Operating Reserve Demand Curves (ORDC) for Reserve Price Formation Project

Delivery Year 2021/2022

Markets Implementation Committee

April 07, 2021

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Regulatory Background

In Docket Nos. EL19-58-000 and ER19-1486-000, the Commission accepted proposed revisions to the PJM Tariff and Operating Agreement to effectuate enhanced reserve price formation in PJM markets.

Under the revised language in the Tariff, Attachment K-Appendix, Section 3.2.3A.02 (C), and Operating Agreement, Schedule 1, Section 3.2.3A.02(C), **PJM is required to post revised Operating Reserve Demand Curves** (ORDCs) **by April 1 for the delivery year starting in June**.

While this Tariff and Operating Agreement language will not become effective until May 1, 2022, PJM has posted the ORDCs for Synchronized Reserve, Primary Reserve, and the 30-Minute Reserve Requirements for the RTO and Mid-Atlantic & Dominion Reserve sub-zone, for Delivery Year 2021/2022 given it starts this coming June.

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ORDC Development and Posting Criteria

PJM indicated the following with respect to the development of the ORDC curves:

- The uncertainties defining the ORDC are quantified from three full calendar years of data.
- PJM will annually update the determination of these quantifications to account for the most recent calendar year's data.
- PJM will post the revised ORDCs each year by April 1 for the delivery year starting in June.

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Posted ORDCs

- PJM has developed and posted the set of ORDCs to be used for the 2021/2022 Delivery Year (June 1, 2021 through May 31, 2022).
  - Posted ORDCs will be effective on May 1, 2022 through May 31, 2022 (first month the reserve price formation project go-live).
- ORDCs developed for Synchronized Reserve (SR), Primary Reserve (PR) and 30-Minute Reserves.
- ORDCs developed using calendar years 2018, 2019 and 2020 data.
- ORDCs developed for the PJM RTO and Mid-Atlantic and Dominion (MAD) sub-zone.
  - No new reserve sub-zones created.

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Posted ORDCs (Cont.)

- For illustrative purposes a Minimum Reserve Requirement (MRR) of 1,400 MW was used for the curves.
- For illustrative purposes a MRR of 2,100 MW (1.5*1,400 MW) was used for the PR curves.
- The SR MRR in Day Ahead (DA) will be based on a resource with the largest bid in Eco Max for a given hour.
- The SR MRR in Real Time (RT) will be based on the max of a resource's State Estimator MWs or bid in Eco Max, whichever is higher.
- The PR MRR in both DA and RT is equal to 1.5 times the SR MRR.

