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| NPRR Number | XXX | NPRR Title | RTC – Modification of Ancillary Service Demand Curves |
| Date Posted | TBD |
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| Requested Resolution  | Normal |
| Nodal Protocol Sections Requiring Revision  | 4.4.12, Determination of Ancillary Service Demand Curves for the Day-Ahead Market and Real-Time Market |
| Related Documents Requiring Revision/Related Revision Requests | None |
| Revision Description | This Nodal Protocol Revision Request (NPRR) … |
| 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 General system and/or process improvement(s) 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 | Provide justification of the Reason for Revision selected above; including qualitative and quantitative market impacts (data transparency, benefit calculations, etc.), impacts to market segments and other information relating to the impacts or benefits of the Revision Request |

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| Sponsor |
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| E-mail Address |  |
| Company |  |
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| Market Segment |  |

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| **Market Rules Staff Contact** |
| **Name** |  |
| **E-Mail Address** |  |
| **Phone Number** |  |

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| Proposed Protocol Language Revision |

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| ***[NPRR1008 and NPRR1216: Insert applicable portions of Section 4.4.12 below upon system implementation of NPRR1216; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1008:]******4.4.12 Determination of Ancillary Service Demand Curves for the Day-Ahead Market and Real-Time Market***(1) This Section describes the process for determining ASDCs for Regulation Up Service (Reg-Up), Regulation Down Service (Reg-Down), Responsive Reserve (RRS), ERCOT Contingency Reserve Service (ECRS), and Non-Spinning Reserve (Non-Spin) for the Day-Ahead Market (DAM) and Real-Time Market (RTM). This section does not apply to ASDCs used in the Reliability Unit Commitment (RUC) process.(2) The DAM shall use the same ASDCs as the RTM, as an initial condition. Specific to the DAM, the ASDCs will be adjusted, as needed, to account for negative Self-Arranged Ancillary Service Quantities.(3) For Reg-Down, the ASDC shall be a constant value equal to VOLL for the full range of the Ancillary Service Plan for Reg-Down. (4) To determine the individual ASDCs for Reg-Up, RRS, ECRS, and Non-Spin, an Aggregate ORDC (AORDC) will be created and then disaggregated into individual curves for the different Ancillary Services.(5) ERCOT shall develop the AORDC from historical data from the period of June 1, 2014 through December 31, 2023 as follows:(a) For all SCED intervals where the sum of RTOLCAP and RTOFFCAP is less than 10,000 MW, use the RTOLCAP and RTOFFCAP values to calculate the AORDC as follows:$$AORDC=\left(0.5\*\left(1-pnorm\left(RTOLCAP-2000, 0.5\*μ, 0.707\*σ\right)\right)+0.5\*\left(1-pnorm\left(RTOLCAP+RTOFFCAP-2000, μ, σ\right)\right)\right)\*\left(VOLL-min\left(System Lambda, 250\right)\right)$$The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| RTOLCAP | MWh | *Real-Time On-Line Reserve Capacity –* The Real-Time reserve capacity of On-Line Resources available for the SCED intervals beginning June 1, 2014 through December 31, 2023 |
| RTOFFCAP | MWh | *Real-Time Off-Line Reserve Capacity –* The Real-Time reserve capacity of Off-Line Resources available for the SCED intervals beginning June 1, 2014 through December 31, 2023. |
| *Μ* | None | The mean value of the shifted LOLP distribution as published for Fall 2024 |
| *Σ* | None | The standard deviation of the shifted LOLP distribution as published for Fall 2024 |

