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PUC PROJECT NO. 46304

OVERSIGHT PROCEEDING	§	
REGARDING ERCOT MATTERS	§	BEFORE THE
ARISING OUT OF DOCKET NO. 45624	§	
(APPLICATION OF THE CITY OF	§	PUBLIC UTILITY COMMISSION
GARLAND TO AMEND A	§	
CERTIFICATE OF CONVENIENCE	§	OF TEXAS
AND NECESSITY FOR THE RUSK TO	§	
PANOLA DOUBLE-CIRCUIT 345-KV	§	
TRANSMISSION LINE IN RUSK AND	§	
PANOLA COUNTIES)	§	

**ELECTRIC RELIABILITY COUNCIL OF TEXAS’S
TENTH STATUS UPDATE**

Electric Reliability Council of Texas, Inc. (ERCOT) submits this status update pursuant to Paragraph 13 of the Revised Order Creating and Scoping Project issued by the Public Utility Commission of Texas (Commission) in this project on May 23, 2017 (Revised Order), which requires ERCOT to “periodically update the Commission regarding its progress in completing” the tasks set forth in the Revised Order. These tasks arise from the Commission’s May 23, 2017, Order on Rehearing in Commission Docket 45624, which imposes certain conditions on the interconnection of the DC tie project proposed by Southern Cross Transmission, LLC (Southern Cross). ERCOT filed its last status update in this matter on September 10, 2021 and subsequently filed a report on December 6, 2021 pursuant to the order issued by the Commission on November 4, 2021, in this project.

ERCOT has made progress on several directives since the last status update. With respect to directive 6, regarding transmission upgrades, while ERCOT conducted transmission analysis that revealed that upgrades would be needed to accommodate the modeled flows over the Southern Cross DC tie under certain system conditions, ERCOT has determined that no transmission system upgrades are ultimately necessary to manage congestion resulting from power flows over the

Southern Cross DC tie because ERCOT will curtail assumed DC tie flows in transmission planning analysis when necessary to meet reliability criteria as required by approved Planning Guide Revision Request (PGRR) 77, DC Tie Planning Assumptions. In real-time operations, ERCOT can redispatch generation and/or limit flows across the Southern Cross DC tie to manage constraints in real time. ERCOT memorialized the foregoing determinations in its directive 6 whitepaper, which was approved by the Board on April 28, 2022. *See* Attachment A (directive 6 and directive 8 Board presentation, directive 6 ERCOT whitepaper, and signed Board resolution). Accordingly, ERCOT considers directive 6 complete, unless otherwise advised by the Commission.

With respect to that part of directive 8 that concerns voltage support, ERCOT determined that any DC tie facility that has an initial energization date after January 1, 2021, and any DC tie facility that is replaced after that date, should be required to have at least 0.95 power factor leading/lagging reactive power capability, as required by approved NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements and NOGRR234, Related to NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements. Just as a sufficient measure of reactive power capability is needed to support output from Generation Resources, sufficient reactive support is also needed to facilitate injections and withdrawals over DC ties. Because Generation Resources are required to provide a quantity of reactive capability equivalent to a 0.95 power factor, ERCOT proposed in NPRR1098 that new DC ties should be required to provide that same quantity of reactive capability. ERCOT memorialized the foregoing determinations in its directive 8 whitepaper regarding voltage support, which was approved by the Board on April 28, 2022. *See* Attachment B (directive 8 ERCOT whitepaper and signed Board resolution). Accordingly, ERCOT considers directive 8 regarding voltage support complete, unless otherwise

advised by the Commission. And, because the portion of directive 8 regarding primary frequency response was previously completed, ERCOT considers directive 8 now fully complete, unless otherwise advised by the Commission.

As previously reported, ERCOT has completed its work on the following six directives:

- Directive 3, regarding DC tie ramp rate limitations;
- Directive 4, regarding outage coordination;
- Directive 5, regarding planning model assumptions and considerations;
- Directive 7, regarding congestion management;
- Directive 9, regarding ancillary services needs; and
- Directive 10 regarding price formation.

ERCOT is working with stakeholders with respect to the determinations for directives 1, 11, and 12. ERCOT expects to complete its work on these three directives by August 2022. Directives 13 and 14 concern status reporting to the Commission, which ERCOT will continue to provide.

As noted in ERCOT's December 6, 2021 report in this project, the timeline for resolving directive 2—which requires ERCOT to execute a coordination agreement with the appropriate grid operator on the eastern end of the DC tie—remains uncertain, as Southern Cross has not yet notified ERCOT of the location of the eastern end of the DC Tie. ERCOT needs this information to know which entity (or entities) would be an appropriate counterparty to any coordination agreement. Additionally, to avoid waste of ERCOT's limited resources, ERCOT intends to delay its pursuit of this directive until Southern Cross has obtained financing and begun construction of the project.

