Winter Storm Elliott Generator Performance

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Operating Committee

February 9, 2023

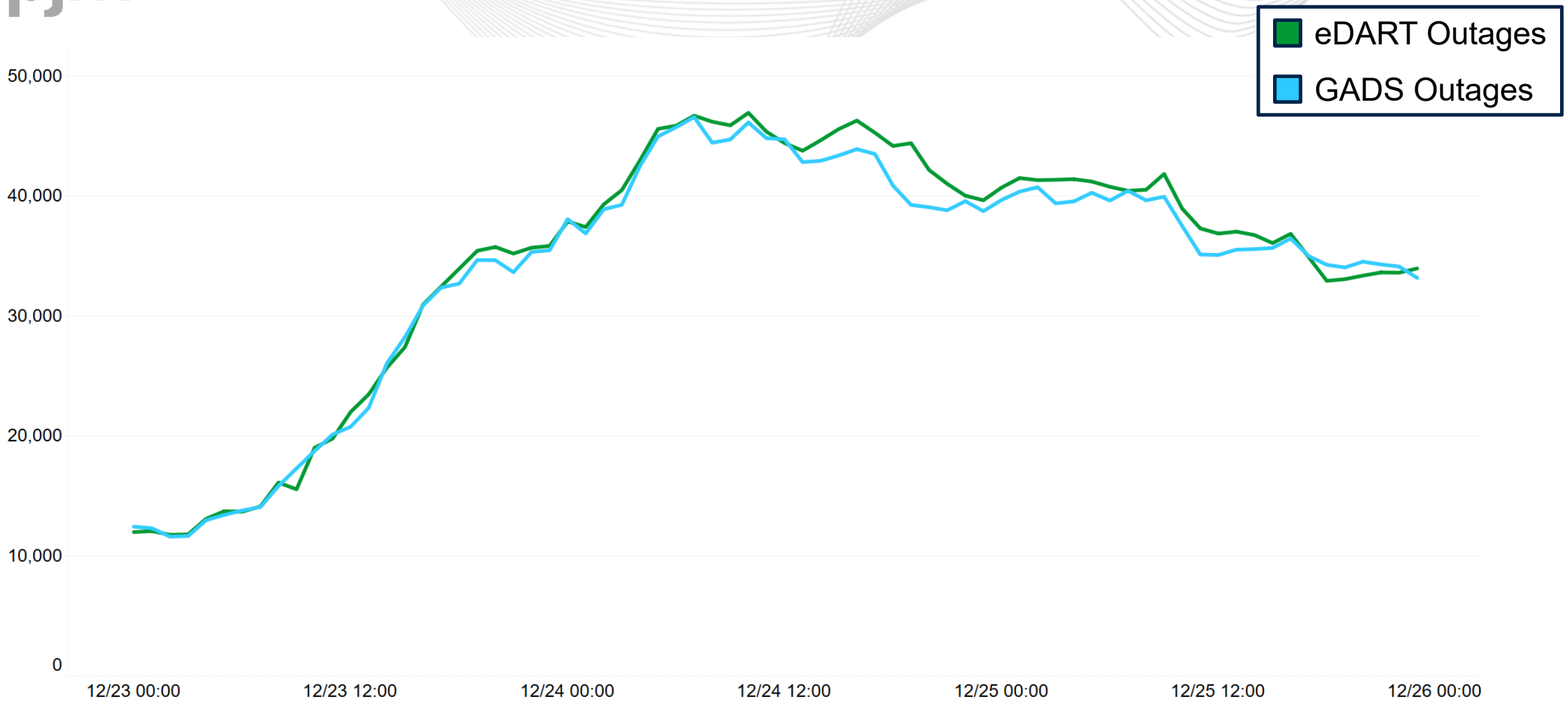
Outage Data Validation

December 2022 GADS data, submitted in late January, showed major discrepancies with outage data reported in eDART. To address this concern and validate the outage data being reported:

