

Winter Storm Gerri Markets Review

January 13–18, 2024

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Market Implementation Committee
February 7, 2024

- An overview of operations and markets during Winter Storm Gerri was provided at the January Markets & Reliability Committee.
- These slides are meant to provide additional detail for how Markets reflected system operations and conditions.

AREAS INCLUDE:

Day-ahead market
clearing and scheduling

Real-time LMP
price verification

Ancillary
service pricing

Uplift
totals

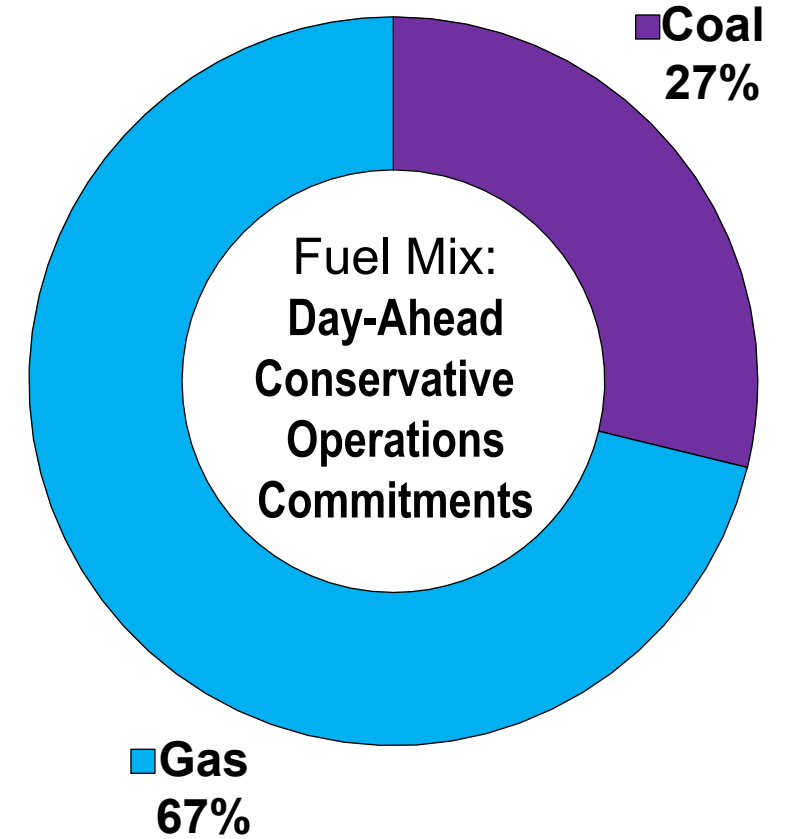
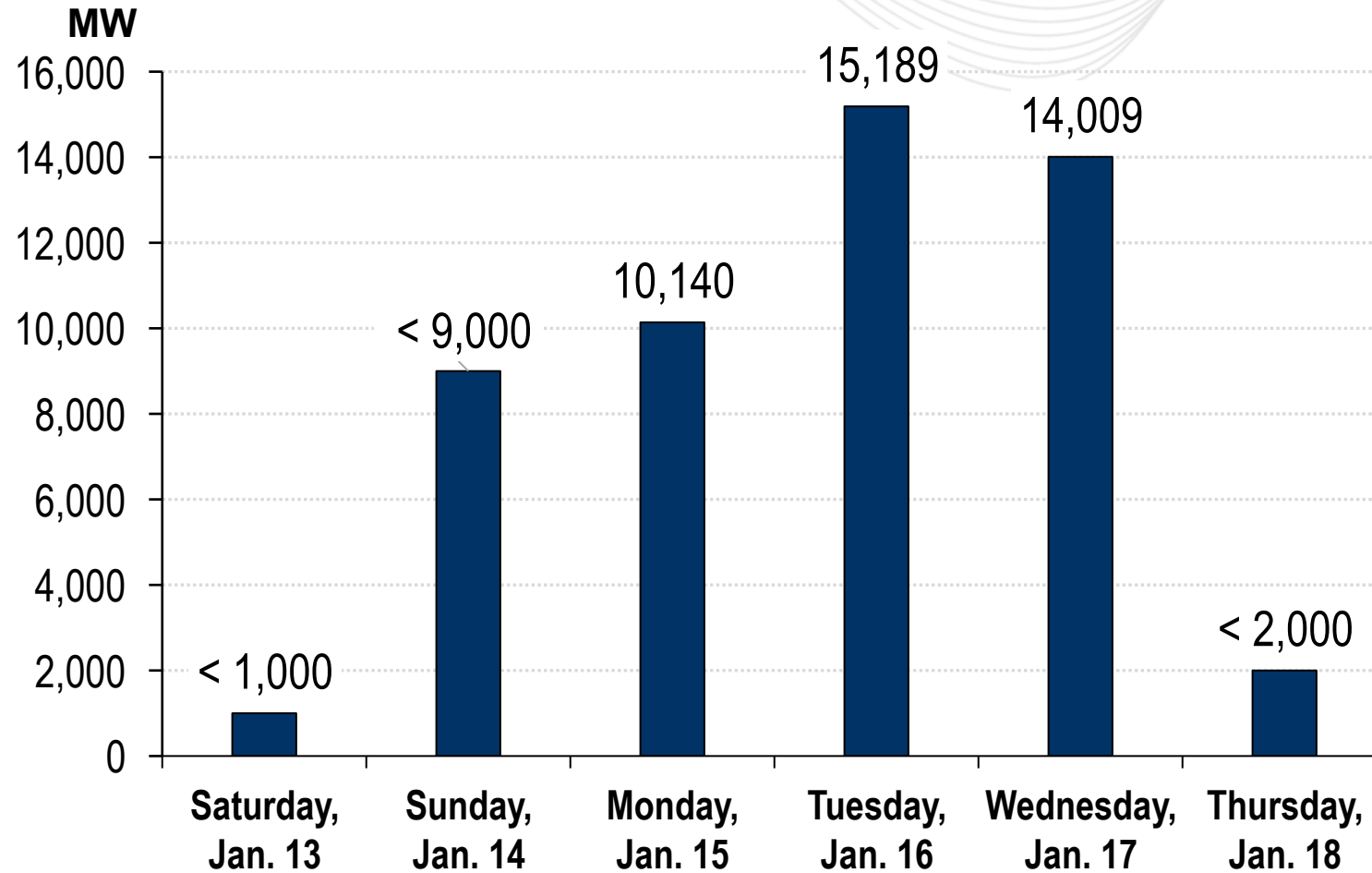
Conservative Operations units scheduled in the Day-Ahead peaked on January 16 at 15,189 MW; 67% were gas-fired units.

Day-Ahead Cleared Demand was as much as ~9,800 under bid compared to the forecast.

46–96% of exports were accounted for in the Day-Ahead clearing process.

