Date: April 11, 2023
To: Board of Directors
From: Bob Flexon, Reliability and Markets (R&M) Committee Chair
Subject: Real-Time Market Price Correction – Generic Transmission Constraint (GTC) Calculation Error

<u>**Issue for the ERCOT Board of Directors**</u>

<u>**ERCOT Board of Directors Meeting Date:**</u> April 18, 2023
<u>**Item No.:**</u> 10.2

<u>**Issue:**</u>
Pursuant to paragraph (7) of Protocol Section 6.3, Adjustment Period and Real-Time Operations Timeline, whether the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) should approve price corrections for Real-Time Locational Marginal Prices (RTLMPs), Real-Time Settlement Point Prices (RTSPPs), Real-Time Price for Energy Metered for Resources (RTRMPRs), and Real-Time Price for Energy Metered for Settlement Only Generators (RTESOGPRs) for certain Settlement Intervals on Operating Day (OD) February 5, 2023, that were affected by a software calculation error for the flow on the Valley Export (VALEXP) GTC.

<u>**Background/History:**</u>
ERCOT staff has identified the need to correct prices in the Real-Time Market (RTM) for certain Settlement Intervals on OD February 5, 2023. The impacted prices include:
- RTLMPs;
- RTSPPs;
- RTRMPRs; and
- RTESOGPRs

The ERCOT Protocols require ERCOT to correct prices when invalid prices are identified in an otherwise valid market solution. If ERCOT determines that prices are erroneous, ERCOT must correct the prices before they are final. Prices are final at 1600 on the second Business Day following the OD. However, if ERCOT determines that prices are erroneous and need correction after they are final, then ERCOT shall seek Board review of such prices provided that, within 30 days of the OD, ERCOT notifies Market Participants of the need for correction and that ERCOT intends to seek Board approval of the correction.

The Board may review and change prices if the impact of the price correction is determined to be significant, as defined in the Protocols, and the Board finds that such prices should be corrected for an OD. The Board may rely on the following reasons to find that prices should be corrected:

- <u>Data Input Error</u>: Missing, incomplete, stale, or incorrect versions of one or more data elements input to the market applications may result in an invalid market solution and/or prices.

- <u>Data Output Error</u>: These include: (i) incorrect or incomplete data transfer, (ii) price recalculation error in post-processing, and (iii) Base Points inconsistent with prices due to the Emergency Base Point flag remaining activated even when the Security-Constrained Economic Dispatch (SCED) solution is valid.

- <u>Hardware/Software Error</u>: These include unpredicted hardware or software failures, planned market system or database outages, planned application or database upgrades, software implementation errors, and failure of the market run to complete.

- <u>Inconsistency with the Protocols or Public Utility Commission of Texas (PUCT) Substantive Rules</u>: Pricing errors may occur when specific circumstances result in prices that are in conflict with such Protocol language or the PUCT Substantive Rules.

See ERCOT Protocol Sections 6.3(4) – (7).

At 21:20 on February 5, 2023, the VALEXP GTC began binding on a flow opposite the direction defined by the VALEXP GTC methodology, resulting in incorrect congestion management including incorrect prices in Real-Time.

The Transmission Constraint Manager (TCM) was passing the absolute value of the flow on the GTC to the SCED engine. This software behavior is specifically designed for thermal constraints due to the flow on thermal constraints needing to be managed in both directions. This bidirectional constraint management works by taking the absolute value of the flow and then adjusting the sign of the shift factors for all the Resources being dispatched by SCED to account for the direction.

GTCs are distinct from thermal constraints and directional in nature, meaning that they should only be managed and bind in the direction for which they are defined. Historically, there has been a dependency on GTCs being deactivated from consideration in SCED before the flow reverses direction to avoid this error in congestion management and prices.

On the impacted OD, there were specific outages that resulted in the limit for the VALEXP GTC being on the lower end of its possible range. This lower limit combined with wind conditions in the region resulted in increased potential for the constraint flow to change directions prior to it being deactivated from consideration in SCED. This in turn led to the erroneous congestion management and prices for February 5, 2023.

This same error in functionality had previously resulted in a correction of Real-Time prices for the morning of December 12, 2021. At that time, the measures put in place

to mitigate the issue were enhancements to procedures to ensure that GTCs would be deactivated from consideration in SCED prior to the flow changing direction. Given the circumstances of grid conditions on the impacted OD, those measures did not prove to be sufficient.

A change to the software was implemented on March 2, 2023, that allows TCM to pass a negative flow to SCED for GTCs, ensuring that the flow is managed in the correct direction and that Resource shift factors and flow information for all constraints are in alignment for the SCED engine.

