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| VCMRR Number | [042](https://www.ercot.com/mktrules/issues/VCMRR042) | VCMRR Title | SO2 and NOx Emission Index Prices Used in Verifiable Cost Calculations |
| Date of Decision | | February 27, 2025 | |
| Action | | Recommended Approval | |
| Timeline | | Normal | |
| Estimated Impacts | | Cost/Budgetary: Between $90K and $140K  Project Duration: 6 to 9 months | |
| Proposed Effective Date | | Upon system implementation | |
| Priority and Rank Assigned | | Priority – 2026; Rank – 4720 | |
| Verifiable Cost Manual Sections Requiring Revision | | 2.6, Additional Rules for Submitting Emission Costs  Appendix 5, Specification of Relevant Equations | |
| Related Documents Requiring Revision/Related Revision Requests | | Nodal Protocol Revision Request (NPRR) 1242, Related to VCMRR042, SO2 and NOx Emission Index Prices Used in Verifiable Cost Calculations | |
| Revision Description | | This Verifiable Cost Manual Revision Request (VCMRR) adds the use of seasonal nitrogen oxide (NOX) prices obtained from indices to calculate emission costs from May through September. Annual index prices would continue to be used for SO2 from January through December. | |
| Reason for Revision | | [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 1 – Be an industry leader for grid reliability and resilience  [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 2 - Enhance the ERCOT region’s economic competitiveness with respect to trends in wholesale power rates and retail electricity prices to consumers  [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 3 - Advance ERCOT, Inc. as an independent leading industry expert and an employer of choice by fostering innovation, investing in our people, and emphasizing the importance of our mission  Administrative  Regulatory requirements  ERCOT Board/PUCT Directive  *(please select ONLY ONE – if more than one apply, please select the ONE that is most relevant)* | |
| Justification of Reason for Revision and Market Impacts | | This VCMRR is needed to ensure ERCOT has access to seasonal emissions data due to volatility in index prices as a result of reductions in allowances and reliance on the market to meet compliance obligations. The swings in index prices are particularly impactful on Verifiable Startup Emission Costs and Verifiable Minimum-Energy Emission Costs, outlined in Appendix 5, Specification of Relevant Equations, and need to be taken into account in Generation Resources’ offer curves.  While there has been attention on the Environmental Protection Agency (EPA) rules and a recent Supreme Court ruling on the Good Neighbor Rule, this does not eliminate seasonal index prices.  Further, it seems appropriate for ERCOT to maintain access to the vendor data needed to include seasonal index prices as EPA is expected to reinstate prior Cross-State Air Pollution Rule (CSAPR) obligations while the legal challenge to the Good Neighbor Rule continues to be litigated.  Although trading has temporarily been suspended, obligations to hold and obtain sufficient allowances consistent with CSAPR obligations are expected to be clarified with relative speed.  Eliminating the need to engage in a new vendor selection process allows ERCOT to quickly respond to the changes in the emissions allowances and resulting prices.  Further, the inventory of allowances is reflected in terms of opportunity costs. They can be used by Luminant to meet compliance obligations or sold if there are potential excess allowances. Therefore, there is a value attached to them even absent trading. | |
| WMS Decision | | On 8/7/24, WMS voted unanimously to table VCMRR042 and refer the issue to the Resource Cost Working Group (RCWG). All Market Segments participated in the vote.  On 12/4/24, WMS voted unanimously to recommend approval of VCMRR042 as amended by the 11/11/24 Luminant comments. All Market Segments participated in the vote.  On 1/8/25, WMS voted unanimously to table VCMRR042. All Market Segments participated in the vote.  On 2/5/25, WMS voted unanimously to endorse and forward to TAC the 12/4/24 WMS Report, as amended by the 2/4/25 ERCOT comments as revised by WMS, and the 1/31/25 Impact Analysis for VCMRR042, with a recommended priority of 2026 and rank of 4720. All Market Segments participated in the vote. | |
| Summary of WMS Discussion | | On 8/7/24, participants supported the concept of using seasonal index values and requested additional review by the RCWG.  On 12/4/24, participants reviewed the 11/11/24 Luminant comments and noted RCWG review and support of the same.  On 1/8/25, participants reviewed the 12/19/24 ERCOT comments requesting additional time to develop the Impact Analysis for VCMRR042.  On 2/5/25, participants reviewed the 2/5/25 ERCOT comments and suggested a clarification to the Revision Description, reviewed the 1/31/25 Impact Analysis, and considered a priority and rank. | |
| TAC Decision | | On 2/27/25, TAC voted unanimously to recommend approval of VCMRR042 as recommended by WMS in the 2/5/25 WMS Report. All Market Segments participated in the vote. | |
| Summary of TAC Discussion | | On 2/27/25, there was no additional discussion beyond TAC review of the items below. | |
| TAC Review/Justification of Recommendation | | Revision Request ties to Reason for Revision as explained in Justification  Impact Analysis reviewed and impacts are justified as explained in Justification  Opinions were reviewed and discussed  Comments were reviewed and discussed (if applicable)  Other: (explain) | |