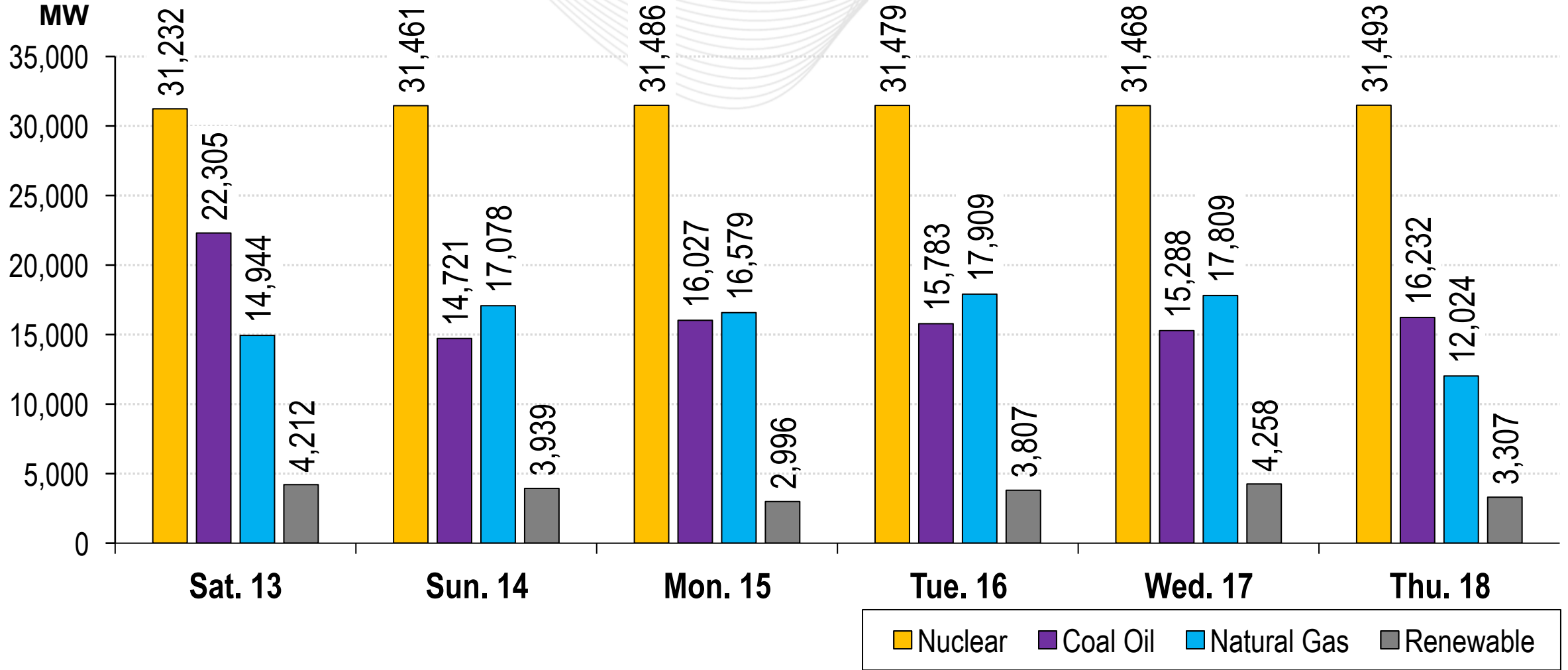
| Date | Day - Ahead | |
|---------|-----------------------|--|
| | Self-Scheduled Units | Committed Unit for Conservative Operations |
| | <i>Sum of Eco Max</i> | |
| Jan. 13 | 72,693 | < 1,000 |
| Jan. 14 | 67,200 | < 9,000 |
| Jan. 15 | 67,088 | 10,140 |
| Jan. 16 | 68,977 | 15,189 |
| Jan. 17 | 68,823 | 14,009 |
| Jan. 18 | 63,056 | < 2,000 |

Day-Ahead Conservative Operations Commitments (Jan. 13–18, 2024)



Day-Ahead Self Scheduled Units

Jan. 13–18, 2024





Day-Ahead Self Scheduled Units

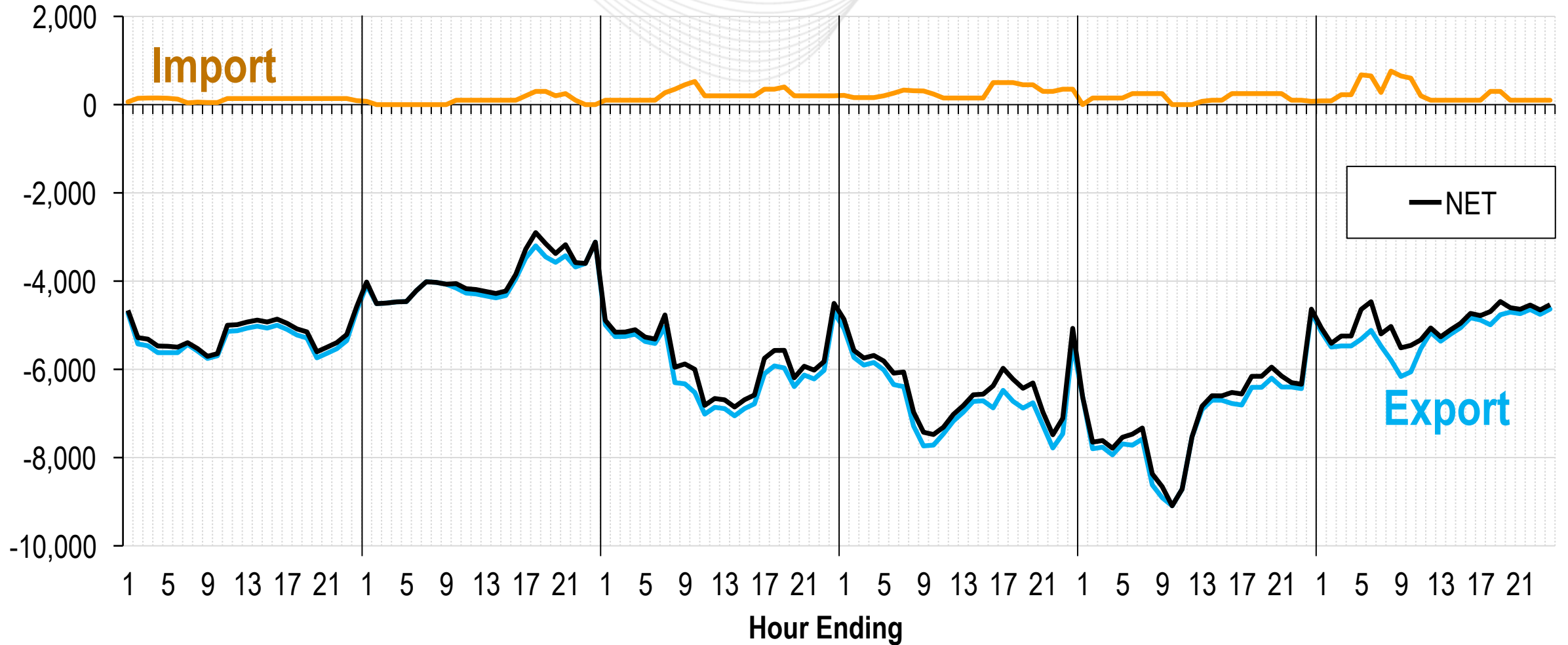
| January 2024 | Nuclear | | Coal Oil | | Natural Gas | | Renewable | | Total (MW) |
|-----------------|---------|-----|----------|-----|-------------|-----|-----------|----|---------------|
| | MW | % | MW | % | MW | % | MW | % | |
| Sat. 13 | 31,232 | 43% | 22,305 | 31% | 14,944 | 21% | 4,212 | 6% | 72,693 |
| Sun. 14 | 31,461 | 47% | 14,721 | 22% | 17,078 | 25% | 3,939 | 6% | 67,200 |
| Mon. 15 | 31,486 | 47% | 16,027 | 24% | 16,579 | 25% | 2,996 | 4% | 67,088 |
| Tue. 16 | 31,479 | 46% | 15,783 | 23% | 17,909 | 26% | 3,807 | 6% | 68,977 |
| Wed. 17 | 31,468 | 46% | 15,288 | 22% | 17,809 | 26% | 4,258 | 6% | 68,823 |
| Thu. 18 | 31,493 | 50% | 16,232 | 26% | 12,024 | 19% | 3,307 | 5% | 63,056 |



