IMM RCSTF Perspective and Proposal

MRC

August 19, 2026

IMM

Monitoring Analytics

IMM RCSTF Recommendation for MRC

1. **Address the practical, operational need for additional reserves due to solar, wind, and load forecast error in net load.**

2. **Do not adopt market design changes that include intentional increases to shortage pricing levels.**

RCSTF

- The RCSTF was created to address two distinct concerns:
  - An immediate concern related to reserve market performance and fuel procurement practices.
  - An upcoming concern related to energy market incentives for an evolving generation fleet.
- PJM/IMM addressed the immediate concern via deployment changes and outreach.
- As PJM did in 2019 with its ORDC proposal, PJM is proposing to radically change PJM's energy and reserve market design in order to increase generation revenues.

RCSTF

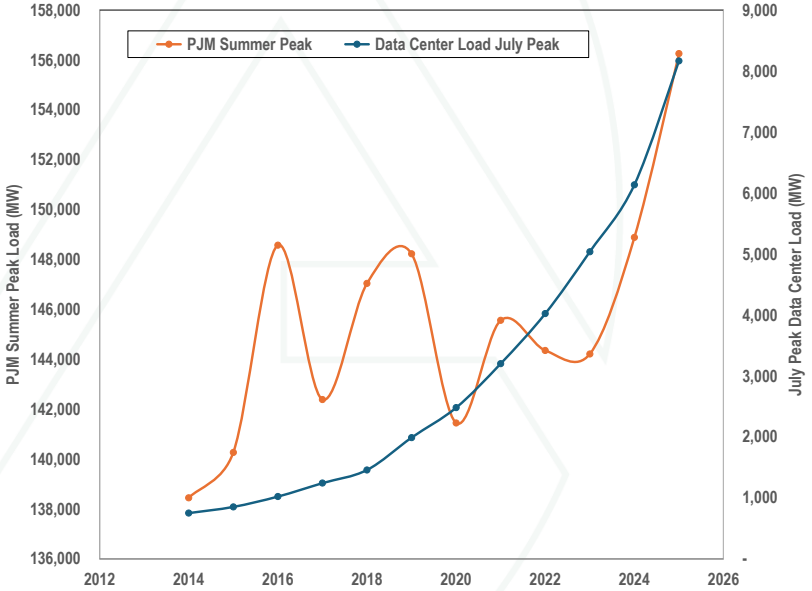
- There is a simple and practical way to address the supply uncertainty from intermittent resources. The IMM proposal addresses it.
- Part of PJM's proposal, even with its calculation flaws, addresses that.
- The problem is that PJM's proposal goes way beyond addressing net load uncertainty.
  - Reinstates PJM's desired downward sloping ORDC curves.
  - No market power mitigation and/or avoidable costs including in reserve offers.
  - Unnecessary day ahead only products.
  - Complex and unproven locational reserve procurement.

Shortage Pricing in the PJM Market Design

- **Shortage is currently signaled in PJM energy market prices in multiple ways:**
  - **Reserve shortage pricing**
  - **Transmission constraint penalty factors**
  - **Demand response pricing**
  - **Use of high marginal cost peaking or emergency generation**
- **All these are more frequent with the increase in load, especially in peak load levels, due to the rapid growth of data centers.**

Data Centers in the Energy Market

- **Load growth from data centers is already increasing scarcity in the energy market.[1]**
- **Adopting a PJM proposal with intentional increases to the level of shortage pricing is counter to the Principles and the Pledge.**



1. See Data Center Accuracy Report. <<https://www.pjm.com/-/media/DotCom/planning/res-adeq/load-forecast/2026-accuracy-report.xlsx

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Shortage Pricing in PJM Proposal

- There are multiple sources of higher prices, especially during tight market conditions, in PJM's proposal:
  - Higher reserve product Operating Reserve Demand Curves (ORDCs) would increase shortage pricing.
  - Requirements for new products and higher requirements for current products would lead to more shortages.
  - Reserve offers without market power mitigation and reserve cost-based offers based on fuel procurement costs that are not marginal costs would increase reserve prices and markups.
  - Locational (constraint specific) reserve requirements would increase congestion pricing.

