



PUC Project No. 46304
Oversight Relating to the Southern Cross Transmission (SCT) DC Tie
Planning Studies for Transmission Upgrades (Directive 6)

Date: 03/03/2022

Market stakeholder input: RPG 04/24/2018, RPG 11/27/2018, RPG 01/22/2019, RPG 02/19/2019, RPG 03/13/2019

Directive #6 – Planning Studies for Transmission Upgrades	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.
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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.

Technical reasons for determination

In 2019, ERCOT conducted 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. ERCOT analyzed the following conditions after consulting with stakeholders:

- 350 MW Southern Cross DC Tie import during summer peak conditions
- 2,100 MW Southern Cross DC Tie export during high wind, low load conditions
- Sensitivity analysis evaluating dynamic stability for full import and export conditions on the Southern Cross DC Tie
- Sensitivity analysis evaluating dynamic stability assuming the proposed Southern Cross DC Tie was importing 1,375 MW during summer peak conditions based on the consideration of the Most Severe Single Contingency (MSSC)
- Impact of the Southern Cross DC Tie providing the equivalent of 0.95 power factor leading and lagging reactive capability, which is related to Directive 8

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.

Following ERCOT's completion of the Directive 6 transmission analysis, ERCOT submitted PGRR077, DC Tie Planning Assumptions. This PGRR, which was approved by the ERCOT Board in October 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.

As noted in the determination on Directive 7 approved by the ERCOT Board on February 11, 2020, 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's transmission analysis identified various transmission improvement options to accommodate full imports and exports across the Southern Cross DC tie under the conditions studied and assuming the physical characteristics of the Southern Cross DC Tie that were provided to ERCOT at the time of the study. If for any reason transmission upgrades were required to be made (notwithstanding PGRR077), ERCOT would need to conduct additional studies using expected system conditions updated from those used for the 2019 study and the latest information about the technology to be used in the Southern Cross DC Tie, in order to develop a recommendation on transmission upgrades.