



# Peer ISO/RTO Regulation Market Designs

RMDSTF

April 26, 2022

- Signal Design
  - Number
  - Frequency
  - Directionality
  - Procurement (DA and/or RT)
- Regulation Requirement
- Resource Eligibility
  - Minimum MW
  - Resource Type Limitations
- Pay for Performance
- Performance Scoring

- *The peer ISO/RTO policies outlined in this presentation have been compiled to the best of PJM's abilities in 1Q2022, using public material and documentation. Policies herein may or may not fully reflect the current practice of these entities.*
- *PJM does not endorse any of the presented policies for the purposes of the RMDSTF. All policies and rules are presented for educational and discussion purposes.*

	PJM	ISO NE	MISO	ERCOT	SPP	CAISO	NYISO
Number of Regulation Signals *	2	3	2	2	2	2	1
Names of Regulation Signals	RegA, RegD	Conventional, Energy Neutral ** (EN Trinary, EN Continuous)	Fast Ramping Regulating (FRR), Regulating	Regulating Service Signal (Reg-Up, Reg-Down)	Regulation Up/Down	Regulation Up/Down	Regulation
Signal Freq.	Reg A: 5 min Reg D: 2 sec	Conventional: 4 sec Energy Neutral: 4 sec	Fast Ramp: 4 sec Traditional: 4 sec	4 sec	4 sec	4 sec	6 sec
Signal Direction	Bidirectional	Bidirectional	Bidirectional	Up/Down	Up/Down	Up/Down	Bidirectional
Procurement in Day-Ahead	N	N	Y	Y	Y	Y	Y
Procurement in Real-Time	Y	Y	Y	N	Y	Y	Y

\* Regulation Up and Down are considered discrete signals for counts in Row 1.

\*\* Alternative Technology Regulating Resources (ATRR) only permitted for EN; created via high-pass filtering of Conventional signal.

Note: ISO-NE, MISO, SPP, CAISO, and NYISO send different (resource-specific) signals based on resource ramp rates.

	PJM	ISO NE	MISO	ERCOT	SPP	CAISO	NYISO
Interval	Periodic (On- or Off-Ramp), Hours Shift Seasonally	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
Dependencies	Season, Fixed values (800 MW On-Ramp, 525 MW Off-Ramp)	Historic control performance	Predicted next-day operating conditions before DA market close	Net load variability, recent regulation utilization level, magnitude of installed wind capacity	Load forecast, intermittent resource forecast	Mandatory Floor Minimum 350 MW for Regulation Up/Down, MW Forecasted Load	Fixed values
Derivation of the Regulation Requirement	Fixed values are based on previous requirements (i.e. percentage of peak load)	Calculated using historical hourly load and control performance	Calculated using predicted hourly load and anticipated system conditions	Calculated using 5-minute net load variability, recent utilization of regulation, and short-term load forecast error, all adjusted using current installed wind capacity	Calculated using the magnitude and variability of load and intermittent resource forecasts	Calculated as percentage of forecasted load in real-time (distinct Up/Down)	Fixed values are based on peak loads during historic hours, week/weekend days, and seasons

	PJM	ISO NE	MISO	ERCOT	SPP	CAISO	NYISO
Minimum Eligible Size (MW)	0.1 MW	Generating Resource: 10 MW Alternative Technology: 1 MW	1 – 5 MW by Resource Type	0.1 MW	1 MW	0.5 MW	1 MW
Testing Requirements	3 consecutive successful tests with minimum 75% compliance, full up and down capability	Minimum response rate 1 MW/min, must pass “minimum responsiveness test”	NA	Reg-Up and Reg-Down qualification test occurs over a 60 minute period with random 2 min instruction intervals (up, hold, down)	3 Regulation Test Scores of 75% or greater	Test over full Regulation capacity range within 10 minutes	Resource preliminarily scheduled for 24 hour period, must meet minimum 0.85 Performance Index threshold A
Additional Participation Considerations	Only 25% of total regulation requirement can come from DR	No self-scheduled resources allowed	Dispatchable Intermittents and DR Type I not permitted to provide Regulation (the latter provides only fixed, predetermined reduction)	NA	NA	NA	NA

	PJM	ISO NE	MISO	ERCOT	SPP	CAISO	NYISO
Mileage Calculated	Yes	Yes	Yes	No	Yes	Yes	Yes
Performance Score and Methodology	Yes, performance score based on (ten-second sampling of) correlation, delay, and precision measurements	Yes, evaluated based on a Regulation Monitoring Program developed in-house that draws envelopes around the signal and compares to the response	Yes. Regulation performance is measured by signal mileage vs. response mileage	No scoring, only monthly performance checks to ensure resources are performing to a certain standard	Yes, the score is based on how well they follow and respond for regulation, using signal mileage vs. response mileage	Yes, regulation performance is measured, using signal mileage vs. response mileage, and poor performance is removed from market	Yes, Performance Tracking System (PTS) to monitor the performance using 30-second sampling of signal and response
Benefits Factor	Yes	No	No	Yes	No	No	No

	PJM	ISO NE	MISO	ERCOT	SPP	CAISO	NYISO
Is performance taken into account for compensation?	Yes	Yes	Yes	No	Yes	Yes	Yes
Do you use real-time, marginal price data or historical for settlements?	Real-time price and performance	Real-time price and performance	Real-time price and performance	Real-time (SASM) price	Real-time price and performance	Real-time price and performance	Real-time price and performance

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