Comparison of Shortage Pricing

	PJM Proposal	IMM Proposal / Status Quo
ORDC highest price	$2,100 per MW	$850 per MW per product $1,750 per MW max price
Locational reserve highest price	$2,100 + up to $1,000 per MW per reserve constraint violated. No stated limit.	$3,400 per MW in MAD
System Energy Price Cap	$4,100 per MWh cap	$3,700 per MWh cap
TCPF in LMP	+ Up to $2,000 per MW default per energy constraint violated. No limit.	+ Up to $2,000 per MW default per energy constraint violated. No limit.
DR Strike Price by lead time	$2,000 per MWh for 30 min $1,500 per MWh for 60 min	$1,840 per MWh for 30 min $1,425 per MWh for 60 min

ORDC

- **Downward sloping ORDC curves create shortage pricing when the system is not short.**
- **Downward sloping ORDC curves are not necessary to address net load uncertainty.**
- **Downward sloping ORDC curves make customers pay for capacity available that has already been paid.**

Components of PJM Real-time LMP

- **The IMM's analysis of the components of LMP for January through June 2026 shows that transmission constraint penalty factors for constraint violations were the second highest determinant of LMP.**
- **LMP set by transmission constraint penalty factors (TCPF) is a form of administrative shortage pricing.**
- **During high load periods in 2026, TCPFs had a significant impact on energy market prices.**
- **The use of TCPF is primarily a result of the pervasive reduction of transmission line limits in real-time SCED.**

Components of PJM Real-time LMP

Element	2025 (Jan - Jun) Contribution to LMP	2025 (Jan - Jun) Percent	2026 (Jan - Jun) Contribution to LMP	2026 (Jan - Jun) Percent	Change in Percent
Gas	$24.35	47.1%	$28.63	39.5%	(7.6%)
Transmission Constraint Penalty Factor	$5.32	10.3%	$14.75	20.3%	10.0%
Positive Markup	$3.17	6.1%	$6.02	8.3%	2.2%
Coal	$3.65	7.1%	$4.62	6.4%	(0.7%)
Oil	$2.44	4.7%	$4.08	5.6%	0.9%
Ten Percent Adder	$3.16	6.1%	$3.80	5.2%	(0.9%)
Variable Maintenance	$3.02	5.8%	$3.29	4.5%	(1.3%)
Market-to-Market	$0.71	1.4%	$2.94	4.1%	2.7%
CO_2 Cost	$1.93	3.7%	$2.34	3.2%	(0.5%)
Opportunity Cost Adder	$0.96	1.9%	$1.95	2.7%	0.8%
Ancillary Service Redispatch Cost	$1.39	2.7%	$1.87	2.6%	(0.1%)
Variable Operations	$1.24	2.4%	$1.54	2.1%	(0.3%)
Increase Generation Differential	$0.59	1.1%	$0.75	1.0%	(0.1%)
Shortage Pricing (ORDCs)	$1.90	3.7%	$0.66	0.9%	(2.8%)
NA	$0.34	0.7%	$0.66	0.9%	0.2%
LPA Rounding Difference	$0.49	0.9%	$0.54	0.7%	(0.2%)
Landfill Gas	$0.09	0.2%	$0.16	0.2%	0.0%
NO_x Cost	$0.02	0.0%	$0.16	0.2%	0.2%
Emergency Demand Response	$1.25	2.4%	$0.10	0.1%	(2.3%)
Other	$0.01	0.0%	$0.02	0.0%	0.0%
SO_2 Cost	$0.00	0.0%	$0.00	0.0%	(0.0%)
LPA-SCED Differential	($0.00)	(0.0%)	($0.00)	(0.0%)	0.0%
PJM Administrative Cap	($0.17)	(0.3%)	($0.02)	(0.0%)	0.3%
Decrease Generation Differential	($0.33)	(0.6%)	($0.11)	(0.2%)	0.5%
Renewable Energy Credits	($0.20)	(0.4%)	($0.67)	(0.9%)	(0.5%)
Negative Markup	($3.59)	(6.9%)	($5.55)	(7.6%)	(0.7%)
Total	$51.75	100.0%	$72.54	100.0%	0.0%