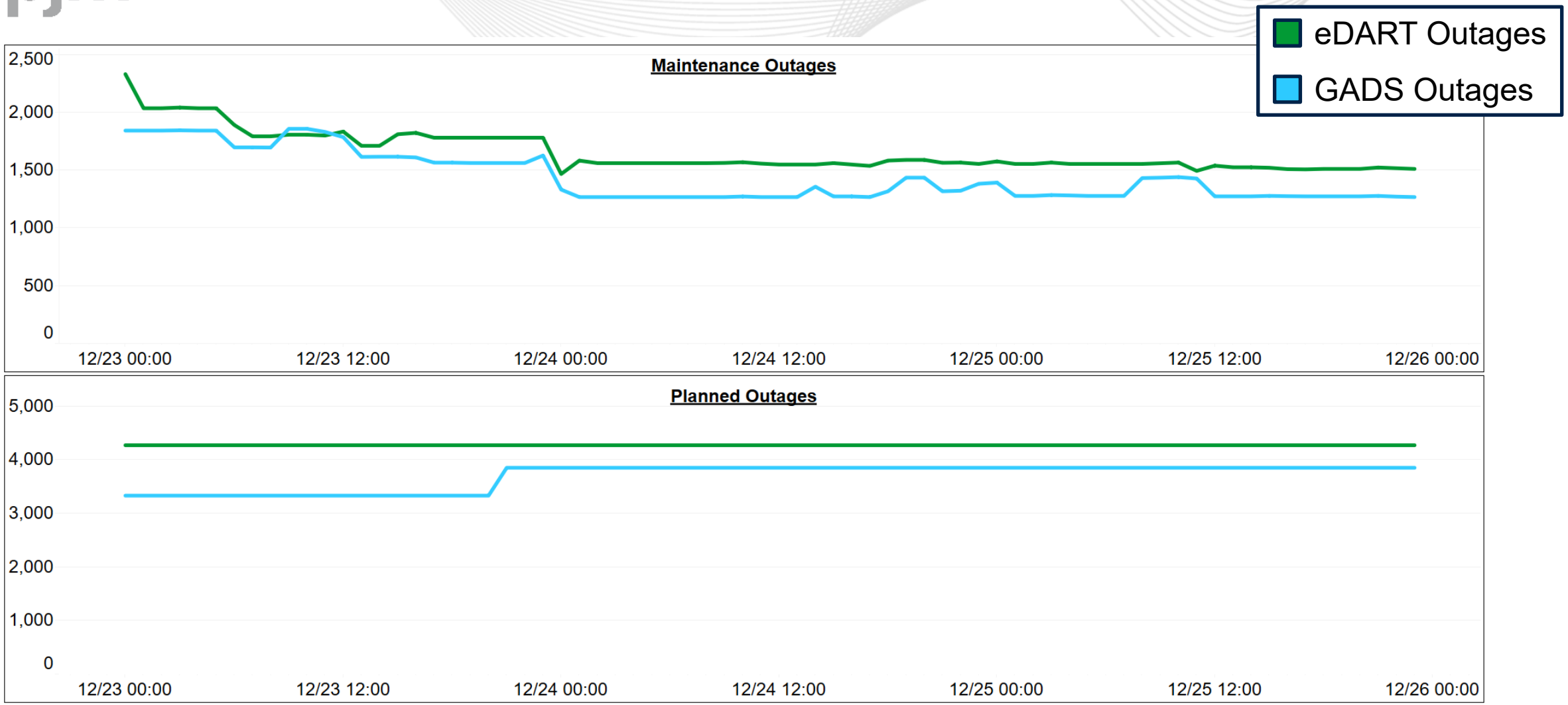
- Monitoring Analytics issued a notice to Generation Owners on Jan. 26th recommending they review their outage submittals[1]
- Since that message, GOs have submitted additional records and updated existing records both eDART and GADS for the Winter Storm Elliott period
  - Nearly 300 new tickets totaling more than 21,000 MW of reductions (spread over the period) have been added to eDART
  - Over 100 existing tickets totaling more than 14,000 MW of reductions (spread over the period) have been updated in eDART
  - Over 250 GADS event records have been added or modified
- PJM and Monitoring Analytics are working together to validate the outage data and perform analysis as shown today