(b) Using the results of step (a) above, use regression methods to fit a curve to the average reserve pricing outcomes for the various MW reserve levels.(c) Calculate points on the regression curve in 1 MW increments for any observed reserve level >= 2,000 MW and price >$0.01/MWh. These points form the AORDC.(6) ERCOT shall disaggregate the AORDC developed pursuant to paragraph (5) above into individual ASDCs for each Ancillary Service product as follows:(a) Using the required percentage of Reg-Up, the maximum percentages of RRS and ECRS, and the minimum quantities of required Non-Spin and ECRS, the quantities of each Ancillary Service product procured until the Minimum Contingency Level (MCL) is satisfied are calculated as follows:If, RUPCT \* RUREQ + ECRSPCTMAX \* ECRSREQ + RRSPCTMAX \* RRSREQ + NSMWMIN > MCL: RUMW = RUPCT \* RUREQ ECRSMW = ECRSPCTMAX \* ECRSREQ RRSMW = RRSPCTMAX \* RRSREQ NSMW = MCL – RUMW – RRSMW – ECRSMWElse, if RUPCT \* RUREQ + RRSPCTMAX \* RRSREQ + ECRSMWMIN + NSMWMIN > MCL: RUMW = RUPCT \* RUREQ ECRSMW = ECRSMWMIN RRSMW = RRSPCTMAX \* RRSREQ – (RRSPCTMAX \* RRSREQ + RUPCT \* RUREQ – (MCL – ECRSMWMIN – NSMWMIN) NSMW = NSMWMINOtherwise, if RUPCT \* RUREQ + RRSPCTMAX \* RRSREQ + ECRSPCTMAX \* ECRSREQ + NSMWMIN > MCL: RUMW = RUPCT \* RUREQ RRSMW = RRSPCTMAX \* RRSREQ – 0.5(RUPCT\*RUREQ + RRSPCTMAX \* RRSREQ + ECRSPCTMAX \* ECRSREQ – (MCL – NSMWMIN))  ECRSMW = ECRSPCTMAX \* ECRSREQ – 0.5(RUPCT\*RUREQ + RRSPCTMAX \* RRSREQ + ECRSPCTMAX \* ECRSREQ – (MCL – NSMWMIN))  NSMW = NSMWMINThe above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| MCL | MW | *Minimum Contingency Level* – the minimum amount of reserves that ERCOT considers necessary to avoid a system-wide failure. |
| RUREQ | MW | Amount of Reg-Up capacity required to meet system reliability needs.  |
| RRSREQ | MW | Amount of RRS capacity required to meet system reliability needs. |
| ECRSREQ | MW | Amount of ECRS capacity required to meet system reliability needs. |
| RUPCT | % | Percentage of total Ancillary Service reserves allocated to Reg-Up. |
| RRSPCTMAX | % | Maximum RRS percentage at RRS max price. |
| ECRSPCTMAX | % | Maximum ECRS capacity percentage at ECRS max price. |
| NSMWMIN | MW | Minimum Non-Spin capacity at max price within the linear portion of the AORDC, regardless of requirement amount. |
| RUMW | MW | Actual capacity allocated to Reg-Up within the linear portion of the AORDC. |
| RRSMW | MW | Actual capacity allocated to RRS within the linear portion of the AORDC. |
| ECRSMW | MW | Actual capacity allocated to ECRS within the linear portion of the AORDC. |
| ECRSMINMW | MW | Minimum ECRS capacity at max price within the linear portion of the AORDC, regardless of requirement amount. |
| NSMW | MW | Actual capacity allocated to Non-Spin within the linear portion of the AORDC. |

Fixed parameters are defined as follows:

| Parameter | Unit | Current Value |
| --- | --- | --- |
| RUPCT | % | 90 |
| RRSPCTMAX | % | 90 |
| ECRSPCTMAX | % | 30 |
| ECRSMINMW | MW | 40 |
| NSMWMIN | MW | 10 |

Further, the quantities of each Ancillary Service product procured until the MCL is satisfied are priced as follows:

| Parameter | Unit | Current Value |
| --- | --- | --- |
| Reg-Up Max Demand Price | $/MWh | 9,052 |
| RRS Max Demand Price | $/MWh | 7,051 |
| ECRS Max Demand Price | $/MWh | 5,050 |
| Non-Spin Max Demand Price | $/MWh | 5,000 |

(b) Beyond the MCL, the nonlinear segments of the AORDC are disaggregated as follows:(i) First, extract evenly spaced 1 MW ORDC segments extending from the MCL to the minimum Reg-Up price. These segments form the nonlinear portion of the Reg-Up ASDC;(ii) Second, extract evenly spaced 1 MW ORDC segments extending from MCL to the minimum RRS price. These segments form the nonlinear portion of the RRS ASDC;(iii) Third, assign the remaining 1 MW segments of the ORDC to ECRS and Non-Spin alternately, until the requirements for both products have been met; and(iv) Assign any remaining 1 MW segments of the ORDC priced above $0.01/MWh to Non-Spin.The minimum prices for Reg-Up and RRS are defined as follows:

| Parameter | Unit | Current Value |
| --- | --- | --- |
| Reg-Up Min Price | $/MWh | 250 |
| RRS Min Price | $/MWh | 100 |

(7) Each ASDC will be represented by a 100-point linear approximation to the corresponding part of the AORDC. Fewer points may be used for cases where it would not result in decreased accuracy in representing the corresponding part of the AORDC.(8) The AORDC used in determining the individual ASDCs will be adjusted to reflect any updates to the value of VOLL, as described in Section 4.4.11, Day-Ahead and Real-Time System-Wide Offer Caps, and Section 4.4.11.1, Scarcity Pricing Mechanism. |