ERCOT notes that certain directives that have been identified as “complete” will also require further action by Southern Cross as a condition for implementation of the identified policy solution. Specifically, pursuant to the Commission's order in Docket 45624 and a memorandum of understanding (MOU) between ERCOT and Southern Cross based on that order, Southern Cross

must provide funding for required upgrades to ERCOT computer systems as a condition for ERCOT's commencement of the development of those upgrades.

In its December 6, 2021 report filed in this project, ERCOT identified two additional issues that must be resolved prior to the energization of the Southern Cross DC tie. With respect to the first issue, regarding DC tie voltage- and frequency-ride-through capabilities, ERCOT submitted NOGRR240, Direct Current Tie (DC Tie) Ride-Through Requirements, to define voltage- and frequency-ride-through capabilities for new DC ties. This NOGRR would prohibit DC ties from tripping during certain significant voltage or frequency excursions. NOGRR240 was approved by the ERCOT Technical Advisory Committee (TAC) on May 25, 2022 and has been submitted to the Commission for approval in Project 52934.

The second issue concerned whether certain responsibilities allocated to the DC Tie Operator in NPRR857 and NOGRR177 should more appropriately be assigned to the owners of DC tie facilities. ERCOT has submitted NPRR1133, Clarify Responsibilities for submission of Planning Model Data for DC Ties, and PGRR101, Related to NPRR1133, Clarify Responsibilities for submission of Planning Model Data for DC Ties, to clarify the respective obligations of owners and operators of DC tie facilities with respect to certain modeling activities. Subject to the timing of the stakeholder process, ERCOT expects it will be able to submit these revision requests to the Commission for approval by August 2022.

In summary, ERCOT staff, Southern Cross, and various ERCOT stakeholder groups continue to work diligently on the issues raised in the Commission's directives, and ERCOT expects continued progress on these directives.

ERCOT is pleased to provide any additional information the Commission may request regarding the status of this project.

Respectfully,

/s/ Nathan Bigbee

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ATTORNEYS FOR ELECTRIC
RELIABILITY COUNCIL OF TEXAS, INC.

**Item 12: ERCOT Recommendations to PUC
Project No. 46304, Oversight Proceeding
Regarding ERCOT Matters Arising Out of
PUC Docket No. 45624 Relating to DC Tie
Project Proposed by Southern Cross
Transmission, LLC**



Janice Ayson
Lead Strategic Advisor

John Bernecker
Manager, Transmission Planning Assessment

Board of Directors Meeting

ERCOT Public
April 28, 2022

Overview

- Background of Project and PUCT Directives
- Process to review and make recommendation on Directives
- Consideration of Directive 6 – Transmission Upgrades
- Consideration of Directive 8 – Voltage Support
- Next Steps
- Appendix
 - List of PUCT Order 46304 Directives and Status

Background of Project and PUCT Directives

- Southern Cross Transmission LLC (SCT) /Pattern Power Marketing LLC received FERC approval (FERC Docket No. TX 11-1-001) to interconnect DC Tie line.
- PUCT imposed conditions for interconnection of the SCT DC Tie line in two PUCT proceedings:
 - City of Garland CCN docket – Docket No. 45624
 - Oversight proceeding arising out of City of Garland docket – Project No. 46304
- As part of the oversight proceeding, PUCT issued 14 Directives to ERCOT, requiring certain studies and determinations be made to accommodate the SCT DC Tie.
- ERCOT began work with Stakeholders on the 14 Directives in 2017.

The bi-directional SCT Project can deliver up to 2,000 MW of economic energy and reliability products in either direction



Market Stakeholder Process Summary

Working
Groups

ERCOT's engagement with experts in non-voting Working Groups or Workshops
Capture key assumptions and solutions in whitepapers and/or Revision Requests

At the direction of TAC/ROS/WMS, ERCOT has engaged the appropriate working groups to brainstorm and assist ERCOT staff in reaching determinations for the issues raised in each Directive.



Sub-
committee

Take determinations to appropriate voting body (ROS, WMS, PRS) for endorsement

Whitepapers presented to relevant subcommittees for endorsement. Stakeholder comments posted on ercot.com along with other documents relevant to work on Directives.



TAC

Determination on Directive presented to Technical Advisory Committee (TAC)

TAC has the option to vote to endorse a determination on a Directive.



Board

Determination on Directive presented to ERCOT Board of Directors

ERCOT Board has the option to vote to approve a determination on a Directive.



Request for Vote to Accept ERCOT Determination

Directive 6

“ERCOT shall study and determine what transmission upgrades, if any, are necessary to manage congestion resulting from power flows over the Southern Cross DC tie, make any necessary revisions to its standards, guides, systems, and protocols as appropriate, and certify to the Commission when it has completed these actions. ”

Directive 6 Determination

While ERCOT studies revealed that upgrades would be needed to accommodate the modeled flows over the Southern Cross DC Tie under certain system conditions, ERCOT has determined that no transmission system upgrades are ultimately necessary to manage congestion resulting from power flows over the Southern Cross DC Tie. This is because PGRR077, DC Tie Planning Assumptions, which was approved by the ERCOT Board in October 2020, requires ERCOT to curtail assumed DC Tie flows in transmission planning analysis when necessary to meet reliability criteria. ERCOT expects that it may need to redispatch generation and/or limit flows across the Southern Cross DC Tie to manage constraints in real time.

