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PROJECT NO. 52373

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

PROJECT NO. 53298

WHOLESALE ELECTRIC MARKET DESIGN IMPLEMENTATION	**§** **§**	**PUBLIC UTILITY COMMISSION OF TEXAS**

ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.'S PROPOSAL REGARDING VOLTAGE SUPPORT COMPENSATION

In furtherance of the Public Utility Commission of Texas's (Commission) evaluation of the concepts identified in Phase I of the Commission's January 13, 2022 blueprint for wholesale market design in Project No. 52373, Electric Reliability Council of Texas, Inc. (ERCOT) submits the attached proposal identifying two possible options for voltage support compensation. ERCOT would appreciate the Commission's consideration and guidance on this proposal at the appropriate time. ERCOT clarifies that it is not requesting discussion of this proposal at the Commission's August 24, 2023 open meeting.

Respectfully submitted,

/s/ Nathan Bigbee

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WHOLESALE MARKET DESIGN BLUEPRINT POLICY PROPOSAL: VOLTAGE SUPPORT COMPENSATION

Pursuant to the Public Utility Commission of Texas's (PUC) Blueprint for Wholesale Electric Market Design and Directives to ERCOT issued in PUC Project No. 52373, *Review of Wholesale Electric Market Design*, Electric Reliability Council of Texas, Inc. (ERCOT) provides the following information to inform the PUC's policy and design decisions regarding voltage support compensation, which is one of the concepts identified under the section titled "enhancing ancillary services" in Phase I of the PUC's blueprint.

Introduction and Explanation of Current Compensation Mechanisms and Settlement for Voltage Support Service

For approximately the last 20 years, the following general framework for Voltage Support Service (VSS) has been in place under the ERCOT Protocols:[1]

- Uncompensated Reactive Support: All transmission-connected Generation Resources greater than 20 MVA are required to provide VSS, which requires the Generation Resource to maintain a voltage regulation schedule without compensation. The uncompensated quantity of Reactive Power the Generation Resource is required to absorb or produce equates to a power factor of 0.95 leading and lagging based on its maximum net power, as measured at the Point of Interconnection Bus (POIB). This quantity is referred to as the Resource's "Unit Reactive Limit" (URL). This reactive capability is required to be maintained at all times the plant is On-line. Wind-powered Generation Resources (WGRs) and PhotoVoltaic Generation Resources (PVGRs) are required to maintain a 0.95 power factor reactive capability only when the WGR's or PVGR's real power output is 10% or more of its nameplate capacity. Other Generation Resources have partial exemptions from the required quantities of Reactive Power based on their operational date and Standard Generation Interconnection Agreement (SGIA) date.

- Compensated Reactive Support: If ERCOT instructs a Generation Resource to exceed a power factor of 0.95 leading or lagging at rated MW output, as measured at the POIB, and the Generation Resource provides the additional Reactive Power, then ERCOT will pay for the additional Reactive Power provided at a price that is intended to recognize the avoided cost of reactive support investment. The $/MVArh price for instructed MVAR beyond a Generation Resource's site URL is currently $2.65/MVArh and is based on an avoided cost of $50.00/installed kVAr.

- Compensation for Power Reduction: Compensation for any real power reduction directed by ERCOT through Verbal Dispatch Instructions (VDIs) to provide for additional reactive capability beyond a Generation Resource's URL for voltage support must be compensated as a lost opportunity payment.

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[1] *See* ERCOT Protocols, Sections 3.15, 6.5.7.7, and 6.6.7.

- Cost Allocation: Any VSS compensation costs for the circumstances listed above are uplifted to Qualified Scheduling Entities (QSEs) representing load on a load-ratio-share basis. While not specifically noted below for the discussed new frameworks, the general assumption is that any costs created under the new compensation mechanisms would also be allocated to QSEs on a load-ratio-share basis.

These compensation mechanisms were first implemented in the ERCOT zonal market and carried over to the nodal market. However, no Generation Resources have been compensated based on this framework.