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| **Opinions** | |
| **Credit Review** | Not applicable |
| **Independent Market Monitor Opinion** | IMM supports VCMRR042. |
| **ERCOT Opinion** | ERCOT supports approval of VCMRR042. |
| **ERCOT Market Impact Statement** | ERCOT Staff has reviewed VCMRR042 and agrees that seasonal NOx emissions prices are a better valuation of NOx emissions costs than annual NOx emissions prices currently used. Also, when automated, this NPRR will enable daily SO2 and NOx prices to be included in the verifiable Operations and Maintenance (O&M) costs, capturing price changes more promptly than the current use of monthly averages. |

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| Sponsor | |
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| Company | Luminant Generation Company LLC |
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| Market Segment | Independent Generator |

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| **Comments Received** | |
| Comment Author | **Comment Summary** |
| ERCOT 080224 | Noted that, as written, VCMRR042 conflicts with VCMRR041, SO2 and NOx Emission Prices Used in Verifiable Cost Calculations, and that both cannot be implemented if approved; and that VCMRR042 eliminates the current manual process to calculate monthly arithmetic average values for annual emission prices without providing an alternative methodology |
| Luminant 111124 | Refined the proposal on the calculation of seasonal NOx and annual SO2 index prices and recommended that upon adoption of the VCMRR, ERCOT should continue to calculate the monthly indices using the arithmetic average of the prices published during Business Days for the first 15 days of the month prior to the effective month |
| ERCOT 121924 | Proposed an alternative schedule for the development of an Impact Analysis for VCMRR042 |
| ERCOT 020425 | Proposed revisions to better distinguish the monthly manual process from the automated daily process, adding gray box language to allow time for system implementation; and to describe the indices used for SO2 and NOx and the corresponding periods |
| PRS 021425 | Endorse the WMS-recommended priority of 2026 and rank of 4720 for Verifiable Cost Manual Revision Request (VCMRR) 042 |

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| Market Rules Notes |

None

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| Proposed Verifiable Cost Manual Language Revision |

**2.6** **Additional Rules for Submitting Emission Costs**

(1) Verifiable cost data may include the cost of purchasing emission credits but only to the extent necessary to meet environmental regulations associated with the operation of the specific Resource. ERCOT will not approve emission costs of any type unless they are sufficiently documented. When submitting emission costs the following procedures apply:

(a) Filing Entities submitting emission costs per-start must do so for each start type, cold, hot and intermediate. ERCOT will calculate Verifiable Startup Emission Costs ($/start) for a Resource by using Equation 4 described in Section 14, Appendices, Appendix 5, Specification of Relevant Equations.

(b) Emission costs incurred while operating the Resource at the Minimum-Energy level or above Low Sustained Limit (LSL) are calculated on a $/MWh basis. ERCOT will calculate Verifiable emission costs ($/MWh) at LSL by using Equation 5 described in Section 14, Appendices, Appendix 5.

(c) Resources may include the cost of NOx, and SO2 emissions requirements as part of the verifiable cost for:

(i) Non-attainment Area for NOx in Houston-Galveston-Brazoria

(ii) The Cross-State Air Pollution Rule (CSAPR) or other federal regulations for NOx and SO2, using Equations 4 and 5 as described in Section 14, Appendices, Appendix 5.