LMP Contribution to Real-time Load Costs

- **The following table multiplies the contribution to LMP analysis by the real-time load MWh.**
- **The total LMP cost to load for January through June, 2026 was $39.4 billion.**
- **The total LMP cost contribution of the transmission constraint penalty factors was $6.0 billion.**
- **The total LMP cost contribution of the operating reserve penalty factors was $0.3 billion.**

LMP Contribution to Real-time Load Costs

Element	Contribution to Real Time Cost of Load ($Million) 2025 (Jan - Jun)	2026 (Jan - Jun)	Change	Percent
Gas	$9,613.4	$11,586.1	$1,972.7	22.1%
Transmission Constraint Penalty Factor	$2,102.1	$5,969.0	$3,867.0	43.3%
Positive Markup	$1,250.2	$2,436.9	$1,186.7	13.3%
Coal	$1,442.1	$1,871.0	$429.0	4.8%
Oil	$964.6	$1,653.1	$688.5	7.7%
Ten Percent Adder	$1,247.7	$1,539.8	$292.0	3.3%
Variable Maintenance	$1,190.8	$1,331.4	$140.6	1.6%
Market-to-Market	$280.2	$1,190.3	$910.1	10.2%
CO_2 Cost	$763.0	$945.4	$182.4	2.0%
Opportunity Cost Adder	$378.2	$788.4	$410.2	4.6%
Ancillary Service Redispatch Cost	$550.4	$757.4	$207.0	2.3%
Variable Operations	$490.2	$623.4	$133.1	1.5%
Increase Generation Differential	$233.8	$302.9	$69.0	0.8%
Shortage Pricing (ORDCs)	$751.2	$269.0	($482.2)	(5.4%)
NA	$134.7	$265.6	$130.9	1.5%
LPA Rounding Difference	$192.1	$218.3	$26.2	0.3%
Landfill Gas	$35.3	$64.5	$29.2	0.3%
NO_x Cost	$7.1	$64.0	$56.9	0.6%
Emergency Demand Response	$494.5	$38.5	($456.0)	(5.1%)
Other	$4.7	$9.4	$4.7	0.1%
SO_2 Cost	$0.1	$0.1	($0.0)	(0.0%)
LPA-SCED Differential	($0.0)	($0.0)	$0.0	0.0%
PJM Administrative Cap	($68.0)	($6.8)	$61.2	0.7%
Decrease Generation Differential	($128.4)	($45.2)	$83.1	0.9%
Renewable Energy Credits	($79.3)	($272.1)	($192.7)	(2.2%)
Negative Markup	($1,418.8)	($2,244.4)	($825.6)	(9.3%)
Total	$20,431.8	$29,356.0	$8,924.1	100.0%

Relevance of TCPF

- The use of TCPFs is a form of shortage pricing.
- The default TCPF value is $2,000 per MWh.
- The TCPF sends strong price signals, frequently inappropriately, that are higher than ORDC prices.

- Key point: PJM has not shown that scarcity pricing is insufficient in the PJM energy market to support its proposal to raise ORDC prices. All forms of scarcity pricing must be considered, not only ORDCs.

Comparison of Proposals

	PJM	IMM
Day-ahead market	New reserve requirements and reserve products: additional uncertainty, energy gap	Day-ahead reserves match real-time requirements
Real-time market	New reserve requirements and reserve products: ramp and uncertainty, more online reserves	Status quo products, includes uncertainty, use of online and offline reserves
Reserve offers	Up to $10/MW without mitigation and fuel procurement costs	Status quo, based on opportunity costs in the clearing engine
Reserve performance	Increased penalties tied to prices, maintains 20-30 percent increases to requirements	Increased penalties based on historic payments, remove increases, limit poor performers
ORDCs	Higher prices and extended curves	Status quo
Locational reserves	Additional locational reserve constraints	Subzone reserves

Other Elements of IMM Proposal

- Incorporate pre-emergency and emergency demand response in the reserve market
- Limit and penalize poor performance reserve resources rather than increase market reserve requirements to compensate for poor performance.
- Ease and speed of implementation of the proposal, preventing delays to combined-cycle model and other important market enhancements
- Based on status quo market design as much as possible to address the need for reserves and improved performance, introducing less risk and uncertainty to the energy market

Day Ahead Reserves

- The IMM proposal includes day ahead reserves equal to the anticipated real time reserve amounts, which is the status quo market design.
- The PJM proposal includes additional reserve requirements that apply only to the day ahead market.
  - Reserves based on day ahead levels of uncertainty
  - Energy gap reserves based on historic load bidding patterns on high load days, despite lack of evidence that PJM commits resources based on any differences.
- The history of differences between the day ahead and real time market models shows that differences lead to market inefficiencies that impose unnecessary costs on customers.