Supporting Details for Determination on Directive 6

Basis for Determination

- ERCOT transmission analysis conducted in 2019, revealed that upgrades would be needed to accommodate the modeled flows over the Southern Cross DC Tie under certain system conditions.
- PGRR077, DC Tie Planning Assumptions, approved by the ERCOT Board in October 2020 requires ERCOT to curtail assumed DC Tie flows in transmission planning analysis, when necessary, to meet reliability criteria.
- Consequently, ERCOT's future transmission planning studies will not identify any reliability-based need for transmission upgrades following the interconnection of the SCT DC Tie.
- Additionally, ERCOT's Directive 7 determination shows that existing operational and market mechanisms can be used to manage congestion due to flows over the SCT DC Tie including ERCOT's ability to curtail the import or export to the extent necessary to operate the system within its limits.
- **ROS endorsed ERCOT Staff's determination on March 3, 2022.**
- **TAC endorsed ERCOT Staff's determination on April 13, 2022.**

Determination on Directive 6

ERCOT staff recommends that the Board accept ERCOT staff's determination that, in order to accommodate the Southern Cross Direct Current (DC) Tie: (1) no transmission system upgrades are necessary to manage congestion resulting from power flows over the Southern Cross DC Tie because ERCOT will curtail assumed DC Tie flows in transmission planning analysis when necessary to meet reliability criteria, as required by approved PGRR77, DC Tie Planning Assumptions; and (2) ERCOT expects that it may need to redispatch generation and/or limit flows across the Southern Cross DC Tie to manage constraints in real time.

<VOTE>

Request for Vote to Accept ERCOT Determination

Directive 8

“ERCOT shall (a) study and determine whether Southern Cross Transmission or any other entity scheduling flows across the Southern Cross DC tie should be required to provide or procure voltage support service or primary frequency response, or their technical equivalents, (b) implement any necessary revisions to its standards, guides, systems, and protocols, as appropriate, and (c) certify to the Commission when it has completed these actions.”

Note: This determination concerns only the voltage support service portion of Directive 8. ERCOT’s determination for Directive 8 related to Primary Frequency Response (PFR) was approved by ERCOT Board on 08/07/2018.

Request for Vote to Accept ERCOT Determination

Directive 8 Determination

To accommodate the Southern Cross DC Tie, any DC Tie facility that has an initial energization date after January 1, 2021, and any DC Tie facility that is replaced after that date, should be required to have at least 0.95 power factor leading/lagging reactive power capability. NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements and NOGRR234, Related to NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements, which were approved by the Public Utility Commission on March 31, 2022, revised the Protocols and Operating Guide to require that new or replaced DC Tie facilities shall have at least 0.95 power factor leading/lagging reactive power capability.

Supporting Details for Determination on Directive 8 regarding Voltage Support Service

Basis for Determination

- NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements and NOGRR234, Related to NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements, approved by the PUCT on March 31, 2022, revised Protocols and Operating Guide to require that new or replaced DC Tie facilities shall have at least 0.95 power factor leading/lagging reactive power capability.
- ERCOT's study performed pursuant to PUCT Directive 6 regarding transmission upgrades needed to address congestion, identified a voltage stability limit for exports of 1,289 MW during high-wind, low-load conditions, which would require the installation of additional reactive capability to accommodate exports in excess of that amount during those conditions.
- ERCOT's study noted that, if the Southern Cross DC Tie provided the equivalent of 0.95 power factor leading and lagging reactive power capability, fewer transmission upgrades would be needed to achieve full export capability under the studied conditions.
- **ROS endorsed ERCOT Staff's determination on March 3, 2022.**
- **TAC endorsed ERCOT Staff's determination on April 13, 2022.**

Determination on Directive 8 regarding Voltage Support Service

ERCOT staff recommends that the Board accept ERCOT staff's determination that in order to accommodate the Southern Cross DC Tie: (1) any DC Tie facility that has an initial energization date after January 1, 2021, and any DC Tie facility that is replaced after that date, should be required to have at least 0.95 power factor leading/lagging reactive power capability, as required by approved NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements and NOGRR234, Related to NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements; (2) no further action is necessary to resolve Directive 8 regarding voltage support service.