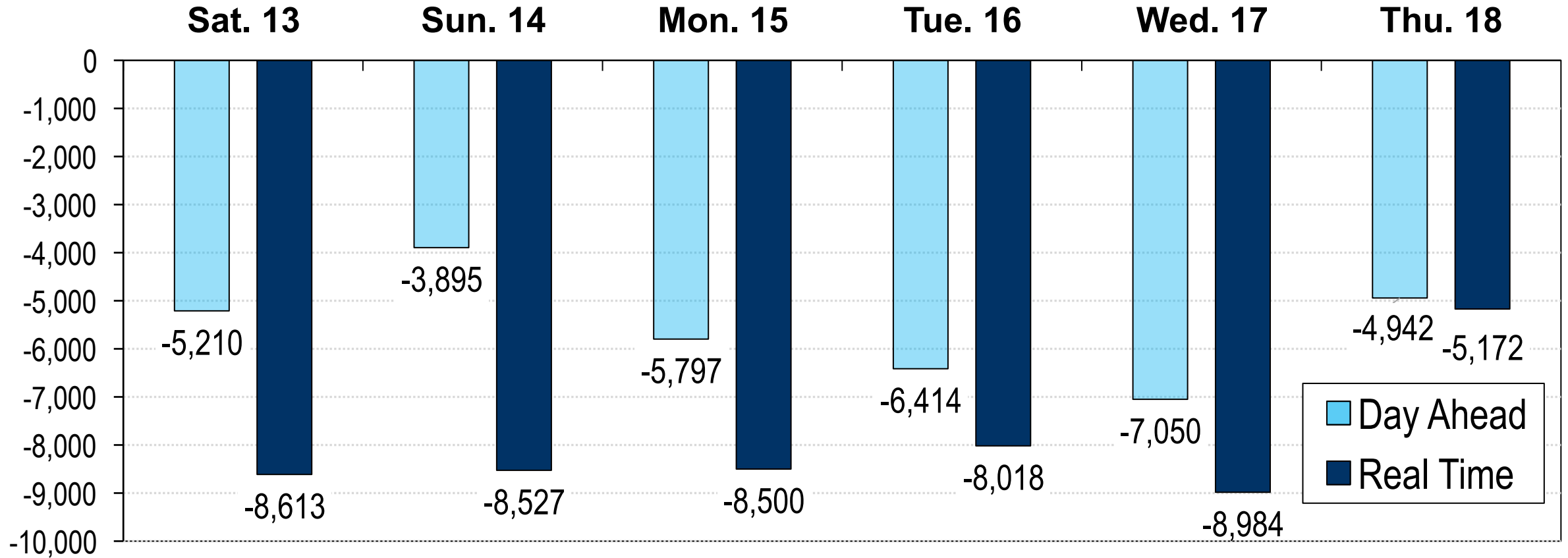
Day-Ahead Demand vs. Forecast at 18:00

| January 2024 | Valley | | | Morning Peak | | | Evening Peak | | |
|---------------|-----------|--------------|-------------------|--------------|--------------|-------------------|--------------|--------------|-------------------|
| | DA Demand | Org Forecast | DA Over/Under Bid | DA Demand | Org Forecast | DA Over/Under Bid | DA Demand | Org Forecast | DA Over/Under Bid |
| Sat., Jan. 13 | 75,914 | 80,468 | -4,554 | 91,300 | 96,996 | -5,696 | 98,701 | 105,543 | -6,842 |
| Sun., Jan. 14 | 90,350 | 90,344 | 6 | 102,362 | 102,014 | 348 | 115,144 | 116,447 | -1,303 |
| Mon. Jan. 15 | 102,365 | 103,808 | -1,443 | 116,683 | 124,309 | -7,626 | 117,383 | 126,687 | -9,304 |
| Tue., Jan. 16 | 100,524 | 102,610 | -2,086 | 116,796 | 124,946 | -8,150 | 122,246 | 131,337 | -9,091 |
| Wed., Jan. 17 | 109,523 | 111,958 | -2,435 | 133,002 | 135,061 | -2,059 | 124,418 | 125,627 | -1,209 |
| Thu., Jan. 18 | 97,243 | 107,104 | -9,861 | 122,000 | 126,563 | -4,563 | 112,698 | 118,939 | -6,241 |

Day-Ahead Interchange Totals (Jan. 13–18, 2024)



Day-Ahead vs. Real-Time Net Daily Average Interchange (Jan. 13–18, 2024)



Real-time pricing peaked coincident with system conditions on Jan. 16–18, driven by load, interchange and localized congestion.