DA Products

- **PJM is introducing day-ahead products that provide no service (real-time only).**
- **PJM already has experience with the lack of purpose of a DA only product (e.g. previous DASR).**
- **DA only products only create more divergence between DA and RT without any added benefit.**
- **PJM already has the tools and processes in place to address uncertainty between DA and RT.**

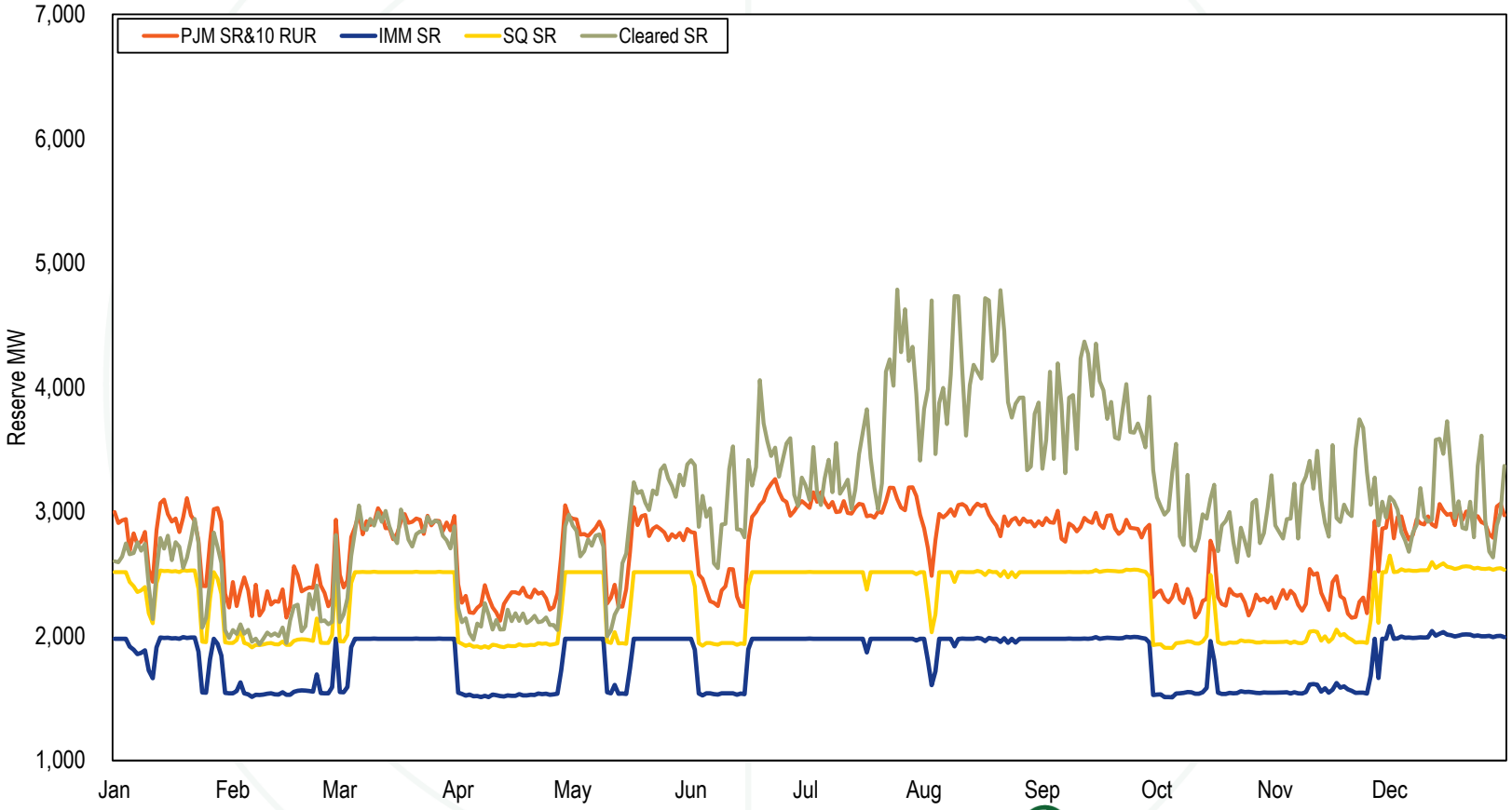
PJM and IMM 10 min Reserves Amounts

- The graphs compare status quo requirements and cleared reserves to the PJM and IMM proposed 10 min reserve quantities.
- Online and Offline Reserves
  - PJM proposes that all 10 min reserves be online only.
  - The PJM proposed amounts are the same for both online only and total 10 min reserves.
  - The IMM proposes separate synchronized (online) and primary (online or offline) reserve requirements.
- PJM proposed amounts exclude the status quo performance adder. PJM amounts will be higher if performance adder is maintained.

Graph Legend for Online 10 Minute Reserves

- **PJM SR & 10RUR**
  - **Proposed PJM synchronized reserves and 10 minute ramp and uncertainty reserve requirements**
- **IMM SR**
  - **Proposed IMM synchronized reserve requirement**
- **SQ SR**
  - **Status quo synchronized reserve requirement**
- **Cleared SR**
  - **Historic cleared synchronized reserve amount**