Reasons to Introduce New VSS Compensation Mechanisms

As the Resource mix continues to evolve to include a larger percentage of solar generation that does not provide reactive support for a significant portion of each Operating Day, this may in turn lead to declines in the existing reactive support that is available for the grid at times and an increase in the amount of required transmission investment that will be needed. Timely development of requirements and compensation mechanisms may allow for future Generation Resources to have enhanced reactive capabilities more easily incorporated into their design.

With the desire to better incent and compensate Resources that provide this valuable service in a manner that best promotes reliable operation of the grid while also minimizing total costs paid by end consumers, ERCOT staff has outlined a framework for enhanced VSS requirements and compensation mechanisms for the PUCT's consideration.

Summary of Existing and Proposed Frameworks for VSS Requirements and Compensation Mechanisms

The table below is intended to provide a summary of existing and potential new frameworks for VSS requirements and compensation mechanisms. At a high-level, the potential new frameworks are:

- Option 1 – A new mechanism to compensate transmission-connected Intermittent Renewable Resource (IRRs) that are Inverter-Based Resources (IBRs) that provide VSS when the IRR is not generating real power. This includes a "make-whole" for instances in which the Resource must consume real power to provide VSS.

- Option 2 – A set of more stringent VSS requirements (i.e., "enhanced" VSS requirements) and a mechanism to compensate Generation Resources that meet those more stringent requirements.

While two options are included in the table, ERCOT staff believes the near-term focus should be placed on Option 1, as that option is likely to provide the most immediate benefit relative to cost and creates compensation mechanisms that are directly in alignment with revision requests currently being pursued by ERCOT staff. The proposed compensation proposal could be included in that overall package of work and help promote that operational direction. While more complex

and not providing as immediate of a reliability benefit, ERCOT believes Option 2 is complementary with Option 1 and is also worthy of consideration by the PUCT. If the Commission is inclined to pursue Options 1 and 2, ERCOT staff would defer to direction from the PUCT on the timing of the implementation of Option 2 to be either concurrent with implementation of Option 1 or at some later time, as each option provides incremental improvements to reliability outcomes while minimizing the need for transmission upgrades to support voltage. It is worth noting that, to the degree the option effectively incentivizes increased reactive capability, the cost to consumers will be higher with Option 2. As such, further discussion and analysis is likely warranted while Option 1 is pursued.

Table 1: Summary of Existing and Proposed Frameworks for VSS Requirements and Compensation Mechanisms

Metric	Current Protocols	Option 1	Option 2
Short Name	Current framework	Compensate IRR IBRs providing VSS when real power output is zero or low	Compensate Resources for "enhanced" VSS
Short Description	Payments only made if ERCOT instructs the Generation Resource to exceed a power factor of 0.95 leading or lagging and the service is provided.	Introduces incremental capability payments to IRR IBRs that are capable of providing VSS when On-Line for hours with zero or low real power output. IRRs that operate under the 10% exclusion or that are not able to maintain dynamic reactive capability at the POIB are not eligible for this capability payment. Also adds a "make-whole" payment for any energy MWh consumption that was necessary to provide the reactive capability for IRR IBRs.	Incrementally adds to the current framework with capability payments to select Resources that provide "enhanced" VSS on top of meeting current 0.95 power factor requirements. This enhanced VSS would include more strict voltage control tolerance bands and would require the fully dynamic reactive capability for compensated Resources. IRRs that operate under the 10% exclusion are not eligible for this capability payment. Generation Resources that are not able to maintain dynamic reactive capability at the POIB are not eligible for this capability payment.
Reactive Capability Payment	None	Periodic payments based on a pre-determined $/MVAr price, capability quantity, and availability metric. The	Periodic payments would be based on a $/MVAr price, capability quantity, and availability metric.

