



**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.

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Jonathan M. Levine  
Assistant Corporate Secretary