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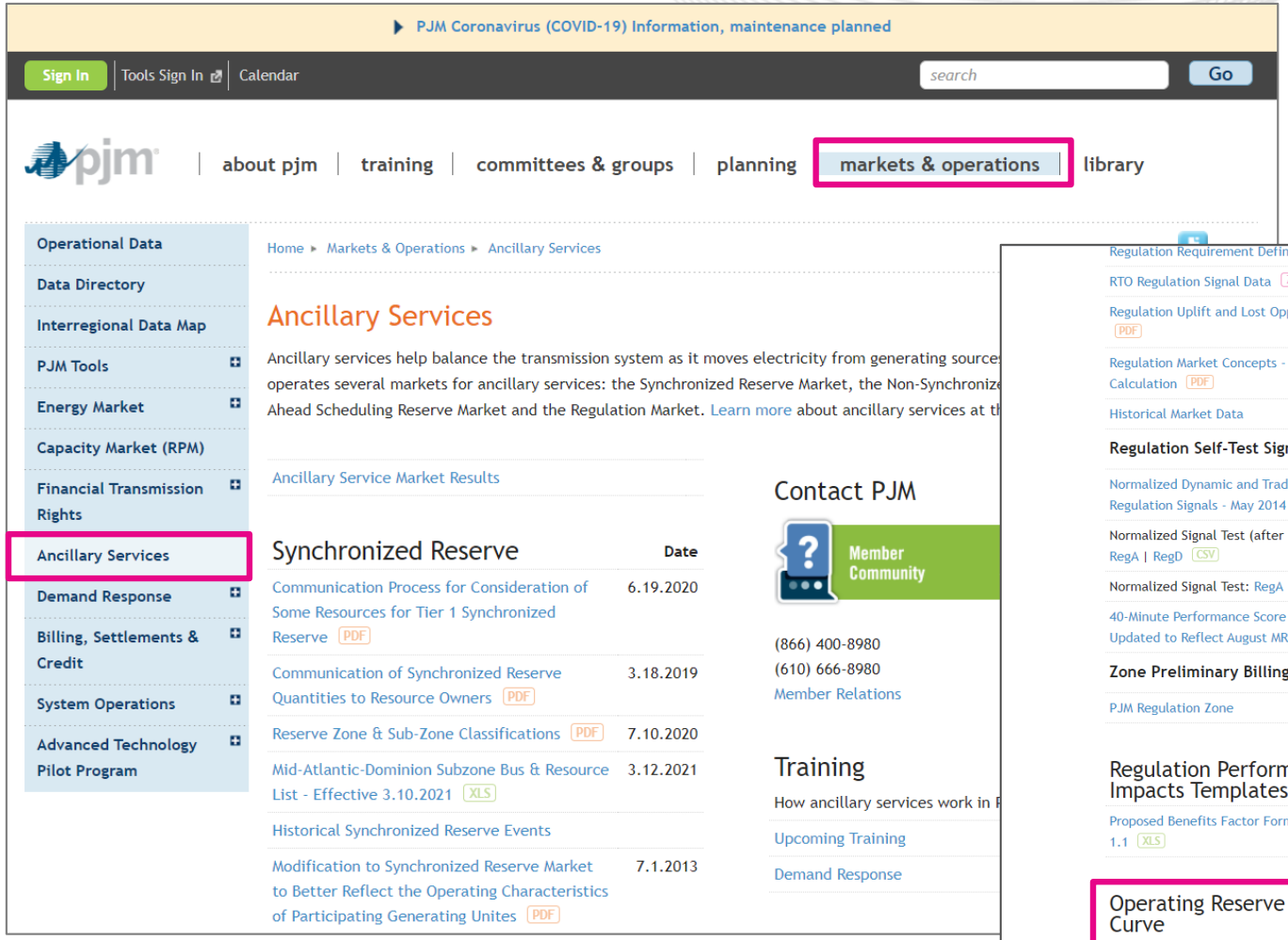
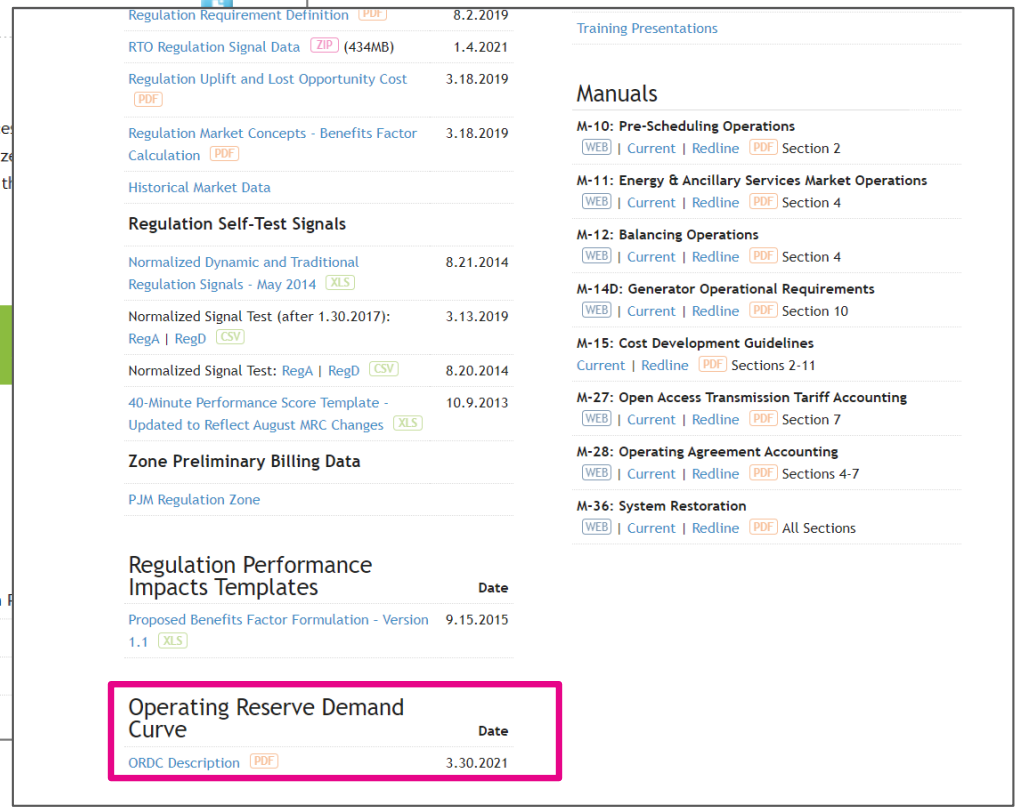
ORDC Posting Location





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Future ORDC Work

ORDCs for the 2022/2023 Delivery Year (June 1, 2022 through May 31, 2023) will be developed and posted by April 1, 2022.

The 2022 Delivery Year ORDCs will be developed using data from calendar years 2019, 2020 and 2021.

Will include ORDCs for the RTO, MAD and any new reserve sub-zone(s) identified by PJM.