(d) For verifying the emission rates, the Filing Entity may submit the historic calendar annual average for the unit-specific emission rates reported to Texas Commission on Environmental Quality (TCEQ) and or Environmental Protection Agency (EPA) by April 30 of the applicable year, if deemed necessary by the Filing Entity.

(e) Emission prices for SO2 will be obtained by ERCOT and will be based on CSAPR Group 2 index prices, applicable to all months of the year. Emission prices for NOX will be obtained by ERCOT based on published CSAPR Group 2 seasonal index prices for the months May through September. ERCOT will select index prices that are generally accepted in the industry and regularly published. ERCOT will calculate monthly indices using the arithmetic average of the prices published during the Business Days for the first 15 days of the month prior to the effective month as shown in Table A below.

Table A: The reference index prices for the arithmetic average will be as follows:

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| **Effective Month** | **SO2**  **Reference**  **Index Price** | **NOx**  **Reference Seasonal Index Price** |
| January | December | N/A |
| February | January | N/A |
| March | February | N/A |
| April | March | N/A |
| May | April | April |
| June | May | May |
| July | June | June |
| August | July | July |
| September | August | August |
| October | September | N/A |
| November | October | N/A |
| December | November | N/A |

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| ***[VCMRR 042: Replace paragraph (e) above with the following upon system implementation:]***  (e) Emission prices for SO2 will be obtained by ERCOT based on daily CSAPR Group 2 index prices, applicable to all days of the year. Emission prices for NOX will be obtained by ERCOT based on published seasonal daily index prices during months May through September of each year. ERCOT will select index prices that are generally accepted in the industry and regularly published. If an index price is not available, the effective price for the most recent preceding Operating Day shall be used. For the period October through April, the NOX price will be set to zero. |

(f) ERCOT will disclose to Market Participants the source of its selected price indices, along with descriptions of the nature and derivation of the indices as available from the publishers of those indices. In the event that an ERCOT selected index becomes unavailable or unsuitable for the intended purpose, ERCOT will select a substitute index source. ERCOT will notify Market Participants of any change in the index, along with a description of the nature and derivation of the substitute index and a summary of the reasons for the change, 60 days prior to the beginning of its use. However, in the event that 60 days notice cannot be given for any reason, ERCOT will notify Market Participants as far prior to use as practical.

(g) On a monthly basis, ERCOT will recalculate each Resource’s emission costs for SO2 and NOx utilizing the emission prices taken from the indices described in paragraph 1(e) above. The new emission costs will replace the emission costs in the previously approved Operations & Maintenance (O&M) Verifiable Costs totals.

(h) ERCOT emission cost calculations for each Resource will be completed by and the new approved O&M Verifiable Costs will be made available to Filing Entities eight days prior to the first day of each effective month. The effective period for use of these new emission costs will be the first day of each calendar month through the end of the same month.

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| ***[VCMRR 042: Replace paragraphs (g) and (h) above with the following upon system implementation:]***  (g) On a daily basis, ERCOT will recalculate each Resource’s emission costs for SO2 and NOX utilizing the emission prices taken from the indices described in paragraph 1(e) above. The new emission costs will replace the emission costs in the previously approved Operations & Maintenance (O&M) Verifiable Costs totals.  (h) ERCOT emission cost calculations for each Resource will be calculated daily and added to approved O&M Verifiable Costs. |

(i) As a trading market develops pertaining to emissions limits at a state and or regional level, the costs associated with complying with emission restrictions may be eligible to be recovered and be part of the verifiable cost methodology. At the appropriate time, any market participant may propose a methodology to the Wholesale Market Subcommittee (WMS) to recuperate the emission costs in the applicable non-attainment area, which will be addressed in the Verifiable Cost Manual.