<VOTE>

Next steps

- ERCOT staff will continue to provide periodic updates to the PUCT on the status of these Directives.
- ERCOT staff will continue to work with stakeholders on the remaining Directives.
- Webpage on [ercot.com](http://www.ercot.com/mktrules/puctDirectives/southernCross) tracks work on these Directives:
<http://www.ercot.com/mktrules/puctDirectives/southernCross>

Appendix

List of PUCT Order 46304 Directives

Directive	Subject	Anticipated Start
1	Determination of appropriate Market Participant category and market segment for SCT.	In Progress
2	Execution of any necessary coordination agreements.	Not Started
3	Determination regarding ramp rate restrictions.	Complete
4	Development of methodology for outage coordination.	Complete
5	Determination of planning model assumptions and considerations.	Complete
6	Determination regarding any needed transmission upgrades.	In Progress
7	Determination as to how to manage congestion caused by DC Ties.	Complete

List of PUCT Order 46304 Directives (continued)

Directive	Subject	Anticipated Start
8	Determination regarding Primary Frequency Response and Voltage Support Service.	In Progress
9	Determination regarding modifications to Ancillary Services.	Complete
10	Determination regarding price formation under emergency conditions.	Complete
11	Determination regarding allocation of costs identified in PUCT Docket No. 45624.	June 2022
12	Determination regarding possible assignment of export-related costs to Qualified Scheduling Entities (QSEs).	June 2022
13	ERCOT reporting of status of work on Directives to PUCT.	Ongoing
14	ERCOT updates to PUCT regarding completion dates for Directives 1 to 12.	Ongoing



Date: April 21, 2022
To: Board of Directors
From: John Bernecker, Manager, Transmission Planning Assessment
Subject: ERCOT Recommendations to PUC Project No. 46304, Oversight Proceeding Regarding ERCOT Matters Arising Out of PUC Docket No. 45624 Relating to DC Tie Project Proposed by Southern Cross Transmission, LLC, (Southern Cross) Directive 6 – ERCOT Determination Regarding Transmission Upgrades

Issue for the ERCOT Board of Directors

ERCOT Board of Directors Meeting Date: April 28, 2022

Item No.: 12.1

Issue:

Whether the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) should vote to accept ERCOT staff's determination that, in order to accommodate the Southern Cross Direct Current (DC) Tie: (1) no transmission system upgrades are necessary to manage congestion resulting from power flows over the Southern Cross DC Tie because ERCOT will curtail assumed DC Tie flows in transmission planning analysis when necessary to meet reliability criteria, as required by approved Planning Guide Revision Request (PGRR) 77, DC Tie Planning Assumptions; and (2) ERCOT expects that it may need to redispatch generation and/or limit flows across the Southern Cross DC Tie to manage constraints in real time.

Background/History:

In PUC Project No. 45624, the Public Utility Commission of Texas (PUCT) issued an Order that approved the City of Garland's application for a certificate of convenience and necessity (CCN) to build a new 38-mile-long, 345-kV transmission line connecting the proposed 2,000 MW Southern Cross DC Tie to ERCOT. In the Order, the PUCT also imposed certain conditions on the interconnection of the Southern Cross DC Tie. The PUCT then opened PUC Project No. 46304, and on May 23, 2017 it issued a Revised Order in that project that directed ERCOT to complete a number of tasks set forth in 14 different Directives.

The Directives require ERCOT to study various issues related to the new DC Tie and make determinations as to whether any actions need to be taken by ERCOT in order to accommodate the new DC Tie. ERCOT staff has been working with stakeholders and Southern Cross since mid-2017 to complete the tasks set forth in the Directives. Discussions on the Directives have been taking place in the relevant working groups and subcommittees of the Technical Advisory Committee (TAC) to assist ERCOT staff in reaching resolutions on the discrete issues raised in each Directive, and these discussions are expected to continue until all of the issues raised in the Directives are fully resolved.



For each Directive, ERCOT staff will propose one or more determinations for stakeholder review and comment, along with any Revision Requests needed to address the Directive and will seek stakeholder endorsement of the determination at relevant working groups, subcommittees, TAC, and the Board.

This particular determination concerns Directive 6, which requires that ERCOT:

“...shall study and determine what transmission upgrades, if any, are necessary to manage congestion resulting from power flows over the Southern Cross DC tie, make any necessary revisions to its standards, guides, systems, and protocols as appropriate, and certify to the Commission when it has completed these actions.”

Discussions with stakeholders regarding this issue occurred at the following meetings: Regional Planning Group (RPG) on 4/24/2018, 11/27/2018, 1/22/2019, 2/19/2019, and 3/13/2019; Planning Working Group (PLWG) on 2/15/2022; Reliability and Operations Subcommittee (ROS) on 3/3/2022; and TAC on 4/13/2022. ERCOT staff prepared a whitepaper setting forth its determination and considerations relevant to that resolution, which was presented for discussion and endorsement at these meetings.

ERCOT's process for making the determination was to conduct a transmission analysis to determine the ability of the transmission system in the area of the Southern Cross DC Tie to support assumed imports and exports across the tie. The analysis was conducted in 2019 following conditions determined through stakeholder consultation. The study report and an addendum are posted on ERCOT's website.