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The ORDC:

Sets the reserve requirement for market clearing purposes

Puts a **defined limit on the cost** to be incurred when procuring reserves

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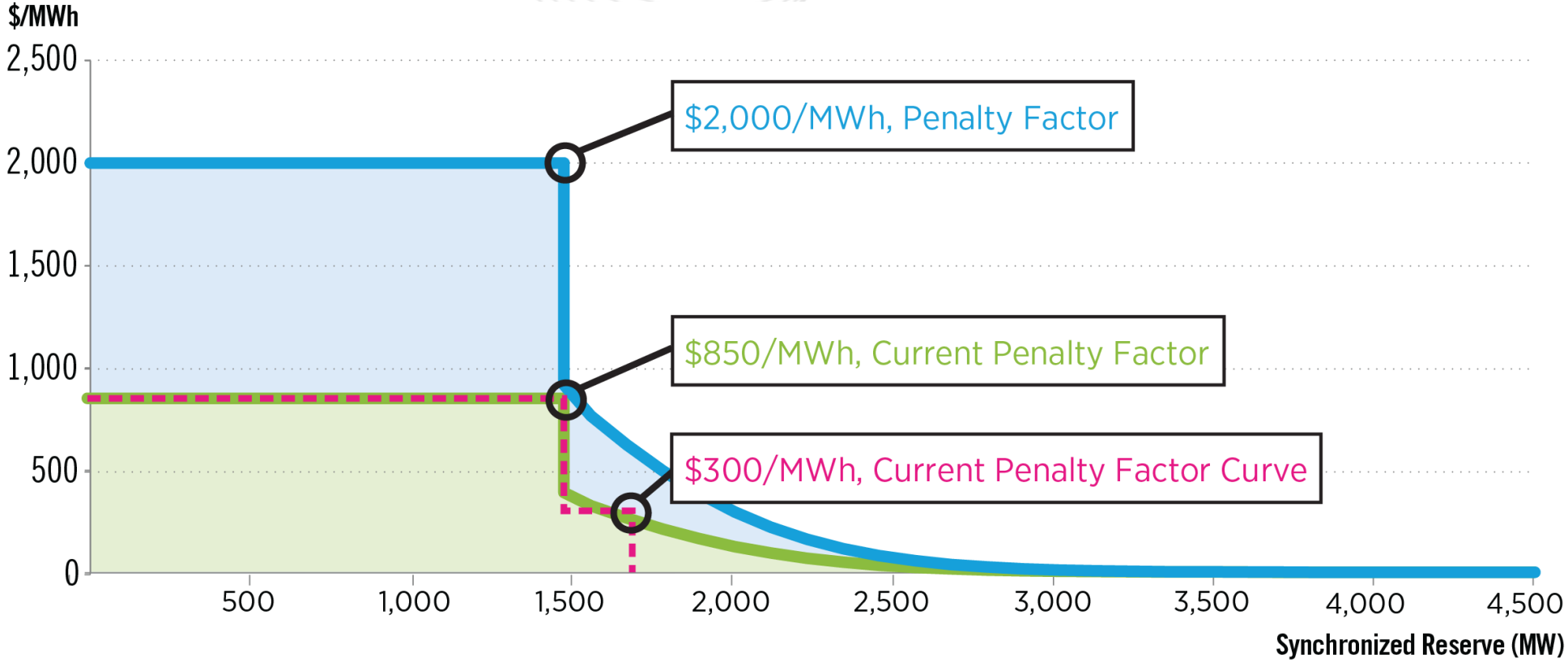
Synch Reserve ORDC Penalty Factor Comparison



For illustrative purposes only.

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Elements for ORDC Construction

	10-Min (SR)	10-Min (PR)	30-Min
MRR	Output of largest online unit (~1,450 MW)	150% of output of largest online unit (~2,175 MW)	Max of 3,000 MW or largest gas contingency (approximately 200% of largest unit)
Uncertainties	Load, Wind, Solar, Thermal Forced Outages	Load, Wind, Solar, Thermal Forced Outages	Load, Wind, Solar, Thermal Forced Outages, Net Interchange
Adjusted by Regulation?	Yes	Yes	Yes
Look-Ahead Uncertainty Interval	30 minutes	30 minutes	60 minutes
Penalty Factor	$2,000/MWh	$2,000/MWh	$2,000/MWh

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Modeling ORDC

Twenty-four different ORDCs will be modeled per reserve zone, one for each season and time-of-day blocks.

Using historical uncertainty data from most recent three full calendar years

Season	Time-of-Day Block (in Hour Beginning)
Summer (June – August)	1 (2300 – 0200)
Fall (September – November)	2 (0300 – 0600)
Winter (December – February)	3 (0700 – 1000)
Spring (March – May)	4 (1100 – 1400)
	5 (1500 – 1800)
	6 (1900 – 2200)

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Zonal Version of ORDCs

- The zonal ORDCs for each of the three products will be developed in a similar manner to the RTO ORDCs.
- The data used to calculate the zonal ORDC will be zonal data.
- The penalty factors will be identical to the RTO penalty factors.

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