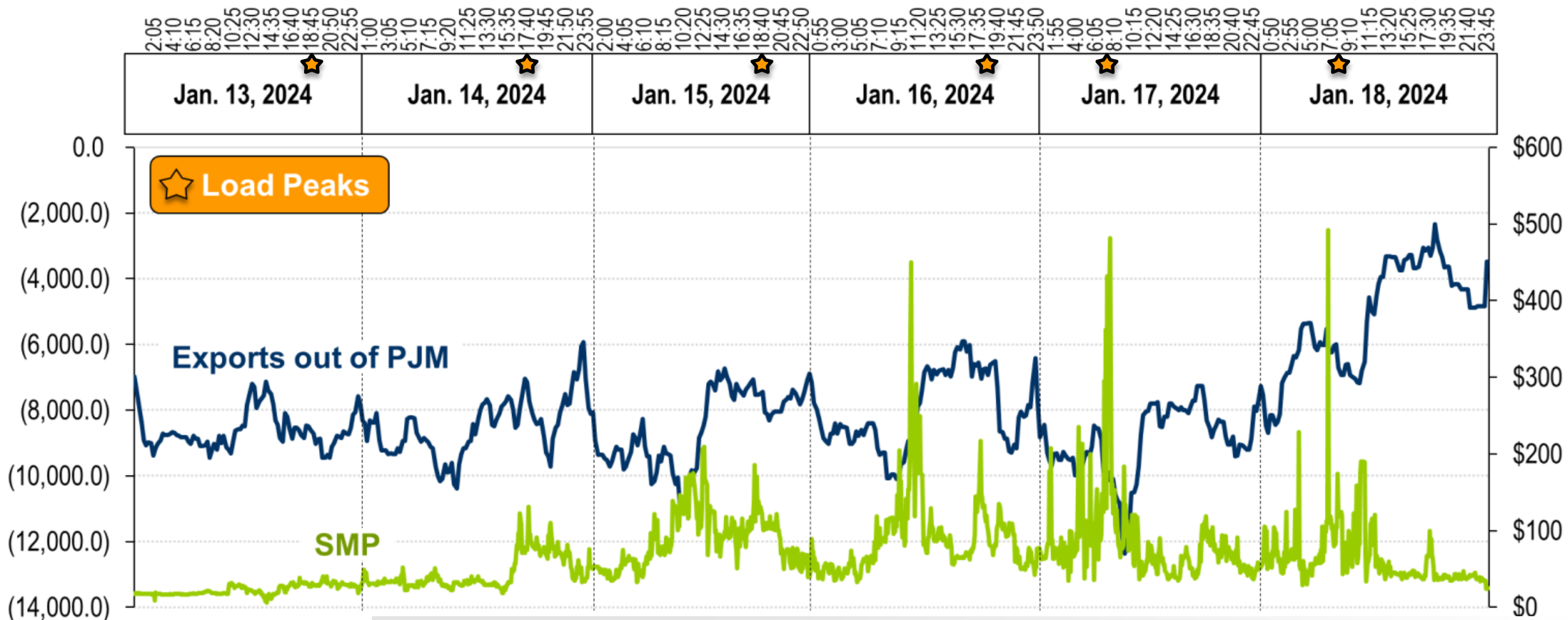
SMP = \$479.87 @ Jan. 17, 07:45; \$490.39 @ Jan. 18, 06:55

Localized congestion peaked on Jan. 17.

Nineteen out of 26 active constraints in RT SCED bound at the \$2,000/MWh penalty factor.

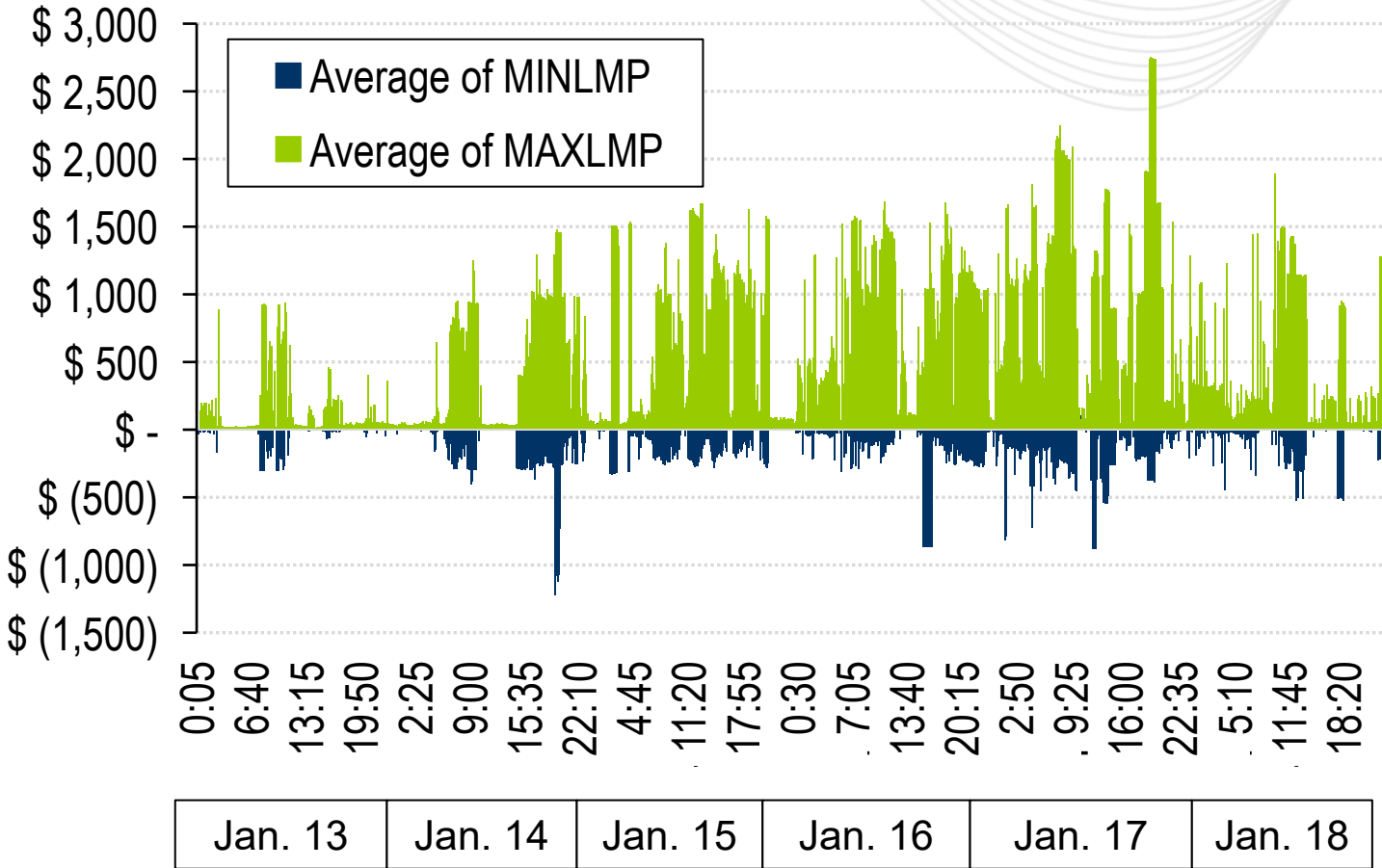
Additional reserves and regulation:

- No reserve shortage cases approved throughout event
- One Synchronized Reserve event Jan. 13 (<10 minutes)



Key takeaway: SMP spike late morning on Jan.16 driven by sudden increase in load; SMP spikes Jan. 17–18 coincident with heavy morning load and interchange

Min./Max. 5-Minute Real-Time Total LMP



Locational aspect of load to constraints ultimately impacts pricing.

