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| NOGRR Number | [271](https://www.ercot.com/mktrules/issues/NOGRR271) | NOGRR Title | Related to NPRR1257, Limit on Amount of RRS a Resource can Provide Using Primary Frequency Response |
| Date Posted | October 21, 2024 |
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| Requested Resolution  | Normal |
| Nodal Operating Guide Sections Requiring Revision  | 2.3.1.2.1, Limit on Generation Resources and Controllable Load Resources Providing RRSSection 8 Attachment N, Procedure for Calculating RRS Limits for Individual Resources |
| Related Documents Requiring Revision/Related Revision Requests | Nodal Protocol Revision Request (NPRR) 1257, Limit on Amount of RRS a Resource can Provide Using Primary Frequency Response |
| Revision Description | This Nodal Operating Guide Revision Request (NOGRR) is related to NPRR1257 and specifies how the maximum limit on the amount of Responsive Reserve (RRS) that an individual Resource can provide using Primary Frequency Response will be used in Section 8, Attachment N. This NOGRR also proposes some clean-up to the Section 8, Attachment N language.  |
| 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 | ERCOT determined that instituting a maximum limit on the amount of RRS that an individual Resource can provide using Primary Frequency Response is necessary based on GE Vernova’s recommendation contained in its [report](https://www.ercot.com/files/docs/2024/03/20/02_GE-ERCOT_StakeholderPresentation_R6_new.pdf) presented to ERCOT stakeholders at the [RRS-PFR Limits Study Workshop](https://www.ercot.com/calendar/04062023-RRS_PFR-Limits-Study-Workshop) on April 6, 2023. |

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| Proposed Guide Language Revision |

**2.3.1.2.1 Limit on Resources Providing RRS Using Primary Frequency Response**

(1) ERCOT shall establish MW limits on individual Resource’s ability to provide RRS using Primary Frequency Response. The MW limit shall be based on Resource performance during Frequency Measurable Events (FME) and actual tests.

(2) The default maximum MW limit of Primary Frequency Response shall be set to 20% of its High Sustained Limit (HSL) for any newly qualified Resource not yet evaluated per Section 8, Attachment N, Procedure for Calculating RRS MW Limits for Individual Resources to Provide RRS Using Primary Frequency Response, for measuring actual performance.

(3) A Private Use Network with a registered Resource may use the gross HSL for qualification and establishing a limit on the amount of RRS capacity that the Resource within the Private Use Network can provide.

**ERCOT Nodal Operating Guides**

**Section 8**

**Attachment N**

**Procedure for Calculating RRS MW Limits for Individual Resources to Provide RRS Using Primary Frequency Response**

**TBD**

1. Introduction

Changes to this attachment shall be reviewed by the Performance, Disturbance, Compliance Working Group (PDCWG).

2. Responsive Reserve Service Using Primary Frequency Response

Responsive Reserve (RRS) using Primary Frequency Response is an operating reserve on Generation Resources, Controllable Load Resources, and Energy Storage Resources (ESRs) maintained by ERCOT to help control the frequency of the system. RRS on Resourcesproviding Primary Frequency Response can be released to Security-Constrained Economic Dispatch (SCED) during scarcity conditions as outlined in Section 4.8, Responsive Reserve Service During Scarcity Conditions.

# 3. RRS MW Limits for Individual Resources

Generation Resources, ESRs, and Controllable Load Resources that do not meet the 12 months or the last eight Frequency Measurable Events (FMEs) (applicable if a minimum threshold of eight FMEs within the 12 month period is not met) rolling average criteria, or have failed to score greater than or equal to 0.75 for Primary Frequency Response initial or Primary Frequency Response sustained measures (computed per Section 8, Attachment J, Initial and Sustained Measurements for Primary Frequency Response) for three consecutive FMEs, where the unit was evaluated, over a minimum period of two calendar months, will be subject to review of their respective RRS MW limit for Primary Frequency Response (PFR) (“RRS MW Limit”) using the process outlined in Section 4 below. All other Generation Resources, ESRs, and Controllable Load Resources shall continue to be limited to their respective RRS MW Limit established as follows.

1. The default RRS MW Limit for any Generation Resource, ESR, or Controllable Load Resource providing RRS shall be set to 20% of its HSL. A Private Use Network with a registered Resource may use its gross HSL for qualifying and establishing a limit on the amount of RRS capacity that the Resources within the Private Use Network can provide.
2. RRS MW Limits for non-thermal Generation Resources, Generation Resources with a Resource Category of either (i) aeroderivative simple cycle commissioned after 1996, or (ii) Reciprocating Engines, ESRs, or Controllable Load Resources may be updated to be higher or lower than the default threshold based on their droop performance characteristics and actual tests.
3. In order to ensure that the frequency responsive capability is distributed across multiple Resources, the RRS MW Limit for all Generation Resources, ESRs, or Controllable Load Resources may be further adjusted based on the maximum amount of RRS that an individual Resource can provide using PFR established per paragraph (3) of Protocol Section 3.16, Standards for Determining Ancillary Service Quantities.

Based on Protocol Section 3.18, Resource Limits in Providing Ancillary Service, (i) Generation Resources operating in synchronous condenser fast-response mode may provide RRS up to the Generation Resource’s ERCOT-validated 20-second response capability (which may be 100% of their HSL).

