier due to implementation timelines and/or costs that would need to be accomplished through rules modifications. Thus, applying classifications changes would complicate and require additional changes to established applicable tools, such as forecasting tools that have been developed for forecasting Wind and Solar.

iii. What should be done to encourage consistency in interconnection agreements between the various interconnecting entities?

ERCOT suggests that there is merit to establishing a “Standardized” Interconnection Agreement for Resources that seek to interconnect to any distribution system in ERCOT. Such standardization should also account for local needs to support reliability (e.g., communication vulnerabilities, weather related vulnerabilities, voltage reduction, voltage control, load shed, in a Black Start, etc.) as well as resiliency. Energy Systems Integration Group (ESIG) report on DER highlights these challenges for utility commissions and utilities as well as identifies multiple regulatory and gaps needing to be addressed for enabling increased DER participation.

v. What successes have been seen in other states that could be implemented in Texas?

EPRI’s recent *DER Aggregation Participation in Electricity Markets* project report is a useful resource on DER aggregation participation in wholesale markets across the country.¹⁸ The current penetration levels of DER participating in the wholesale markets at other ISOs are not yet at useful levels to provide lessons that can be learned and implemented in ERCOT. EPRI is willing to provide the latest state of the art on DER participation in wholesale markets across the various ISOs at a technical conference that the PUC arranges.

vi. What can reasonably and economically be done within a 5-year timeframe?

ERCOT suggests that there is significant merit to exploring what may be accomplished towards improving and increasing DER participation in the ERCOT market within the specified timeframe. ERCOT further suggests that prioritization of projects is a useful tool towards

¹⁸ See *DER Aggregation Participation in Electricity Market: EPRI Collaborative Forum Final Report and FERC Order 2222 Roadmap (March 29, 2022)*.

addressing DER interconnection to the system. ERCOT will work with the Commission and interested stakeholders on prioritization of projects.

vii. What other issues, if any, should the Commission consider and address while developing rules related to DERs?

With the critical framework for DGR and DESR participation in the ERCOT market now in place as addressed in Section I. above, there may be additional need for improved coordination between ERCOT, the TSPs and the DSPs on DER issues that includes but is not limited to interconnection, planning, communications, voltage control, telemetry, pricing and resiliency. Better coordination and information exchange will allow the system to be planned and operated at levels that are more optimal and not unnecessarily limited due to sub-optimal information and coordination.

ERCOT supports an approach for the PUC, ERCOT and other Stakeholders to:

- First, identify a proposed framework for market participation which should help inform the Commission for identifying a list of gaps and issues,
- Second, determine and list projects for addressing issues related to improving the operation and market participation of resources on the distribution system,
- Third, develop a roadmap identifying priority and sequencing of work and identification of which issues need help from the PUC to resolve and which issues are candidates to be worked through the ERCOT Stakeholder process.

III. CONCLUSION

ERCOT appreciates the opportunity to offer the foregoing responses and comments to the DER issues-related questions posed by Commissioner McAdams as expanded in Commission Staff's April 29, 2022 memorandum. ERCOT believes that interested stakeholder input into these questions will be helpful towards developing a framework that addresses barriers to greater DER entry into the ERCOT market as well as to assure resilience of the ERCOT grid with these added resources. ERCOT looks forward to continued participation in this project and others that the Commission may establish that address DER-related issues. ERCOT will also continue its efforts to also address DER-related issues that may be uniquely addressed through the ERCOT stakeholder process.

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Respectfully Submitted,

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ATTORNEYS FOR ELECTRIC RELIABILITY
COUNCIL OF TEXAS, INC.

PROJECT NO. 51603

**REVIEW OF DISTRIBUTED ENERGY § PUBLIC UTILITY COMMISSION
RESOURCES §
§ OF TEXAS**

**ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.'S RESPONSES TO
COMMISSIONER QUESTIONS**

Executive Summary

ERCOT's responses and comments to the Commission's scoping questions intend to broadly raise for consideration issues relative to greater DER penetration and the impact to the ERCOT system in terms of reliability and market participation. While ERCOT anticipates that the Commission will take these first round of comments to scope the broad range of DER issues through workshops and further rounds of interest stakeholder comments, ERCOT generally offers the following points for consideration to commence establishing the framework of DER issues.

- The stakeholder process at ERCOT has recently accomplished establishing rules and requirements applicable to setting a framework to address reliability and interconnection requirements pertaining to DGR and DESR implemented through Nodal Protocol, Operating Guide, Planning Guide, and Resource Registration Glossary revisions. However, greater DER penetration and attendant grid reliability issues ERCOT and NERC have identified remain and should be addressed through this Commission process and through the ERCOT stakeholder process.
- In addition to the framework established to address reliability and interconnection requirements pertaining to DGR and DESR, ERCOT believes there may be additional need for improved coordination between ERCOT, the TSPs and the DSPs on DER issues that includes but is not limited to interconnection, planning, communications, voltage control, telemetry, pricing and resiliency. Better coordination and information exchange will allow the system to be planned and operated at levels that are more optimal and not unnecessarily limited due to sub-optimal information and coordination.

- Relative to greater DER on and their impacts to the reliability of the ERCOT system, ERCOT has particular interest in enhancing its ability to have sufficient information from DERs to maintain situational awareness, ensure real-time reliability, and appropriately settle the market.
- ERCOT has identified through several studies and reports different utilization and participation formats for existing DERs on distribution networks. ERCOT anticipates that an understanding of these formats participating on the grid may be useful towards addressing enhancing greater participation and grid resilience.
- ERCOT supports an approach for the PUC, ERCOT and other Stakeholders to:
 - First, identify a proposed framework for market participation which should help inform the Commission for identifying a list of gaps and issues,
 - Second, determine and list projects for addressing issues related to improving the operation and market participation of resources on the distribution system,
 - Third, develop a roadmap identifying priority and sequencing of work and identification of which issues need help from the PUC to resolve and which issues are candidates to be worked through the ERCOT Stakeholder process.