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| NPRR Number | [828](http://www.ercot.com/mktrules/issues/nprr828) | NPRR Title | Include Fast Frequency Response as a Subset of Responsive Reserve |
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| Date | October 31, 2017 |
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| Submitter’s Information |
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| Market Segment | Independent Generator |

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| Comments |

Apex would support Nodal Protocol Revision Request (NPRR) 828 assuming the technical standards applied to Fast Frequency Response (FFR) are adjusted in a fashion to more closely match the value of the existing Responsive Reserve (RRS) product. Absent such changes, the compensation for this service will be excessive relative to the value provided, to the disadvantage of consumers in ERCOT. Below are Apex’s comments:

As proposed, the FFR product would be compensated (i.e., priced) based on the clearing price for RRS supplied by conventional generators (“RRS-gen”); therefore, it is imperative that the system benefits from FFR are reasonably equivalent to those provided by RRS-gen.

FFR would only provide Primary Frequency Response (“PFR”) for up to 15-minutes per low frequency event. RRS-gen provides 1) PFR with a 30-second initial response and sustained response for up to 60 minutes per clock-hour, 2) contingency reserves releasable to Security-Constrained Economic Dispatch (SCED) with a 10-minute deployment time, 3) system inertia, and 4) voltage control. Given the limited performance criteria of the FFR product, it is imperative that the technical performance standards for frequency response meet an appropriate threshold to justify pricing at the same level as RRS-gen. Otherwise, Load Serving Entities (LSEs) would be better off procuring additional volumes of the existing RRS-gen product rather than procuring an inferior FFR product.

FFR performance standards should incentivize technological development aimed at providing the best and most efficient frequency control possible. We can look to the experience of other ISOs to observe the importance of aligning performance characteristics (and hence value) against compensation for grid support services as well as grid needs. In PJM, the Reg-D product was implemented as a fast-responding Ancillary Service with severely limited deployment duration and contingent restoration time. After three years of product usage, the frequency correction provided by Reg-D was demonstrably inferior to the existing Reg-A product, particularly during ramp periods. PJM staff and stakeholders responded by reducing the procurement volumes for Reg-D, expanding the deployment duration, and cutting the restoration time. In making these adjustments PJM appropriately raised the bar for this product, ensuring market participants receive reasonable frequency control benefits relative to the cost of substitutable products. Nevertheless, investments were made in new resources (mainly battery technology) designed to meet the initial performance standards, and now those investments are impaired as their participation in Reg-D has been curtailed (owing to the need for greater storage duration to comply with PJM’s revised performance standards). Had the Reg-D product initially been formulated to meet an appropriate standard, the subsequent investment in flexible resources would certainly have been more economically efficient.

The PJM example provides evidence that regulatory concessions resulting in the addition of inferior products, relative to those that already exist, undermine the development of technologies that could meet or exceed the requirements of the current Ancillary Service products.

The following items outline Apex’s view of a higher, more appropriate standard for the FFR product.

1. **The proposed frequency trigger of 59.850 Hz for Fast Frequency Response (FFR) would result in negligible deployments, and thus the expected frequency correction would be far inferior to Responsive Reserve (RRS) supplied by generators.**

RRS-gen provides PFR by responding to frequency deviations based on a 5% droop setting (for most generation types) and +/-0.017 Hz deadband. Based on 2016 1-minute average frequency data, RRS generators provided primary frequency response 83,775 minutes (15.9% of all 1-minute intervals) when system frequency dipped below the PFR deadband of 59.983 Hz (see Exhibit 1 & 2). This frequent PFR deployment results in a material improvement in ERCOT Control Performance 1 (“CPS1”) scores, relative to less frequent PFR deployment with a larger deadband. The RRS-gen contribution to improved CPS1 scores in turn permits a reduction in procurement of Regulation Services (per the ERCOT Methodologies for Determining Minimum Ancillary Service Requirements).

According to ERCOT, system frequency dipped below 59.850 Hz on 11 occasions during 2016, but using the TRE 1-minute average system frequency data, there is not a single clock-minute that would have triggered FFR deployment at 59.850 Hz. Such a low FFR deployment trigger and the resultant minimal deployment would yield little to no improvement in CPS1 scores (which are measured using the 1-minute data).