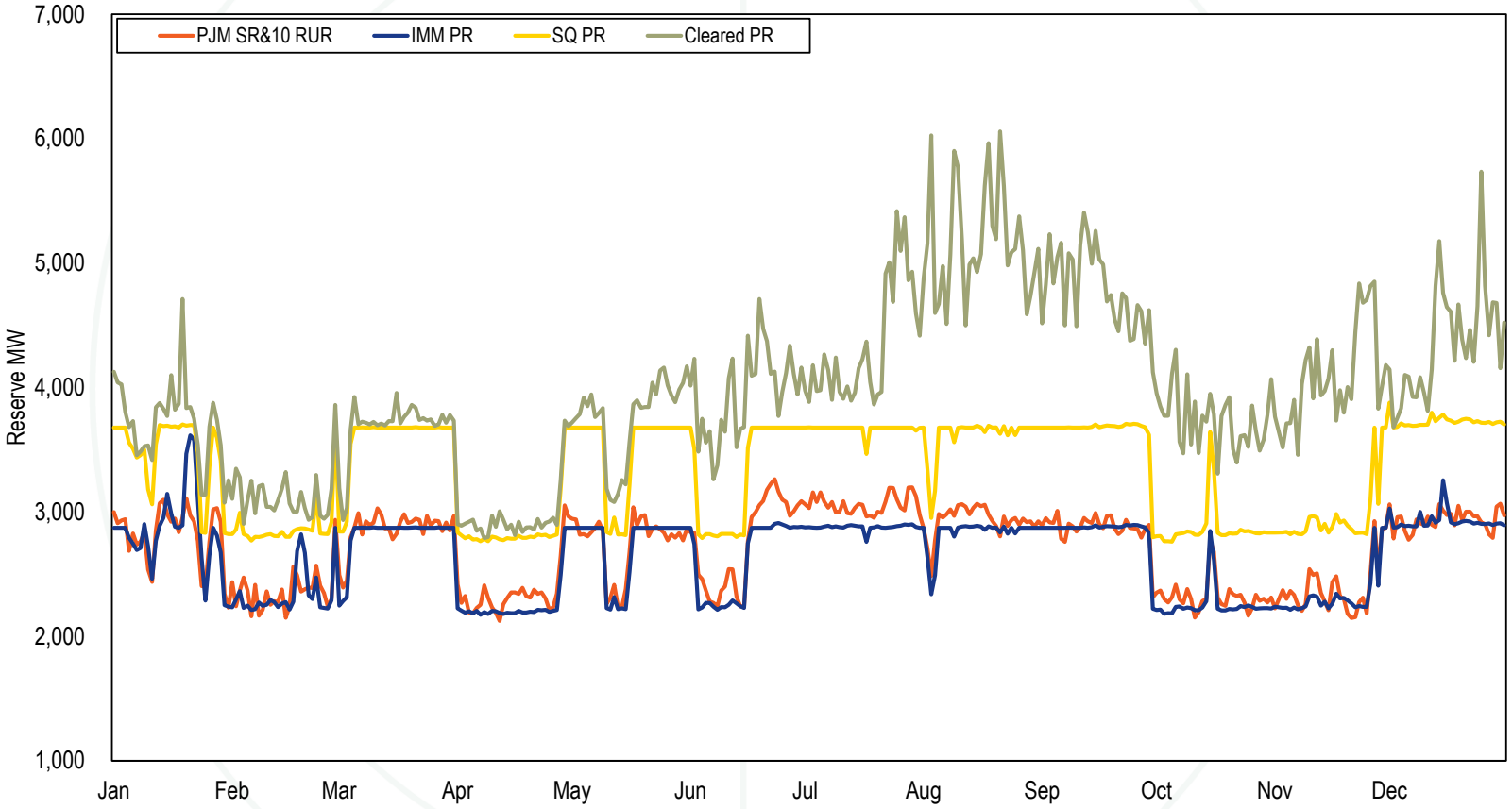
PJM and IMM 10 Minute Online Reserves



Graph Legend for Total 10 Minute Reserves

- **PJM SR & 10RUR**
  - **Proposed PJM synchronized reserves and 10 minute ramp and uncertainty reserve requirements**
- **IMM PR**
  - **Proposed IMM primary reserve requirement**
- **SQ PR**
  - **Status quo primary reserve requirement**
- **Cleared PR**
  - **Historic cleared primary reserve amount**