**Appendix 5: Specification of Relevant Equations**

**Equation 1: Verifiable Startup Offer Cap ($/Start)**

Verifiable Startup Offer Cap ($/Start) = DAFCRS (MMBtu/Start) \* [(GASPERSU\*FIP + OILPERSU\*FOP)/100] + VOMS

Where: DAFCRS = Total Fuel \* (1+VOXR)

Total Fuel = [FuelStartup-BC + FuelBC-LSL + FuelBO-Shutdown]

The bill determinants utilized above are defined as:

DAFCRS = the adjusted verified fuel consumption for the start type (MMBtu/Start)

GASPERSU = Percentage of natural gas used for a start

FIP = Fuel Index Price ($/MMBtu)

OILPERSU = Percentage of oil used for a start

FOP = Fuel Oil Price ($/MMBtu)

VOMS = the verified O&M cost for a hot start ($/Start)

VOXR= Value of X for the Resource

FuelStartup-BC= Fuel quantity required to bring Resource from Startup to Breaker Close (MMBtu)

FuelBC-LSL= Fuel quantity required to bring Resource from Breaker Close to Minimum Energy at LSL (MMBtu)

FuelBO-Shutdown= Fuel quantity required to take Resource from Breaker Open to Shutdown (MMBtu)

Note 1: GASPERSU and OILPERSU are decimal percentages in the Settlements equations and will be multiplied by 100 during the Integration process.

Note 2: ERCOT will use the solid fuel price and percentages to create Startup offers when no offer is submitted by the QSE for solid fuel Resources.

Note 3: This equation does not include any adjustments made to the final calculation of the Startup Offer cap, as described in Protocol Section 4.4.9.2.1, Startup Offer and Minimum-Energy Offer Criteria*.*

**Equation 2: Verifiable Minimum-Energy Offer Cap ($/MWh)**

Verifiable Minimum-Energy Offer Cap ($/MWh) = AHR\*[(GASPERME\*FIP + OILPERME\*FOP)/100] + VOMLSL

Where: AHR(1)= Fuel Rate (MMBtu/Hour) divided by LSL (MW)

GASPERME = Percentage of natural gas used at LSL

FIP = Fuel Index Price ($/MMBtu)

OILPERME = Percentage of oil used at LSL

FOP = Fuel Oil Price ($/MMBtu)

VOMLSL = the verified O&M cost at Minimum-Energy ($/MWh)

(1) Adjusted by VOXR

And: AHR= (verified fuel consumption/LSL)\*(1+VOXR)

Note 1: GASPERME and OILPERME are decimal percentages in the Settlements equations and will be multiplied by 100 during the Integration process.

Note 2: ERCOT will use the solid fuel price and percentages to create Startup offers when no offer is submitted by the QSE for solid fuel Resources.

Note 3: This equation does not include any adjustments made to the final calculation of the Minimum-Energy Offer cap, as described in Protocol Section 4.4.9.2.1, Startup Offer and Minimum-Energy Offer Criteria*.*

**Equation 3: Calculation of Composite Unit Parameters using Alternate Unit Specifications**

Composite Unit Parameter = [Alt\_Unit\_Par\*Alt\_Unit\_HSL + Non\_Alt\_Unit\_Par\* Non\_Alt\_Unit\_HSL] / [Alt\_Unit\_HSL + Non\_Alt\_Unit\_HSL]

Where: Alt\_Unit\_Par = Relevant parameter of Alternate Unit

Alt\_Unit\_HSL = High Sustained Limit of Alternate Unit

Non\_Alt\_Unit\_Par = Relevant parameter of non-Alternate Unit

Non\_Alt\_Unit\_HSL = High Sustained Limit of non-Alternate Unit

This calculation would be executed for all relevant parameters of the alternate and non-alternate units. This would include for example Startup Cost data, Minimum-Energy Cost data and heat rate data.

**Equation 4: Equation for Calculation of Verifiable Startup Emission Costs**

Verifiable Startup Emission Cost ($/Start) = RAFCRS \* ∑Emission Rate i \* Emission Cost Index i

Where RAFCRS **=** Quantity of approved startup fuel consumed by Resource (including fuel used to shutdown Resource (MMBtu/Start)

Emission Rate i = Quantity of emission i emitted by resource (lbs/MMBtu)

Emission Cost Indexi **=** Published index price of emission i ($/lb)

i = Index for each emittent approved for inclusion in Startup Cost

**Equation 5: Equation for Calculation of Verifiable Minimum-Energy Emission Costs**

Verifiable Minimum-Energy Emission Costs ($/MWh) =

[AHR] \* ∑Emission Rate i \* Emission Cost Index i

Where AHR = Average heat rate at Minimum Energy (MMBtu/Hr)-

Emission Rate i = Quantity of emission i emitted by resource (lbs/MMBtu)