ERCOT's transmission analysis yielded the following conclusions:

- For imports during summer peak conditions, thermal limits were reached before voltage stability limits. The transmission system was able to accommodate an import level of approximately 547 MW before thermal overloads were observed. This value was in excess of the assumed 350 MW import value. For purposes of real-time operations, ERCOT expects that it would need to redispatch generation and/or limit flows across the Southern Cross DC Tie if the actual import level exceeds the level analyzed in the study.
- For high wind, low load conditions, exports across the Southern Cross DC Tie would be limited to 1,289 MW by voltage stability constraints. Without transmission system upgrades, ERCOT expects that exports across the Southern Cross DC Tie would need to be limited to manage the voltage stability constraints identified.
- The cost of transmission upgrades needed to resolve the voltage stability constraint associated with exports was estimated to be \$182-205 million.
- Fewer transmission upgrades would be needed to achieve full export capability under the studied conditions if the Southern Cross DC Tie provided the equivalent of 0.95 power factor leading and lagging reactive power capability, as proposed in NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements, which ERCOT submitted to resolve Directive 8. If Southern Cross were required to provide reactive power capability equivalent to a 0.95 power factor, the cost of

transmission upgrades needed to resolve the stability constraint associated with exports was estimated to be \$70-123 million.

- The transmission system would experience angular instability at assumed full import conditions (2,000 MW). Additionally, under summer peak conditions, the transmission system would experience instability at an import level of 1,375 MW for the contingency loss of a double-circuit transmission line. While thermal constraints would be most binding for imports, if those constraints were relieved, stability limits would limit imports across the Southern Cross DC Tie at the levels assumed for the study. Actual stability limits could be lower than those resulting from the study and could be managed in real time by curtailing the Southern Cross DC Tie or creating a Generic Transmission Constraint (GTC).

The cost of the incremental transmission upgrades that would resolve the angular stability limits was estimated to be \$161-360 million. ERCOT's studies considered the operational impacts of a loss of the Southern Cross DC Tie when importing up to its maximum import capability of 2,000 MW and when exporting up to its maximum export capability of 2,100 MW.

Following ERCOT's completion of the Directive 6 transmission analysis, ERCOT submitted PGRR077. This PGRR, which was approved by the Board on October 13, 2020, clarifies that ERCOT will curtail assumed DC Tie flows in its transmission planning studies when necessary to meet reliability criteria. Consequently, ERCOT's future transmission planning studies will not identify any reliability-based need for transmission upgrades following the interconnection of the Southern Cross DC Tie, notwithstanding the results of ERCOT's Directive 6 study.

Key Factors Influencing Issue:

- PGRR077 clarifies that ERCOT will curtail assumed DC Tie flows in its transmission planning studies when necessary to meet reliability criteria. Consequently, ERCOT's future transmission planning studies will not identify any reliability-based need for transmission upgrades following the interconnection of the Southern Cross DC Tie, notwithstanding the results of ERCOT's Directive 6 study.
- ERCOT's determination related to Directive 7, Congestion Management, notes that existing operational and market mechanisms can be used to manage congestion due to flows over the Southern Cross DC Tie, including ERCOT's ability to issue a DC Tie Curtailment Notice and curtail the import or export of the DC Tie to the extent necessary to operate the system within its limits.
- ERCOT expects that it may need to redispatch generation and/or limit flows across the Southern Cross DC tie to manage constraints in real time.

Conclusion/Recommendation:

While ERCOT studies revealed that upgrades would be needed to accommodate the modeled flows over the Southern Cross DC Tie under certain system conditions, ERCOT has determined that no transmission system upgrades are ultimately necessary to manage congestion resulting from power flows over the Southern Cross DC Tie because ERCOT will curtail assumed DC Tie flows in transmission planning analysis when



necessary to meet reliability criteria as required by approved PGRR77. In real-time operations, ERCOT can redispatch generation and/or limit flows across the Southern Cross DC Tie to manage constraints in real time.

ERCOT staff recommends that the Board accept ERCOT staff's determination that, in order to accommodate the Southern Cross DC Tie: (1) no transmission system upgrades are necessary to manage congestion resulting from power flows over the Southern Cross DC Tie because ERCOT will curtail assumed DC Tie flows in transmission planning analysis when necessary to meet reliability criteria, as required by approved PGRR77; and (2) ERCOT expects that it may need to redispatch generation and/or limit flows across the Southern Cross DC Tie to manage constraints in real time.



ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.
BOARD OF DIRECTORS RESOLUTION

WHEREAS, the Public Utility Commission of Texas (PUCT) issued a Revised Order (Revised Order) on May 23, 2017, in PUCT Project No. 46304 that contains 14 Directives requiring Electric Reliability Council of Texas, Inc. (ERCOT) to study certain issues related to the proposed Southern Cross Transmission, LLC (Southern Cross) DC Tie and make determinations as to whether certain actions must be taken by ERCOT in order to accommodate the Southern Cross DC Tie;

WHEREAS, Directive 6 of the Revised Order requires that ERCOT evaluate what modifications to transmission upgrades, if any, are necessary to manage congestion resulting from power flows over the Southern Cross DC Tie, implement any needed modifications to its standards, guides, system and protocols as appropriate, and certify to the Commission when it has completed these actions;

WHEREAS, approved Planning Guide Revision Request (PGRR) 077, DC Tie Planning Assumptions, was implemented and revised the Planning Guide to make clear that ERCOT will curtail DC Tie flows in transmission planning analysis when necessary to meet reliability criteria;

WHEREAS, ERCOT staff has determined that no transmission system upgrades are necessary to manage congestion resulting from power flows over the Southern Cross DC Tie because ERCOT will curtail assumed DC Tie flows in transmission planning analysis when necessary to meet reliability criteria, as required by approved PGRR77;

WHEREAS, ERCOT expects that it may need to redispatch generation and/or limit flows across the Southern Cross DC Tie to manage constraints in real time; and

WHEREAS, after due consideration of the alternatives, the Board deems it desirable and in the best interest of ERCOT to accept ERCOT staff's determination;

THEREFORE, BE IT RESOLVED, that the Board hereby accepts ERCOT staff's determination that, to accommodate the Southern Cross DC Tie: (1) no transmission system upgrades are necessary to manage congestion resulting from power flows over the Southern Cross DC Tie because ERCOT will curtail assumed DC Tie flows in transmission planning analysis when necessary to meet reliability criteria, as required by approved PGRR77; and (2) ERCOT expects that it may need to redispatch generation and/or limit flows across the Southern Cross DC Tie to manage constraints in real time.



CORPORATE SECRETARY'S CERTIFICATE

I, Jonathan M. Levine, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its April 28, 2022, meeting, the ERCOT Board passed a motion approving the above Resolution by _____.

IN WITNESS WHEREOF, I have hereunto set my hand this ____ day of April 2022.

Jonathan M. Levine
Assistant Corporate Secretary



ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.
BOARD OF DIRECTORS RESOLUTION

WHEREAS, the Public Utility Commission of Texas (PUCT) issued a Revised Order (Revised Order) on May 23, 2017, in PUCT Project No. 46304 that contains 14 Directives requiring Electric Reliability Council of Texas, Inc. (ERCOT) to study certain issues related to the proposed Southern Cross Transmission, LLC (Southern Cross) DC Tie and make determinations as to whether certain actions must be taken by ERCOT in order to accommodate the Southern Cross DC Tie;

WHEREAS, Directive 6 of the Revised Order requires that ERCOT evaluate what modifications to transmission upgrades, if any, are necessary to manage congestion resulting from power flows over the Southern Cross DC Tie, implement any needed modifications to its standards, guides, system and protocols as appropriate, and certify to the Commission when it has completed these actions;

WHEREAS, approved Planning Guide Revision Request (PGRR) 077, DC Tie Planning Assumptions, was implemented and revised the Planning Guide to make clear that ERCOT will curtail DC Tie flows in transmission planning analysis when necessary to meet reliability criteria;

WHEREAS, ERCOT staff has determined that no transmission system upgrades are necessary to manage congestion resulting from power flows over the Southern Cross DC Tie because ERCOT will curtail assumed DC Tie flows in transmission planning analysis when necessary to meet reliability criteria, as required by approved PGRR77;

WHEREAS, ERCOT expects that it may need to redispatch generation and/or limit flows across the Southern Cross DC Tie to manage constraints in real time; and

WHEREAS, after due consideration of the alternatives, the Board deems it desirable and in the best interest of ERCOT to accept ERCOT staff's determination;

THEREFORE, BE IT RESOLVED, that the Board hereby accepts ERCOT staff's determination that, to accommodate the Southern Cross DC Tie: (1) no transmission system upgrades are necessary to manage congestion resulting from power flows over the Southern Cross DC Tie because ERCOT will curtail assumed DC Tie flows in transmission planning analysis when necessary to meet reliability criteria, as required by approved PGRR77; and (2) ERCOT expects that it may need to redispatch generation and/or limit flows across the Southern Cross DC Tie to manage constraints in real time.



CORPORATE SECRETARY'S CERTIFICATE

I, Jonathan M. Levine, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its April 28, 2022, meeting, the ERCOT Board passed a motion approving the above Resolution by unanimous voice vote with no abstentions.

IN WITNESS WHEREOF, I have hereunto set my hand this 18th day of May, 2022.

A handwritten signature in dark ink, appearing to read "Jonathan M. Levine", written over a horizontal line.