# 4. Calculating RRS MW Limits for Individual Resources

For Resources that fail the Primary Frequency Response initial or Primary Frequency Response sustained measures for three consecutive FMEs, where the unit was evaluated, over a minimum period of two calendar months or are failing the 12 months or the last eight FMEs (applicable if a minimum threshold of eight FMEs within the 12 month period is not met) rolling average criteria, ERCOT shall establish RRS MW Limit for providing RRS using PFR based on their respective performance during FMEs, any limitations exhibited within its dynamic models, or through droop performance tests on an as needed basis.

If the RRS MW Limit is to be determined based upon the Resource’s performance during an FME, then such RRS MW Limit shall be calculated as follows,

1. The RRS MW Limit for each Generation Resource, ESR, and Controllable Load Resource will be calculated using the droop performance during an FME. The Calculated Droop Performance and RRS MW Limit for an FME is calculated as follows:

$$Calculated Droop Performance (Droop)=\frac{(HSL-PA Capacity) \*(∆Hz -Deadband\_{max})}{ScheduledFrequency \* ∆MW}$$

$$Calculated RRS MW Limit \left(\%\right)= \frac{0.01\*ScheduledFrequency-Deadband\_{max}}{ScheduledFrequency\*Droop}\*100$$

**Delta Hertz (∆Hz):** The pre-perturbation [the 16-second period of time before t(0)] average frequency minus the post-perturbation [the 32-second period of time starting 20 seconds after t(0)] average frequency

**Delta MW (∆MW):** The pre-perturbation average MW of the Resource minus the post-perturbation average MW of the Resource

**Scheduled Frequency:** The frequency value to be maintained on the system, always 60 Hz

**Power Augmentation (PA) Capacity:** The telemetered portion of a Generation Resource’s HSL that represents the sustainable non-Dispatched power augmentation capability from duct firing, inlet air cooling, auxiliary boilers, or other methods which does not immediately respond, arrest, or stabilize frequency excursions during the first minutes following a disturbance without secondary frequency response or instructions from ERCOT

**Deadband (Deadbandmax):** The range of deviations of system frequency (+/-) that produces no PFR

1. The median of the calculated RRS MW Limits in the last five FMEs where the unit was evaluated will be computed for each individual Generation Resource, ESR, and Controllable Load Resource. If a Resource hasn’t participated in five FMEs, proceed to Step 3.
2. The median of all FMEs during the previous three months where the unit was evaluated will be computed for each individual Generation Resource, ESR, and Controllable Load Resource.
3. RRS MW Limit will be established based on the lower of the values computed in Steps 2 and 3.

If a Generation Resource’s, ESR’s, or Controllable Load Resource’s performance during an FME is excluded per the current process (NERC Reliability Standard BAL-TRE-001) from the rolling average calculation, the Resource’s performance will also be excluded from the RRS MW Limit calculation. Also note that all members of a Combined Cycle Generation Resource will be evaluated as one Generation Resource for the purposes of this evaluation.

# 5. Timeline to Establish RRS MW Limits

ERCOT will recalculate the RRS MW Limit on each individual Generation Resource, ESR, and Controllable Load Resource on a monthly basis. ERCOT shall post on the Market Information System (MIS) Certified area the RRS MW Limit for each Resource qualified to provide RRS by the 10th day of each month. These RRS MW Limits will be effective in ERCOT systems coincident with the first Network Model Database Load[[1]](#footnote-1) two months later. For example, ERCOT shall post the RRS MW Limit for each Resource by January 10, 2020. These RRS MW Limits will be effective in ERCOT systems beginning March 4, 2020. These recalculated values will follow any threshold limitations as expressed in Section 3 above.

If at the time of recalculation, a Generation Resource, ESR, or Controllable Load Resource was previously limited due to any failure mentioned in Section 4 above, then the established RRS MW Limit will continue to apply. In order to reset the RRS MW Limit, a Generation Resource, ESR, or Controllable Load Resource may use dynamic models, droop performance tests, or documentation of an implemented corrective action plan to demonstrate that it is capable of carrying the standard RRS limit as mentioned in Section 3 above. A Generation Resource, ESR, or Controllable Load Resource that requests its RRS MW Limit to be reset must have a current 12 months or the last eight FMEs rolling average of at least 0.75 for Primary Frequency Response initial or sustained measures.

# Appendix: RRS mw Limit Decision Tree

The diagram below describes at a high level the decision tree procedure to compute a RRS MW Limit for every Generation Resource, ESR, and Controllable Load Resource. In the event there is a conflict between the diagram below and text stated in the sections above, the language stated in text above takes precedence.

Monthly RRS MW Limit Calculation for a Resource

Is the Resource currently limited due to previous failure?

Entry criteria\* met?

Compute new RRS MW Limit and post

Corrective Actions Complete?

Set RRS MW Limit to default based on Section 3 above and post

RRS MW Limit remains unchanged at prior limited value and post

Y

Y

Y

N

N

N

\*(1) failed rolling average or (2) score in last three evaluated events in two consecutive months is less than 0.75

1. The most recent Network Model Database Load Schedules can be accessed at the following link.

[**https://www.ercot.com/gridinfo/transmission/opsys-change-schedule**](https://www.ercot.com/gridinfo/transmission/opsys-change-schedule) [↑](#footnote-ref-1)