PJM and IMM Total 10 Minute Reserves



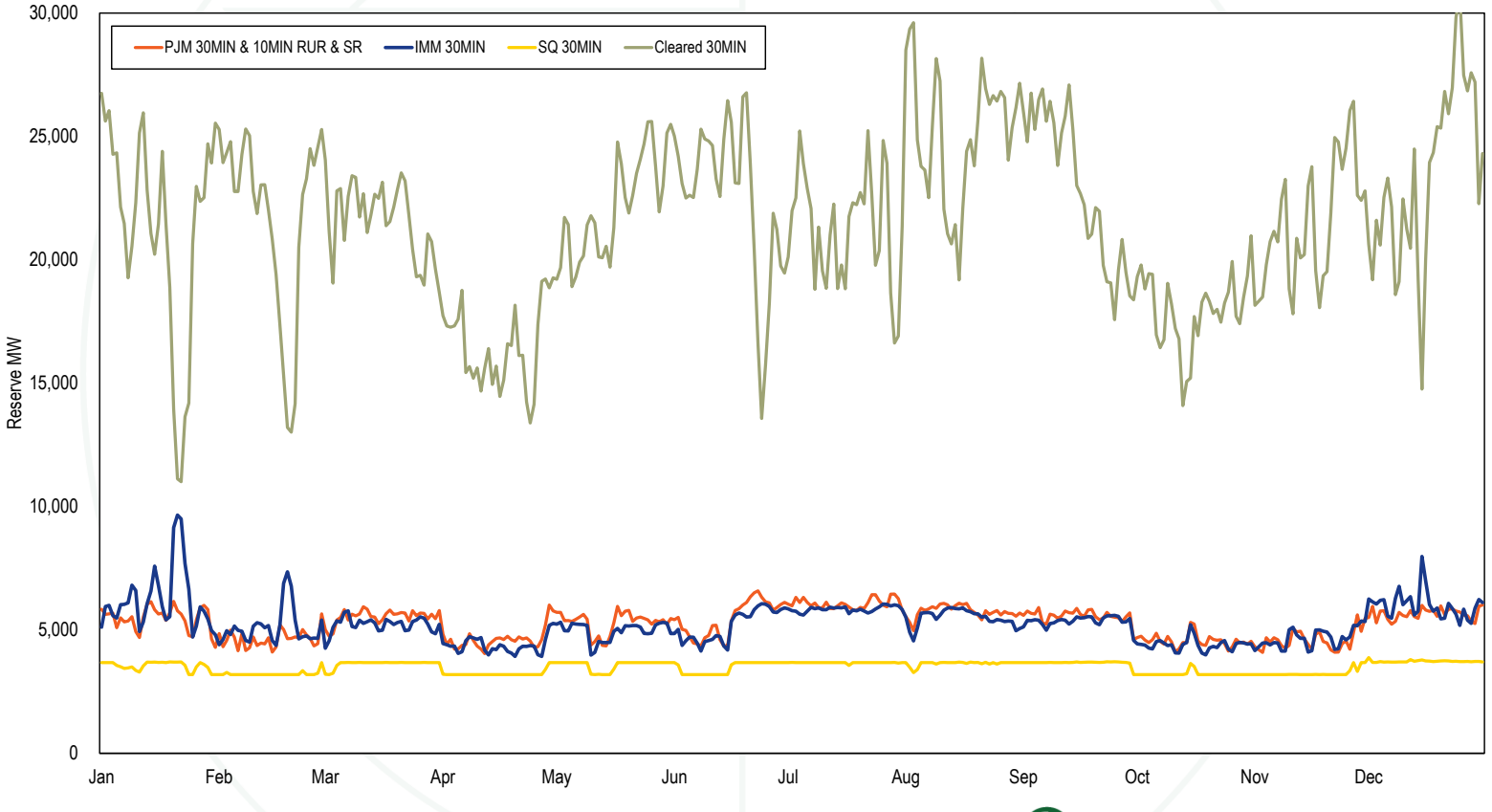
PJM and IMM 30 Min Reserves Amounts

- The graph compares the status quo requirement and cleared reserves to the PJM and IMM proposed 30 min reserve quantities.
- Online and Offline Reserves
  - PJM proposes a required online only component of the 30 min reserves.
  - The IMM proposes that all 30 min reserves can be online or offline.

Graph Legend for 30 Minute Reserves

- **PJM 30Min & 10Min RUR & SR**
  - **Proposed PJM synchronized reserves and 10 minute ramp and uncertainty reserve and 30 minute reserve requirements**
- **IMM 30 Min**
  - **Proposed IMM 30 minute reserve requirement**
- **SQ 30 Min**
  - **Status quo 30 minute reserve requirement**
- **Cleared 30 Min**
  - **Historic cleared 30 minute reserve amount**

PJM and IMM 30 Minute Reserve Proposals



PJM vs IMM Reserves Products

- A key difference between the PJM and IMM reserve requirements is the product definitions: online vs offline.
- PJM would significantly increase the required amount of online reserves, which increases production costs, increases prices, and reduces market efficiency.
- PJM should make full use of offline reserves.
- PJM's proposed elimination of the offline 10 min product (NSR) would make the market less efficient and would reduce reliability if current 10 min start generators remove fast start capability.

Reserve Offers

- PJM includes availability costs in reserve offers.
- PJM has provided no guidelines or criteria to discern which type of availability costs will be allowed in reserve offers, and therefore, not allowed in capacity offers.
- Availability costs are already included and recoverable through capacity market offers.
- Previous experience (e.g. maintenance costs) has resulted in confusion.

PJM vs IMM Locational Reserves

- The IMM proposes to use the current nested subzone reserve structure, with the default MAD subzone.
- PJM proposes to add new constraint reserve requirements.
  - These are additional reserve requirements on top of the proposed products and extended requirements.
  - Locational reserve transmission constraints will interact with energy transmission constraints.
  - Further reduces flow of energy on transmission constraints in the market dispatch, which PJM already reduces by lowering constraint limits.
  - Risks increasing the frequency of constraint violations and TCPF pricing

Reserve Performance

- PJM has made process and software changes that have improved reserve performance.
- The IMM has worked with market participants to improve reserve performance.
- This momentum should be maintained. More progress can be made.
- The IMM proposal replaces PJM's performance adder to reserve requirements with a process limiting the amount a poor performing resource can clear.
- The IMM proposal also ensures that all reserve performance is measured and enhances penalties.

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