Metric	Current Protocols	Option 1	Option 2
		price would be based on the typical incremental costs to install and maintain the equipment and the incremental cost necessary to provide 24/7 support at the Resource facility for each Resource type. An avoided cost of transmission equipment for equivalent voltage support could be used as a guardrail. Note that there would need to be a mechanism to claw back or reduce payments to Resources that underperform.	The price would be based on the typical incremental costs to install and maintain fully dynamic reactive power equipment and the incremental cost necessary to provide enhanced voltage control at the Resource facility for each Resource type. An estimate of avoided costs of transmission equipment that would provide equivalent voltage support could be used as a guardrail. Note that there would need to be a mechanism to claw back or reduce payments to Resources that underperform.
Provision Payment	$2.65/MVArh for reactive power provided outside of required range	Compensation for response to the instructions that are part of the current framework would remain in place, should those instructions be issued.	Compensation for response to the instructions that are part of the current framework would remain in place, should those instructions be issued.
Other Payment	Lost opportunity payment for any real power reduction directed by ERCOT to provide the additional reactive capability	Compensation for response to the instructions that are part of the current framework would remain in place, should those instructions be issued. Also, compensation would include an energy payment to make the Resource whole for any MWh consumption that was necessary to provide the reactive capability.	Compensation for response to the instructions that are part of the current framework would remain in place, should those instructions be issued. If this option was implemented in addition to Option 1, those make-whole revisions would also remain in place. No new "Other Payments."
Resources Impacted	Payments available to all Resource types	New requirements and compensation as part of this option applies to new and existing IRR IBRs that can	Existing Resources that meet the enhanced requirements, existing Resources that implement changes in order to meet

Metric	Current Protocols	Option 1	Option 2
		meet the identified requirements.	the enhanced requirements, and new Resources that meet the enhanced requirements.
General Comments	No payments have been made since implementation of the rules (approximately 20 years ago).	Only a select set of Generation Resources are eligible for the new "Capability Payment" and additional "Other Payment."	All Generation Resource types could be eligible for the new "Capability Payment."
0.95 Power Factor Lagging/Leading	Not all Generation Resources are required to comply with this standard.	All compensated IRR IBRs would be required to provide reactive capability of a 0.95 power factor leading/lagging or less at all levels of real power output.	All compensated and non-exempted Generation Resources would be required to provide reactive capability of a 0.95 power factor leading/lagging or less at all levels of real power output.
VSS required at all positive MW outputs	Yes	Yes	Yes
VSS at 0 MW Output	Yes, from ESRs and new HVDC Ties only.	Yes, from compensated IRR IBRs, ESRs, and new HVDC Ties. This option requires compensated IRR IBRs to stay On-Line at times of zero real power output and to be ready to provide VSS.	Yes, from compensated IRR IBRs, ESRs, and new HVDC Ties.
.95 Power Factor Lagging and Leading between 0 and 10% Output for IRRs.	No	Yes, for compensated IRR IBRs.	Yes, for compensated IRR IBRs.
For IRRs, a Telemetered Number of Turbines/Inverters for Reactive Support	No	Yes	Yes
Meet Voltage Ride Thru Requirements	Some	Yes	Yes
Static Reactive Must be from Switchable Shunts	No	Yes	Yes
Meet New Reactive Capability Tests below 10% Output	N/A	Yes, for compensated IRR IBRs.	Yes, for compensated IRR IBRs.

Metric	Current Protocols	Option 1	Option 2
Implements Steady State Voltage Control within Enhanced Tolerance Bands	N/A	No	Yes, for compensated Resources
Available to all GRs or ESRs	N/A	No, available only to IRR IBRs that meet requirements.	Yes, for Generation Resources that meet requirements.
Effectiveness in Improving Reliability while Minimizing Transmission Upgrades	N/A	Most effective; recommend Option 1 at a minimum.	Less effective than Option 1 but can complement Option 1 in overall benefit; if PUC adopts Option 2, recommend implementing with Option 1 or after Option 1.

Conclusion

ERCOT appreciates the Commission's consideration of this framework and requests the Commission' feedback on it. Once the Commission provides direction on a mechanism for providing compensation for VSS, ERCOT can develop additional details, including an estimate of program costs. ERCOT is available to answer any questions the Commission may have and stands ready to take other action as directed by the Commission.