Pnode prices reached:

As high as \$2,749 As low as -\$1,222
on Jan. 17 *on Jan. 14*

Zonal prices reached as high as
 \$1,122 (DOM) on Jan. 18.

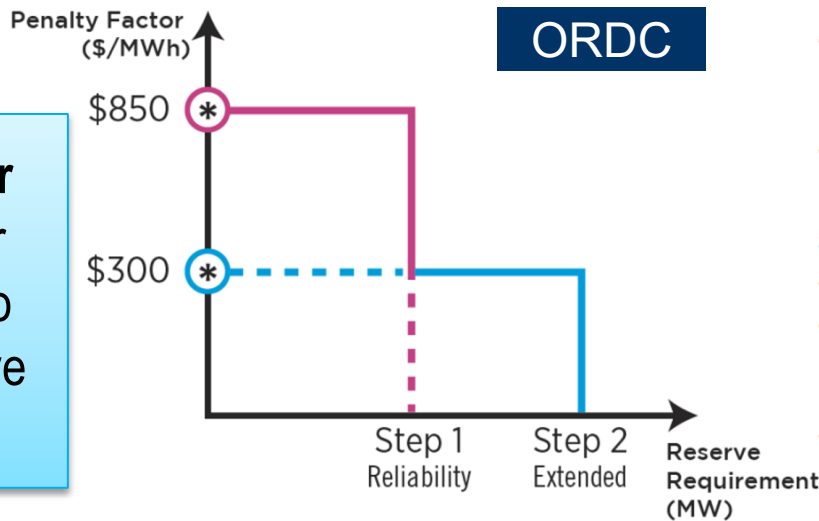
Transmission Constraint Penalty Factors

These are parameters used by the Security Constrained Economic Dispatch (SCED) applications to determine the maximum cost of the redispatch incurred to control a transmission constraint. Default is \$2,000/MWh.

Reserves:

On Jan. 14–17 – Step 2B of the ORDCs extended from 190 MW by 300 MW for a total of 490 MW for 05:00 through 23:00 (*RTO Zone only, DA & RT*)

Penalty Factor sets a price for being unable to meet the reserve requirement.



Regulation:

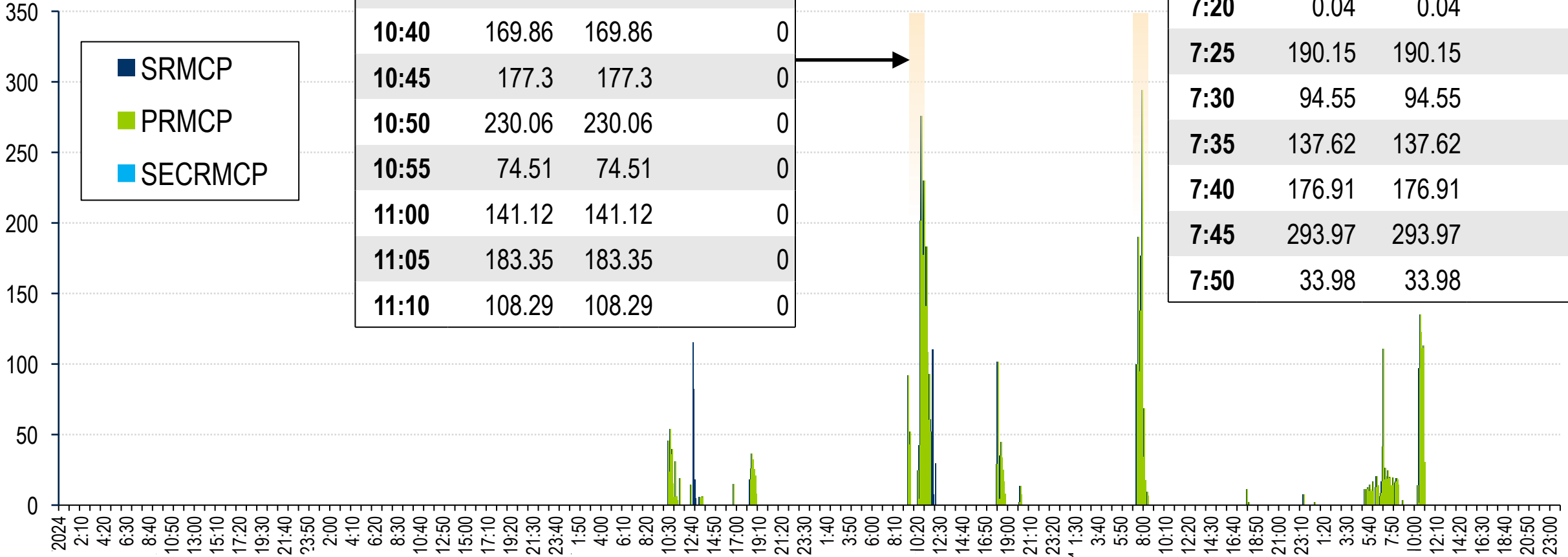
Jan. 14–17 – 800 MW for all hours

Normal requirement is 525 MW, 800 MW for off-peak, on-peak periods.

Updates communicated to stakeholders through Special Notice in Emergency Procedures tool



