



**The Reliability and Markets (R&M) Committee
is expected to consider
R&M Committee Agenda Item 8:**

***Recommendation regarding
Real-Time Market Price Correction – Security
Constrained Economic Dispatch (SCED) Error***

at its meeting on December 18-19, 2023.

**The Board of Directors is expected to hear
the R&M Committee's recommendation on
this matter at the Board meeting on
December 19, 2023.**

**Attached are the Board and Committee
materials in relation to these agenda items.**



Item 8: Recommendation regarding Real-Time Market Price Correction – Security Constrained Economic Dispatch (SCED) Error

Kenan Ögelman

Vice President, Commercial Operations

Reliability and Markets Committee Meeting

ERCOT Public

December 18-19, 2023

Reliability and Markets Committee Request

Why this is being presented today:

ERCOT staff requests that the Reliability and Markets (R&M) Committee recommend that the ERCOT Board of Directors (Board) approve the proposed correction of Real-Time Market prices for Operating Day October 22, 2023 (Board Decision Template Attachments A through I).

Background

- On October 22, 2023, ERCOT experienced market submission failures that impacted market submissions from the Market Management System (MMS) user interface and Application Programming Interface (API). This issue affected submissions to both the Real-Time Market (RTM) as well as the Day-Ahead Market (DAM).
 - Security-Constrained Economic Dispatch (SCED) was not able to read Three Part Offers (TPOs) between 12:15 PM – 12:54 PM and Current Operating Plans (COPs) between 1:00 PM – 1:09 PM, resulting in SCED failing to produce valid prices during these windows. This issue initially started at 6:36 AM, however SCED was able to continue using existing offer submissions until 12:15 PM.
 - The DAM deadlines were extended with results being published at 5:35 PM.
 - Additional details regarding this issue were [presented](#) to the Wholesale Market Subcommittee (WMS) on November 1, 2023.
- Market Notice [M-B102423-01](#) was issued on October 24, 2023, notifying the market of the issue and ERCOT's intent, upon completion of impact analysis, to seek Board approval for price correction as specified by ERCOT Protocol Section 6.3(7)(b).
- Market Notice [M-B102423-02](#) was issued on November 3, 2023, notifying the market that files containing price correction data have been posted to the [TAC meeting page for December 4, 2023](#).

Timeline for SCED

- 12:15 PM – 12:54 PM : SCED was unable to process TPOs, resulting in proxy Energy Offer Curves (EOCs) being created for Resources. The EOCs were created in accordance with paragraph (4) of ERCOT Protocol Section 6.5.7.3.
 - This drove the RTM System Lambda to ~\$4,992/MWh for this entire window of time. System Lambda was \$23.54/MWh for the SCED execution at 12:10 PM.
- 12:55 PM – 12:56 PM : SCED was able to process TPOs, resulting in valid SCED runs. In accordance with paragraph (2) of Protocol Section 6.5.9.2, a 15-minute price hold starts from the first good SCED run (12:55 PM) following resolution of the failure. The prices used in the hold are required to be from the last good SCED run before the issue began (12:10 PM)
- 1:00 PM – 1:05 PM : SCED failed to process COPs, resulting in additional SCED failure.
- 1:09 PM : SCED was able to process COPs and produce valid results. The 15-minute hold period for SCED failure resets, beginning at 1:09 PM and ending at 1:24 PM.
- 1:25 PM : 15-minute hold ends and current SCED results were published to the market.
 - System Lambda was \$23.29/MWh for the SCED execution at 1:25 PM.

Settlements Impact Analysis

- ERCOT Protocols Section 6.3(7)(b) requires that the absolute value impact to any single Counter-Party (CP) meet one of the following two criteria before seeking approval from the Board.
 - i. 2% and also greater than \$20,000; or
 - ii. 20% and also greater than \$2,000.
- With the large change in the Real-Time System Lambda, several CPs met these criteria.

CPs meeting (i)	CPs meeting (ii)	CPs meeting both Criteria
141	172	140

Largest Absolute Value Impact to a CP	Largest Absolute Percent Impact to a CP
\$8,414,409.32	650.63%

Change in Statement Charges Due to ERCOT	
\$(62,266,419.44)	79.14%



Date: December 12, 2023 (Revised December 15, 2023)
To: Board of Directors
From: Bob Flexon, Reliability and Markets (R&M) Committee Chair
Subject: Real-Time Market Price Correction – Security Constrained Economic (SCED) Error

Issue for the ERCOT Board of Directors

ERCOT Board of Directors Meeting Date: December 19, 2023

Item No.: 14.4

Issue:

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) October 22, 2023, that were affected by a software error that resulted in the failure to process market submissions.

Background/History:

ERCOT staff has identified the need to correct prices in the Real-Time Market (RTM) for certain Settlement Intervals on OD October 22, 2023. The impacted prices include:

- RTLMPs;
- RTSPPs;
- RTRMPRs;
- 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.