Jonathan M. Levine
Assistant Corporate Secretary



Date: April 21, 2022
To: Board of Directors
From: John Bernecker, Manager, Transmission Planning Assessment
Subject: ERCOT Recommendations to PUC Project No. 46304, Oversight Proceeding Regarding ERCOT Matters Arising Out of PUC Docket No. 45624 Relating to DC Tie Project Proposed by Southern Cross Transmission, LLC, (Southern Cross) Directive 8 – ERCOT Determination Regarding Voltage Support Service

Issue for the ERCOT Board of Directors

ERCOT Board of Directors Meeting Date: April 28, 2022

Item No.: 12.2

Issue:

Whether the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) should accept ERCOT staff's determination that, in order to accommodate the Southern Cross Direct Current (DC) Tie: (1) any DC Tie facility that has an initial energization date after January 1, 2021, and any DC Tie facility that is replaced after that date, should be required to have at least 0.95 power factor leading/lagging reactive power capability, as required by approved Nodal Protocol Revision Request (NPRR) 1098, Direct Current tie (DC tie) Reactive Power Capability Requirements, and Nodal Operating Guide Revision Request (NOGRR) 234, Related to Direct Current tie (DC tie) Reactive Power Capability Requirements; and (2) no other necessary changes to Voltage Support Service are needed.

Background/History:

In PUC Project No. 45624, the Public Utility Commission of Texas (PUCT) issued an Order that approved the City of Garland's application for a certificate of convenience and necessity (CCN) to build a new 38-mile-long, 345-kV transmission line connecting the proposed 2,000 MW Southern Cross DC Tie to ERCOT. In the Order, the PUCT also imposed certain conditions on the interconnection of the Southern Cross DC Tie. The PUCT then opened PUC Project No. 46304, and on May 23, 2017 it issued a Revised Order in that project that directed ERCOT to complete a number of tasks set forth in 14 different Directives.

The Directives require ERCOT to study various issues related to the new DC Tie and make determinations as to whether any actions need to be taken by ERCOT in order to accommodate the new DC Tie. ERCOT staff has been working with stakeholders and Southern Cross since mid-2017 to complete the tasks set forth in the Directives. Discussions on the Directives have been taking place in the relevant working groups and subcommittees of the Technical Advisory Committee (TAC) to assist ERCOT staff in reaching resolutions on the discrete issues raised in each Directive, and these discussions are expected to continue until all of the issues raised in the Directives are fully resolved.

For each Directive, ERCOT staff will propose one or more determinations for stakeholder review and comment, along with any Revision Requests needed to address the Directive and will seek stakeholder endorsement of the determination at relevant working groups, subcommittees, TAC, and the Board.

This particular determination concerns whether Southern Cross should be required to provide some form of voltage support service. This issue was raised by the PUCT in Directive 8, which requires that ERCOT:

“...shall (a) study and determine whether Southern Cross Transmission or any other entity scheduling flows across the Southern Cross DC tie should be required to provide or procure voltage support service or primary frequency response, or their technical equivalents, (b) implement any necessary revisions to its standards, guides, systems, and protocols, as appropriate, and (c) certify to the Commission when it has completed these actions.”

Discussions with stakeholders regarding this issue occurred at the following meetings: Regional Planning Group (RPG) on 4/24/2018, 11/27/2018, 1/22/2019, 2/19/2019, and 3/13/2019; Reliability and Operations Subcommittee (ROS) on 12/3/2020; 3/3/2022; Operations Working Group on 2/17/2022; and TAC on 01/20/2021, 04/13/2022.

ERCOT staff prepared a whitepaper setting forth its determination and considerations relevant to that resolution, which was presented for discussion and endorsement at these meetings.

ERCOT's process for making the determination included transmission analysis to determine the ability of the transmission system in the area of the Southern Cross DC Tie to support assumed imports and exports across the tie. The analysis was conducted in 2019 following conditions determined through stakeholder consultation.

The Southern Cross DC Tie facility was not originally designed to have any reactive power capability to support ERCOT system voltage. However, any level of imports and exports over a DC Tie will cause reactive losses on the ERCOT system. ERCOT's study noted that, if the Southern Cross DC Tie provided the equivalent of 0.95 power factor leading and lagging reactive power capability, fewer transmission upgrades would be needed to achieve full export capability under the studied conditions.

Note: This recommendation concerns only the issue of voltage support service in Directive 8. Resolution of the issue of Primary Frequency Response (PFR), also part of Directive 8, was approved by ERCOT Board on August 7, 2018.

Key Factors Influencing Issue:

- ERCOT's study performed pursuant to PUCT Directive 6 (regarding transmission upgrades needed to address congestion) identified a voltage stability limit for exports of 1,289 MW during high-wind, low-load conditions, which would require

the installation of additional reactive capability to accommodate exports in excess of that amount during those conditions.

- ERCOT currently requires Generation Resources and Energy Storage Resources to provide voltage support. Specifically, with certain specified exceptions, Section 3.15 of the ERCOT Protocols requires Generation Resources and Energy Storage Resources to provide leading and lagging reactive capability equivalent to a 0.95 power factor.
- It is expected that this standard amount of reactive capability will not always perfectly match the amount of reactive capability needed to accommodate the Resource's real power injections or withdrawals. Nevertheless, a Generation Resource's or Energy Storage Resource's obligation remains the same for the life of the asset, even though the grid is always changing.
- Flows across DC Ties are similar to power injections or withdrawals from Generation Resources and Energy Storage Resources.
- As such, ERCOT concluded that it is appropriate to require DC Ties to provide voltage support under a similar paradigm as that currently used for Generation Resources and Energy Storage Resources.