On February 7, 2023, ERCOT notified Market Participants of the data error that impacted RTM prices on OD February 5, 2023, and its intent to seek Board review of RTM prices for February 5, 2023. *See* Market Notice M-A022123-01.

Accordingly, ERCOT staff requests that the Board:

(a)   Review RTLMPs, RTSPPs, RTRMPRs, and RTESOGPRs for OD February 5, 2023;

(b)   Make a determination as to whether such prices should be corrected; and

(c)   Direct/authorize ERCOT to correct the impacted RTLMPs, RTSPPs, RTRMPRs, and RTESOGPRs for OD February 5, 2023.

Attached hereto are document containing corrected RTLMPs, RTSPPs, RTRMPRs, and RTESOGPRs for OD February 5, 2023, as follows:

- ***Attachment A*** - Corrected Electrical Bus Locational Marginal Prices (EBLMPs)
- ***Attachment B*** - Corrected Settlement Point Locational Marginal Prices (LMPs)
- ***Attachment C*** - Corrected RTSPPs
- ***Attachment D*** - Corrected RTRMPRs
- ***Attachment E*** - Corrected Settlement Only Generator LMPs
- ***Attachment F*** - Corrected RTESOGPRs

Relevant Protocol Sections:

6.3   Adjustment Period and Real-Time Operations Timeline

(4)   ERCOT shall correct prices for an Operating Day when accurate prices can be determined, the impact of the price correction is determined to be significant, and one of the following conditions has been met: a market solution is determined to be invalid, invalid prices are identified in an otherwise valid market solution, the Base Points received by Market Participants are inconsistent with the Base Points of a valid market solution, or the Security-Constrained Economic Dispatch (SCED) process experiences a failure as described in Section 6.5.9.2,

Failure of the SCED Process. The following are some reasons that may cause these conditions:

(a)   Data Input error: Missing, incomplete, stale, or incorrect versions of one or more data elements input to the market applications may result in an invalid market solution and/or prices.

(b)   Data Output error: These include: incorrect or incomplete data transfer, price recalculation error in post-processing, and Base Points inconsistent with prices due to the Emergency Base Point flag remaining activated even when the SCED solution is valid.

(c)   Hardware/Software error: These include unpredicted hardware or software failures, planned market system or database outages, planned application or database upgrades, software implementation errors, and failure of the market run to complete.

(d)   Inconsistency with the Protocols or Public Utility Commission of Texas (PUCT) Substantive Rules: Pricing errors may occur when specific circumstances result in prices that are in conflict with such Protocol language or the PUCT Substantive Rules.

(7)   All Real-Time LMPs, Real-Time Settlement Point Prices, Real-Time prices for energy metered, Real-Time On-Line Reliability Deployment Price Adders, Real-Time On-Line Reliability Deployment Prices, Real-Time Reserve Prices for On-Line Reserves, Real-Time Reserve Prices for Off-Line Reserves, Real-Time On-Line Reserve Price Adders, Real-Time Off-Line Reserve Price Adders and SASM MCPCs are final at 1600 of the second Business Day after the Operating Day.

(a)   However, after Real-Time LMPs, Real Time Settlement Point Prices, Real-Time prices for energy metered, Real-Time On-Line Reliability Deployment Price Adders, Real-Time On-Line Reliability Deployment Prices, Real-Time Reserve Prices for On-Line Reserves, Real-Time Reserve Prices for Off-Line Reserves, Real-Time On-Line Reserve Price Adders, Real-Time Off-Line Reserve Price Adders and SASM MCPCs are final, if ERCOT determines that prices qualify for a price correction pursuant to paragraph (4) above and that ERCOT will seek ERCOT Board review of such prices, it shall notify Market Participants and describe the need for such correction as soon as practicable but no later than 30 days after the Operating Day. Failure to notify Market Participants within this timeline precludes the ERCOT Board from reviewing such prices.

However, nothing in this section shall be understood to limit or otherwise inhibit any of the following:

(i)   ERCOT's duty to inform the PUCT of potential or actual violations of the ERCOT Protocols or PUCT Rules and its right to request that the PUCT authorize correction of any prices that may have been affected by such potential or actual violations;

(ii)   The PUCT's authority to order price corrections when permitted to do so under other law; or

(iii)   ERCOT's authority to grant relief to a Market Participant pursuant to the timelines specified in Section 20, Alternative Dispute Resolution Procedure.