Emission Cost Index i = Published index price of emission i

i = Index of each emittent approved for inclusion in Minimum-Energy Cost

**Equation 6: Verifiable Startup Costs (VERISU) ($/Start)**

A) For RUC Settlements, the Verifiable Startup Costs are calculated as follows:

VERISU = AFCRS + VOMS

Where AFCRS = [Total Fuel - PHR \* AVGEN + Total Fuel\*VOXR] \* [FIP\*GASPERSU(%) + FOP\*OILPERSU(%) + SFP\*SFPERSU(%)]

Total Fuel = [FuelStartup-BC + FuelBC-LSL + FuelBO-Shutdown]

VOMS = IO&MStart-LSL +IO&MBO-Shutdown + Verifiable Startup Emission Costs

B) For DAM Make-Whole Payments, the Verifiable Startup Costs are calculated as follows:

VERISU = DAFCRS + VOMS

Where DAFCRS = [Total Fuel + Total Fuel\*VOXR] \* [FIP\*GASPERSU(%) + FOP\*OILPERSU(%) + SFP\*SFPERSU(%)]

Total Fuel = [FuelStartup-BC + FuelBC-LSL + FuelBO-Shutdown]

VOMS = IO&MStart-LSL +IO&MBO-Shutdown + Verifiable Startup Emission Costs

The bill determinants utilized above are defined as:

VERISU = Verifiable Startup Costs ($/Start)

AFCRS = Verifiable Startup Fuel Costs adjusted by VOXR and PHR ($/Start)

DAFCRS = the adjusted verified fuel consumption rate for the start type (MMBtu/Start)

VOMS = Verifiable Operations and Maintenance Costs ($/Start)

FuelStartup-BC = Fuel Quantity required to bring Resource from Startup to Breaker Close (MMBtu)

FuelBC-LSL = Fuel Quantity required to bring Resource from Breaker Close to Minimum Energy at LSL (MMBtu)

FuelBO-Shutdown = Fuel Quantity required to take Resource from Breaker Open to Shutdown (MMBtu)

PHR = Proxy Heat Rate (MMBtu/MWh)

AVGEN = Average Generation between Breaker Close and LSL (MWh)

VOXR = Value of X for the Resource

FIP = Fuel Price Index for gas ($/MMBtu)

FOP = Fuel Price Index for oil ($/MMBtu)

SFP = Fuel Price Index for solid fuel = $1.50/MMBtu

GASPERSU = Percent of gas used during startup

OILPERSU = Percent of oil used during startup

SFPERSU = Percent of solid fuel used during startup

IO&MStart-LSL = Incremental O&M costs incurred to bring Resource from Start to LSL ($/Start)

IO&MBO-Shutdown = Incremental O&M costs incurred to take Resource from Breaker Open to Shutdown ($/Start)

Verifiable Startup Emission Costs = The allowable costs of acquiring emission credits required to start up Resource and defined in Equation 4 above.

**Equation 7: The Equation for calculating Verifiable Minimum Energy Costs ($/MWh)**

VERIME = FCLSL + VOMLSL

Where VERIME = Verifiable Minimum Energy Costs

FCLSL = Verifiable Fuel Costs at Minimum Energy

VOMLSL = Verifiable variable O&M costs at Minimum Energy

FCLSL = [(AHR)] \* [FIP\*GASPERME(%) + FOP\*OILPERME(%) + SFP\*SFPERME(%)]

Where AHR = Adjusted average heat rate at Minimum Energy (MMBtu/Hr)

FIP = Fuel Price Index for gas ($/MMBtu)

FOP = Fuel Price Index for oil ($/MMBtu)

SFP = Fuel Price Index for solid fuel = $1.50/MMBtu

GASPERME = Percent of gas used at minimum energy

OILPERME = Percent of oil used at minimum energy

SFPERME = Percent of solid fuel used at minimum energy

VOMLSL = IO&MLSL + Verifiable Emission Costs at Minimum Energy

Where IO&MLSL = Incremental O&M costs at minimum energy

Verifiable Emission Costs at Minimum Energy = The allowable costs of acquiring emission credits required to operate Resource at minimum energy and defined in Equation 5 above.