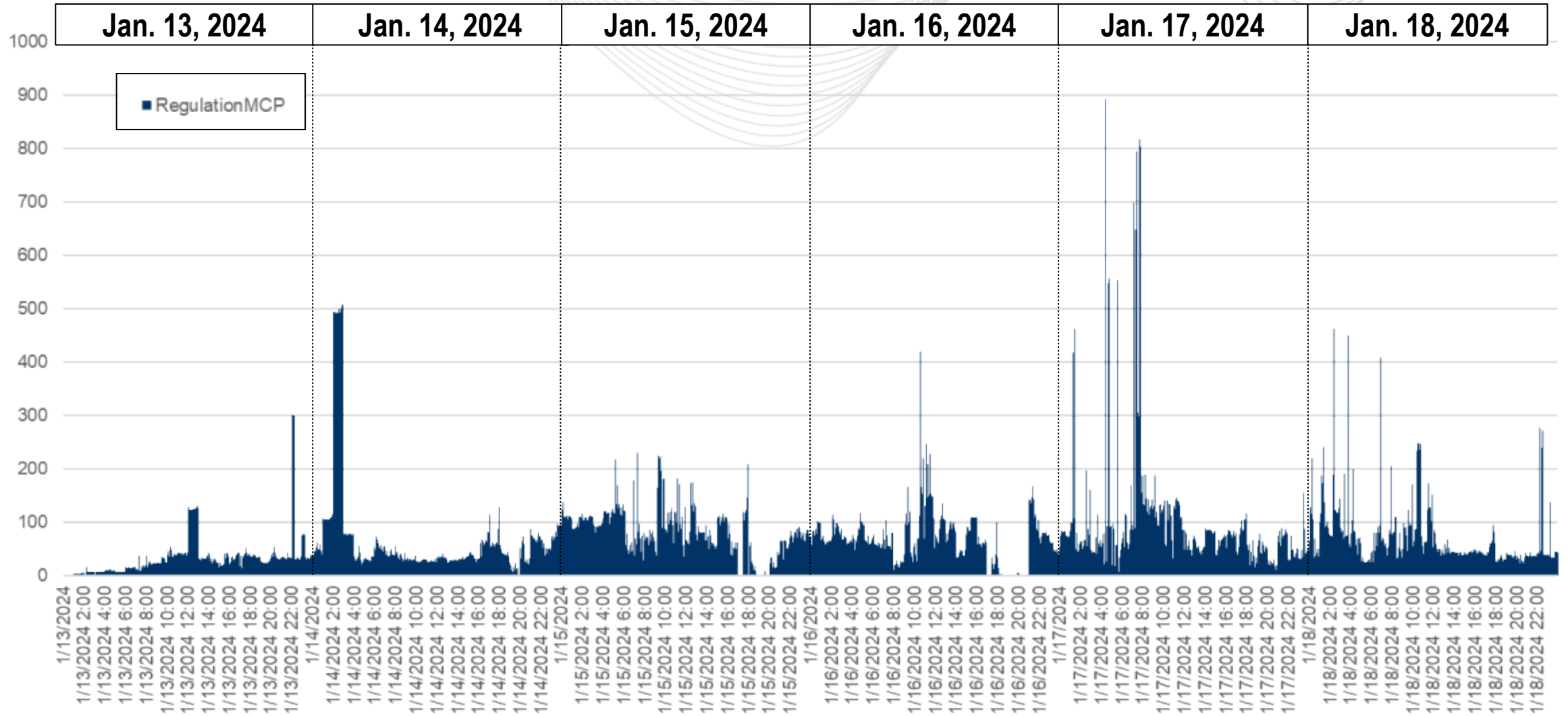
Reserve Market Clearing Pricing



| Jan. 16 | SRMCP | PRMCP | SECRMCP |
|---------|--------|--------|---------|
| 10:25 | 42.45 | 42.45 | 0 |
| 10:30 | 201.37 | 201.37 | 0 |
| 10:35 | 275.79 | 275.79 | 0 |
| 10:40 | 169.86 | 169.86 | 0 |
| 10:45 | 177.3 | 177.3 | 0 |
| 10:50 | 230.06 | 230.06 | 0 |
| 10:55 | 74.51 | 74.51 | 0 |
| 11:00 | 141.12 | 141.12 | 0 |
| 11:05 | 183.35 | 183.35 | 0 |
| 11:10 | 108.29 | 108.29 | 0 |

| Jan. 17 | SRMCP | PRMCP | SECRMCP |
|---------|--------|--------|---------|
| 7:15 | 99.52 | 99.52 | 0 |
| 7:20 | 0.04 | 0.04 | 0 |
| 7:25 | 190.15 | 190.15 | 0 |
| 7:30 | 94.55 | 94.55 | 0 |
| 7:35 | 137.62 | 137.62 | 0 |
| 7:40 | 176.91 | 176.91 | 0 |
| 7:45 | 293.97 | 293.97 | 0 |
| 7:50 | 33.98 | 33.98 | 0 |