(b)   Before seeking ERCOT Board review of prices, ERCOT will determine if the impact of the price correction is significant, as that term is used in paragraph (4) above, by calculating the potential changes to the Real-Time Market (RTM) Settlement Statement(s) of any Counter-Party on a given Operating Day. ERCOT shall seek ERCOT Board review of prices if the change in RTM Settlement Statement(s) would result in the absolute value impact to any single Counter-Party, based on the sum of all original RTM Settlement Statement amounts of Market Participants assigned to the Counter-Party, to be greater than:

(i)   2% and also greater than $20,000; or

(ii)   20% and also greater than $2,000.

(c)   The ERCOT Board may review and change Real-Time LMPs, Real-Time Settlement Point Prices, Real-Time prices for energy metered, Real-Time On-Line Reliability Deployment Price Adders, Real-Time On-Line Reliability Deployment Prices, Real-Time Reserve Prices for On-Line Reserves, Real-Time Reserve Prices for Off-Line Reserves, Real-Time On-Line Reserve Price Adders, Real-Time Off-Line Reserve Price Adders and SASM MCPCs if ERCOT gave timely notice to Market Participants and the ERCOT Board finds that such prices should be corrected for an Operating Day.

(d)   In review of Real-Time LMPs, Real Time Settlement Point Prices, Real-Time prices for energy metered, Real-Time On-Line Reliability Deployment Price Adders, Real-Time On-Line Reliability Deployment Prices, Real-Time Reserve Prices for On-Line Reserves, Real-Time Reserve Prices for Off-Line Reserves, Real-Time On-Line Reserve Price Adders, Real-Time Off-Line Reserve Price Adders and SASM MCPCs,

the ERCOT Board may rely on the same reasons identified in paragraph (4) above to find that the prices should be corrected for an Operating Day.
Key Factors Influencing Issue: • Due to incorrect flow data on the VALEXP GTC, RTORDPAs, RTRDPs, RTSPPs, and RTRMPRs on OD February 5, 2023, were incorrect and cannot be corrected by ERCOT without authorization from the Board. • Analysis of the potential price correction impact for the RTM for February 5, 2023, show that this OD meets the criteria for "significance" set forth in Protocol Section 6.3(7)(b). The analysis indicates that the largest dollar impact to a Counter-Party is approximately $60K, and the largest percentage impact to a Counter-Party is approximately 33%.
Conclusion/Recommendation: ERCOT staff recommends, and the R&M Committee is expected to recommend, that the Board find that RTLMPs, RTSPPs, RTESOGPRs, and RTRMPRs for certain Settlement Intervals on OD February 5, 2023, should be corrected, and direct ERCOT to correct impacted RTM prices for OD at issue.

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

WHEREAS, paragraph (7) of Protocol Section 6.3, Adjustment Period and Real-Time Operations Timeline, authorizes the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) to approve a price correction for certain prices if ERCOT has determined that such prices have been significantly affected by an error;

WHEREAS, pursuant to paragraph (7) of Protocol Section 6.3, ERCOT staff gave timely notice to Market Participants that Real-Time Locational Marginal Prices (RTLMPs), Real-Time Settlement Point Prices (RTSPPs), Real-Time Prices for Energy Metered for Resources (RTRMPRs), and Real-Time Prices for Energy Metered for Settlement Only Generators (RTESOGPRs) for certain Settlement Intervals on Operating Day (OD) February 5, 2023 were incorrect; that a price correction for each of those Settlement Intervals met the criteria for "significance" in Protocol Section 6.3(7)(b); and ERCOT staff would be seeking Board review of such prices; and

WHEREAS, after due consideration of the alternatives, the Board deems it desirable and in the best interest of ERCOT to correct RTLMPs, RTSPPs, RTRMPRs, and RTESOGPRs for certain Settlement Intervals on OD February 5, 2021, that were affected by a software calculation error;

THEREFORE, BE IT RESOLVED, that the Board hereby (1) determines that RTLMPs, RTSPPs, RTRMPRs, and RTESOGPRs for certain Settlement Intervals on OD February 5, 2021, were affected by a software calculation error, and (2) directs ERCOT staff to implement the appropriate price corrections pursuant to Protocol Section 6.3.

CORPORATE SECRETARY'S CERTIFICATE

I, Jonathan M. Levine, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its April 18, 2023 meeting, the Board passed a motion approving the above Resolution by _____.

IN WITNESS WHEREOF, I have hereunto set my hand this ___ day of April, 2023.

_____
Jonathan M. Levine
Assistant Corporate Secretary