In considering a correction of prices, the Board may rely on the following reasons to find that prices should be corrected:

- 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.

- Data Output Error: 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 Security-Constrained Economic Dispatch (SCED) solution is valid.
- 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.
- 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.

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

At 6:36 AM, on October 22, 2023, a software issue occurred which resulted in the failure of ERCOT to process all new market submissions. The RTM was able to run successfully with the existing submissions.

After the 12:10pm SCED run, a fix was implemented that allowed market submissions to be processed. The fix had a downstream impact that resulted in SCED failing to process any Three-Part Offers (TPOs) between 12:15 PM – 12:54 PM and Current Operating Plans (COPs) between 1:00 PM – 1:05 PM.

Between 12:15 PM – 12:54 PM, while SCED was unable to process TPOs, proxy Energy Offer Curves (EOCs) were being created for Resources. The EOCs were created in accordance with paragraph (4) of Protocol Section 6.5.7.3. This drove the RTM System Lambda to ~\$4,992/MWh for this entire window of time. System Lambda was \$23.54/MWh for the SCED execution at 12:10 PM.

After the 12:54 PM SCED run, a new fix was implemented that allowed SCED to process TPOs and SCED ran successfully. In accordance with paragraph (2) of Protocol Section 6.5.9.2, a 15-minute price hold starts from the first good SCED run (12:55 PM) following resolution of the failure. The prices used in the hold are required to be from the last good SCED run before the issue began (12:10 PM).

Between 1:00 PM – 1:05 PM, SCED was unable to process COPs, resulting in SCED failure.

At 1:09 PM, SCED was able to process COPs and ran successfully. The 15-minute hold period for SCED failure resets, beginning at 1:09 PM and ending at 1:24 PM.

At 1:25 PM, the 15-minute hold ends and the 1:25 PM SCED results were published to the market. System Lambda was \$23.29/MWh for the SCED execution at 1:25 PM.

On October 24, 2023, ERCOT notified Market Participants of the issue and, upon completion of an impact analysis, its intent to seek Board review of RTM prices for October 22, 2023. See Market Notice M-B102423-01.

On November 3, 2023, ERCOT notified Market Participants that files containing price correction data had been posted to the TAC meeting page for December 4, 2023. See Market Notice M-B102423-02.

Accordingly, ERCOT requests that the Board:

- (a) Review RTLMPs, RTSPPs, RTRMPRs, and RTESOGPRs for OD October 22, 2023;
- (b) Make a determination as to whether such prices were significantly affected by the error; and
- (c) Direct/authorize ERCOT to correct the impacted RTLMPs, RTSPPs, RTRMPRs, and RTESOGPRs for OD October 22, 2023.

Attached hereto are documents containing corrected RTSPPs, RTRMPRs, and RTESOGPRs for OD October 22, 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
- **Attachment G** - Corrected System Lambdas
- **Attachment H** - Corrected Constraint Shadow Prices
- **Attachment I** - Corrected Peaker Net Margins

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 the failure of SCED to process TPOs and COPs, RTSPPs, RTRMPRs, and RTESOGPRs for a portion of OD October 22, 2023 were incorrect and cannot be corrected by ERCOT without authorization from the Board.
- Analysis of the impacts of the pricing error for OD October 22, 2023 has shown that the largest dollar impact to any individual Counter-Party for the OD is approximately \$8.4 million. For Counter-Parties meeting the dollar impact criteria, the largest percentage impact to a Counter-Party for a single OD is 650.63%
- Notably, Nodal Protocol Revision Request (NPRR) 1024, Determination of Significance with Respect to Price Corrections, was approved by the Board in February 2021 and became effective on April 1, 2021. NPRR1024 requires ERCOT to seek 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 2% and also greater than \$20,000, or 20% and also greater than \$2,000.

Conclusion/Recommendation:

ERCOT recommends, and the R&M Committee is expected to recommend, that the Board find that RTSPPs, RTRMPRs, and RTESOGPRs for certain intervals on OD October 22, 2023, were significantly affected by SCED's failure to process TPOs and COPs, and direct ERCOT to correct the impacted 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, 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 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) October 22, 2023, were incorrect; that a price correction for 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 RTSPPs, RTRMPRs, and RTESOGPRs for certain intervals on OD October 22, 2023, that were significantly affected by the failure of Security-Constrained Economic Dispatch (SCED) to process Three-Part Offers (TPOs) and Current Operating Plans (COPs), as recommended by the Reliability and Markets (R&M) Committee;

THEREFORE, BE IT RESOLVED, that the Board hereby (1) determines that RTSPPs, RTRMPRs, and RTESOGPRs for certain intervals on OD October 22, 2023, were significantly affected by SCED’s failure to process TPOs and COPs, 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 December 19, 2023 meeting, the Board passed a motion approving the above Resolution by _____.

IN WITNESS WHEREOF, I have hereunto set my hand this ____ day of December, 2023.

Jonathan M. Levine
Assistant Corporate Secretary