Conclusion/Recommendation:

ERCOT staff recommends that the Board accept ERCOT staff's determination that, in order to accommodate the Southern Cross DC Tie: (1) any DC Tie facility that has an initial energization date after January 1, 2021, and any DC Tie facility that is replaced after that date, should be required to have at least 0.95 power factor leading/lagging reactive power capability, as required by approved NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements and NOGRR234, Related to NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements; and (2) no other necessary changes to Voltage Support Service are needed.



ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.
BOARD OF DIRECTORS RESOLUTION

WHEREAS, the Public Utility Commission of Texas (PUCT) issued a Revised Order (Revised Order) on May 23, 2017, in PUCT Project No. 46304 that contains 14 Directives requiring Electric Reliability Council of Texas, Inc. (ERCOT) to study certain issues related to the proposed Southern Cross Transmission, LLC (Southern Cross) DC Tie and make determinations as to whether certain actions must be taken by ERCOT in order to accommodate the Southern Cross DC Tie;

WHEREAS, Directive 8 of the Revised Order requires, in part, that ERCOT evaluate what and determine whether the Southern Cross DC Tie should be required to provide or procure voltage support service and whether any revisions to ERCOT Protocols or Binding Documents (OBDs) are necessary to effectuate that determination;

WHEREAS, ERCOT staff, after discussions with stakeholders, have determined that Nodal Protocol Revision Request (NPRR) 1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements, and Nodal Operating Guide Revision Request (NOGRR) 234, Related to NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements, which were approved by the Public Utility Commission on March 31, 2022, provide the revisions to ERCOT rules necessary to accommodate the Southern Cross DC Tie; and

WHEREAS, after due consideration of the alternatives, the Board deems it desirable and in the best interest of ERCOT to accept ERCOT staff's determination;

THEREFORE, BE IT RESOLVED, that the Board hereby accepts ERCOT staff's determination that, to accommodate the Southern Cross DC Tie: (1) any DC Tie facility that has an initial energization date after January 1, 2021, and any DC Tie facility that is replaced after that date, should be required to have at least 0.95 power factor leading/lagging reactive power capability, as required by approved NPRR1098 and NOGRR234; and (2) no other necessary changes to Voltage Support Service are needed.



CORPORATE SECRETARY'S CERTIFICATE

I, Jonathan M. Levine, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its April 28, 2022, meeting, the ERCOT Board passed a motion approving the above Resolution by_____.

IN WITNESS WHEREOF, I have hereunto set my hand this ____ day of April 2022.

Jonathan M. Levine
Assistant Corporate Secretary



ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.
BOARD OF DIRECTORS RESOLUTION

WHEREAS, the Public Utility Commission of Texas (PUCT) issued a Revised Order (Revised Order) on May 23, 2017, in PUCT Project No. 46304 that contains 14 Directives requiring Electric Reliability Council of Texas, Inc. (ERCOT) to study certain issues related to the proposed Southern Cross Transmission, LLC (Southern Cross) DC Tie and make determinations as to whether certain actions must be taken by ERCOT in order to accommodate the Southern Cross DC Tie;

WHEREAS, Directive 8 of the Revised Order requires, in part, that ERCOT evaluate what and determine whether the Southern Cross DC Tie should be required to provide or procure voltage support service and whether any revisions to ERCOT Protocols or Binding Documents (OBDs) are necessary to effectuate that determination;

WHEREAS, ERCOT staff, after discussions with stakeholders, have determined that Nodal Protocol Revision Request (NPRR) 1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements, and Nodal Operating Guide Revision Request (NOGRR) 234, Related to NPRR1098, Direct Current Tie (DC Tie) Reactive Power Capability Requirements, which were approved by the Public Utility Commission on March 31, 2022, provide the revisions to ERCOT rules necessary to accommodate the Southern Cross DC Tie; and

WHEREAS, after due consideration of the alternatives, the Board deems it desirable and in the best interest of ERCOT to accept ERCOT staff's determination;

THEREFORE, BE IT RESOLVED, that the Board hereby accepts ERCOT staff's determination that, to accommodate the Southern Cross DC Tie: (1) any DC Tie facility that has an initial energization date after January 1, 2021, and any DC Tie facility that is replaced after that date, should be required to have at least 0.95 power factor leading/lagging reactive power capability, as required by approved NPRR1098 and NOGRR234; and (2) no other necessary changes to Voltage Support Service are needed.



CORPORATE SECRETARY'S CERTIFICATE

I, Jonathan M. Levine, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its April 28, 2022, meeting, the ERCOT Board passed a motion approving the above Resolution by unanimous voice vote with no abstentions.

IN WITNESS WHEREOF, I have hereunto set my hand this 18th day of May, 2022.



Jonathan M. Levine
Assistant Corporate Secretary