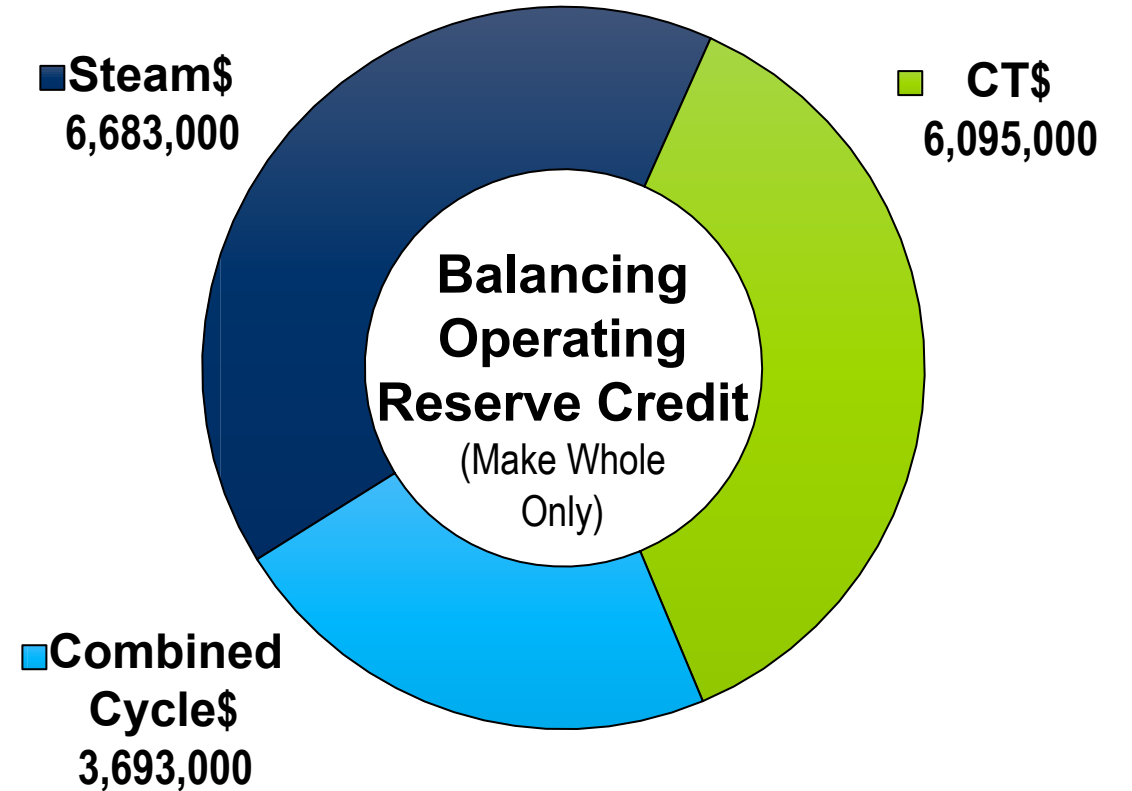
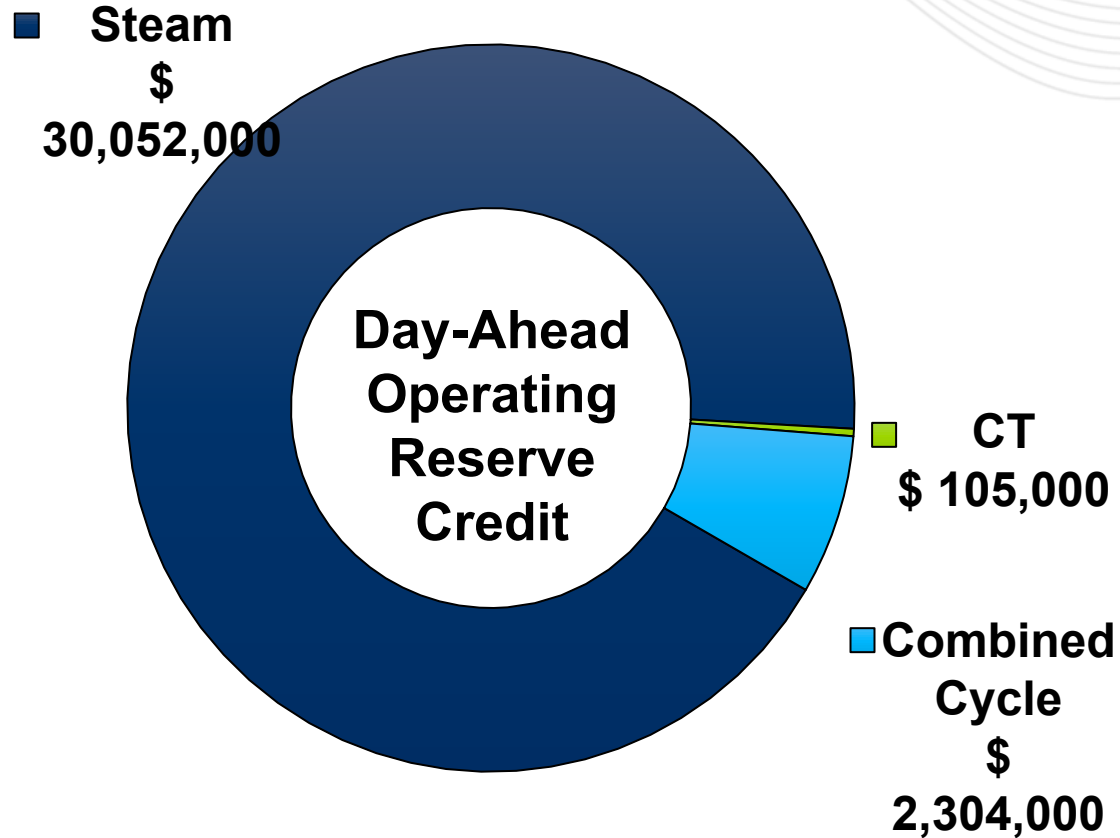
| | | | | | |
|---------------|---------------|---------------|---------------|---------------|---------------|
| Jan. 13, 2024 | Jan. 14, 2024 | Jan. 15, 2024 | Jan. 16, 2024 | Jan. 17, 2024 | Jan. 18, 2024 |
|---------------|---------------|---------------|---------------|---------------|---------------|



| January 2024 | Operating Reserve Credit | | Total Uplift |
|---------------------------|--------------------------|---------------------|---------------------|
| | Day Ahead | Balancing | |
| Friday: Jan. 12 | \$21,974 | \$48,416 | \$70,390 |
| Saturday: Jan. 13 | \$38,934 | \$3,122,138 | \$3,161,072 |
| Sunday: Jan. 14 | \$3,135,907 | \$1,569,792 | \$4,705,699 |
| Monday: Jan. 15 | \$14,275,847 | \$6,051,075 | \$20,326,922 |
| Tuesday: Jan. 16 | \$10,243,688 | \$2,168,132 | \$12,411,821 |
| Wednesday: Jan. 17 | \$4,204,974 | \$2,217,142 | \$6,422,116 |
| Thursday: Jan. 18 | \$562,398 | \$1,830,112 | \$2,392,510 |
| Friday: Jan. 19 | \$186,575 | \$167,063 | \$353,638 |
| Saturday: Jan. 20 | \$0 | \$928,947 | \$928,947 |
| Sunday: Jan. 21 | \$279,973 | \$376,496 | \$656,469 |
| Monday: Jan. 22 | \$9,699 | \$2,071,810 | \$2,081,510 |
| Total | \$32,959,970 | \$20,551,126 | \$53,511,096 |