1. **Based on 2016 system frequency data, FFR should provide “up” response at a frequency trigger of at least 59.955 Hz in order to match the expected frequency correction of RRS supplied by generators.**

In order to be as valuable as RRS-gen, FFR deployments should produce a similar impact on ERCOT’s CPS1 score. It is important to note that FFR is designed to “up” deploy 100% of its award in 30 cycles when the frequency trigger is met, while RRS-gen deploys on an increasing linear basis from its trigger point of 59.983 Hz (see Exhibit 3).[[1]](#footnote-1) To find an equivalency between FFR and RRS-gen, RRS-gen “up” deployment for each minute of 2016 is calculated based on the actual 1-minute frequencies. Based on this method, Apex has determined the FFR trigger should be set at 59.955 Hz for the primary frequency response to be equivalent to RRS-gen (see Table A).

**Table A: Equivalent “up” frequency response below 60Hz for FFR & RRS**

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| **Product** | **Frequency trigger** | **Number of 1-minute intervals at or below trigger** | **Average deployment from 100 MW award when triggered** | **Average deployment from 100 MW across all minutes in 2016** | **Average 2016 CPS1 score improvement from incr. 100 MW** |
| RRS (generators) | 59.983 Hz | 83,775 min/yr(15.896%) | 1.24 MW | 0.197 MW | 0.8% |
| FFR (Apex proposal) | 59.955 Hz | 1,039 min/yr(0.197%) | 100 MW | 0.197 MW | 0.8% |
| FFR (ERCOT proposal) | 59.850 Hz | 0 min/yr(~0%) | NA | ~0 MW | ~0% |

1. **FFR should provide “down” response at a 60.038 Hz trigger, when available, to match the expected Primary Frequency Response of RRS-gen.**

Pursuant to PFR mandate BAL-001-TRE-1, most online generators must also respond to frequency deviations at or above 60.017 Hz[[2]](#footnote-2). PFR suppliers are required to provide this “down” response to the extent that the unit output exceeds the Low Sustained Limit. While BAL-001-TRE-1 applies to “generators”, it is unclear if Energy Storage Resources would need to comply with PFR requirements. Therefore, it is important that Energy Storage Resources that supply FFR are treated in an equivalent manner to generation supplying RRS since the FFR product would be paid the same as RRS-gen.

To find an equivalency between FFR and RRS-gen, RRS-gen “down” deployment for each minute of 2016 is calculated based on the actual 1-minute frequencies. Based on this method, the FFR trigger should be set at 60.038 Hz for the primary frequency response to be equivalent to RRS (see Table B).

**Table B: Equivalent “down” frequency response above 60Hz for FFR & RRS[[3]](#footnote-3)**

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| **Product** | **Frequency trigger** | **Number of 1-minute intervals at or above trigger** | **Average deployment from 100 MW award when triggered** | **Average deployment from 100 MW award in 2016** | **Average 2016 CPS1 score improvement from incr. 100 MW** |
| RRS (generators) | 60.017 Hz | 45,322 min/yr(8.600%) | 0.72 MW | 0.062 MW | 0.3% |
| FFR (Apex proposal) | 60.038 Hz | 325 min/yr(0.062%) | 100 MW | 0.062 MW | 0.3% |
| FFR (ERCOT proposal) | NA | NA | NA | 0 MW | 0% |

1. **NPRR draft should clarify how FFR would be prorated when offered supply exceeds the product volume limit for FFR or the RRS-Load and FFR offers exceed 50% of the total RRS procurement.**







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| Revised Cover Page Language |

None

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| Revised Proposed Protocol Language |

None

1. PFR up deployment = [(Hzactual – 60.0 – 0.017)/(60.0 \* Droop – 0.017)] \* NDC \* -1; where Droop = 0.05 (for most generator types), NDC = Name plate capacity of unit [↑](#footnote-ref-1)
2. PFR down deployment = [(Hzactual – 60.0 + 0.017)/(60.0 \* Droop – 0.017)] \* NDC \* -1 [↑](#footnote-ref-2)
3. Down deployment analysis assumes that FFR, RRS-gen, and online conventional resources have sufficient output above Low Sustained Load to accommodate the down deployment. [↑](#footnote-ref-3)