Operating Reserve Credits by Unit Type

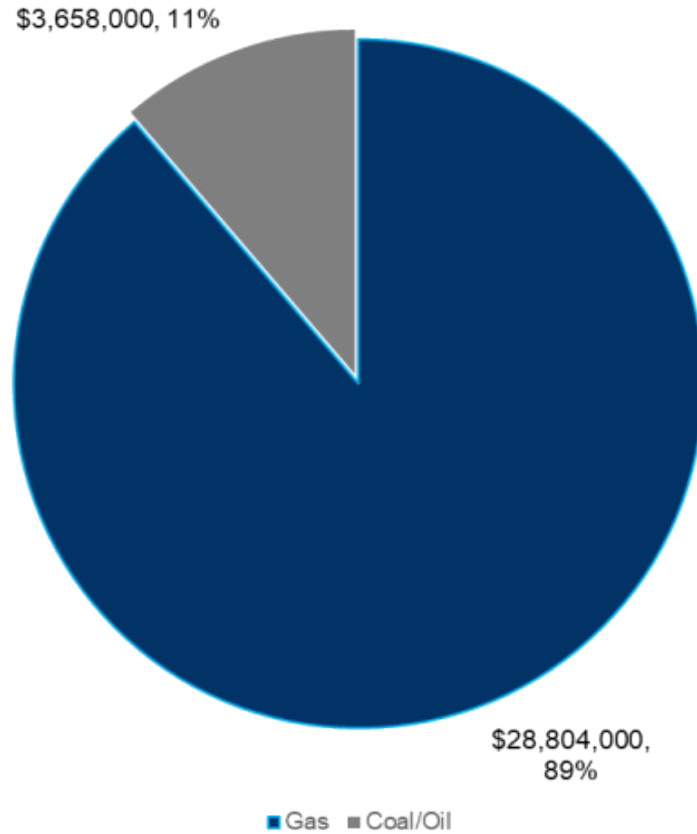
Sat. January 13 to Thu. January 18



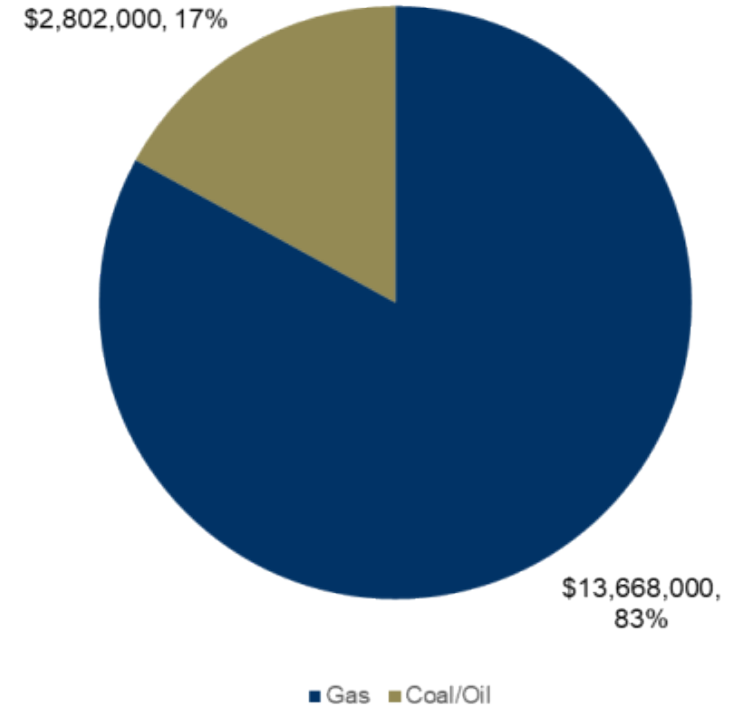
Operating Reserve Credits by Fuel Type

Sat. January 13 to Thu. January 18

Day-Ahead Operating Reserve Credit



Balancing Operating Reserve Credit by Fuel Type (Make Whole Only)



Presenter/SME:
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Brian.Chmielewski@pjm.com



Member Hotline

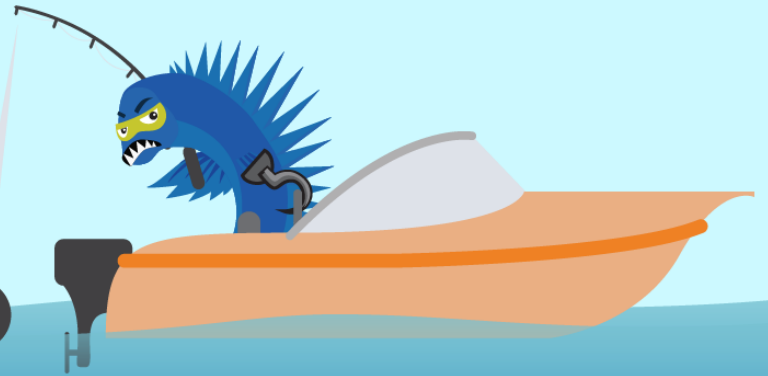
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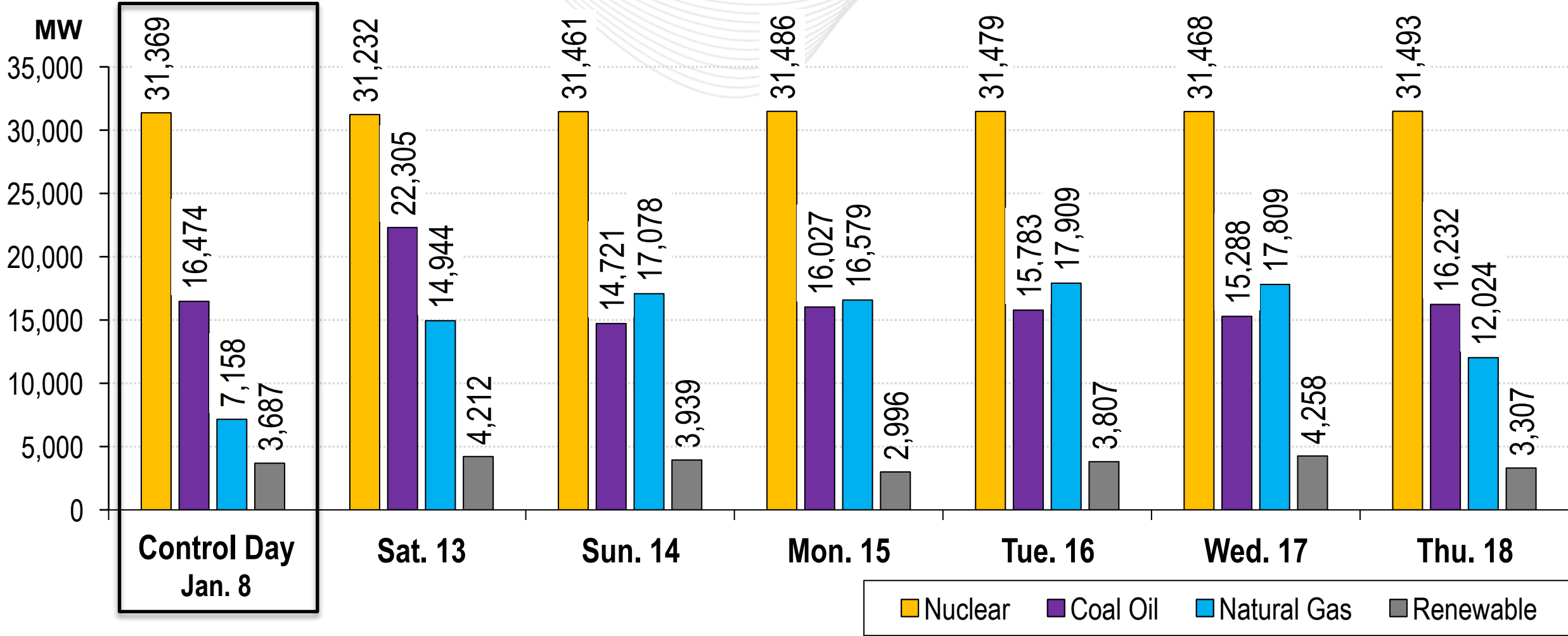


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Updated and New Slides

Day-Ahead Self Scheduled Units

Control day (Jan. 8, 2024 vs. Jan. 13–18, 2024)





Day-Ahead Self Scheduled Units

| January 2024 | Nuclear | | Coal Oil | | Natural Gas | | Renewable | | Total (MW) |
|-----------------------------|---------|-----|----------|-----|-------------|-----|-----------|----|---------------|
| Control Day (Jan. 8) | 31,369 | 53% | 16,474 | 28% | 7,158 | 12% | 3,687 | 6% | 58,688 |
| Sat. 13 | 31,232 | 43% | 22,305 | 31% | 14,944 | 21% | 4,212 | 6% | 72,693 |
| Sun. 14 | 31,461 | 47% | 14,721 | 22% | 17,078 | 25% | 3,939 | 6% | 67,200 |
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Hourly Net of Day-Ahead Inc. & Dec. January 13-18, 2024