Note 1: The Monitoring Analytics notice can be found on their website (link)

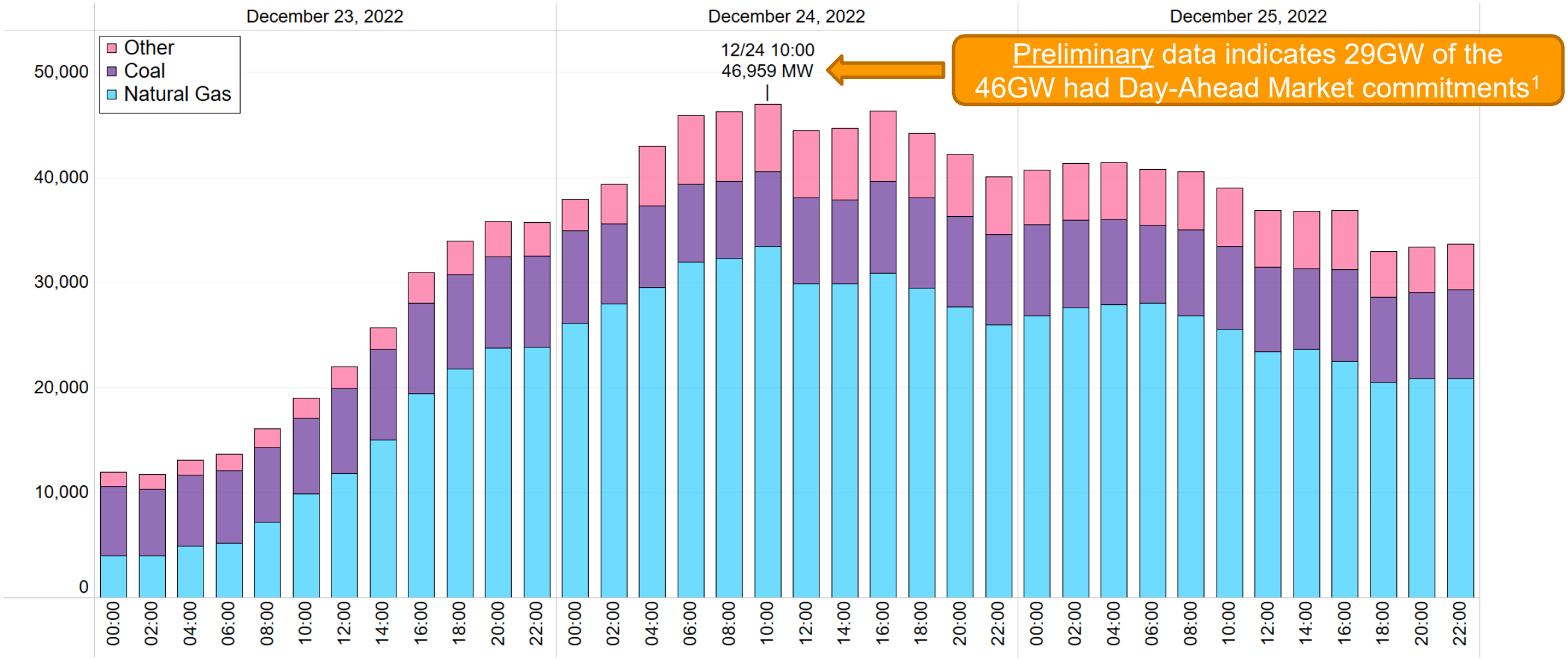
Forced Outage Comparison



Planned & Maintenance Outage Comparisons



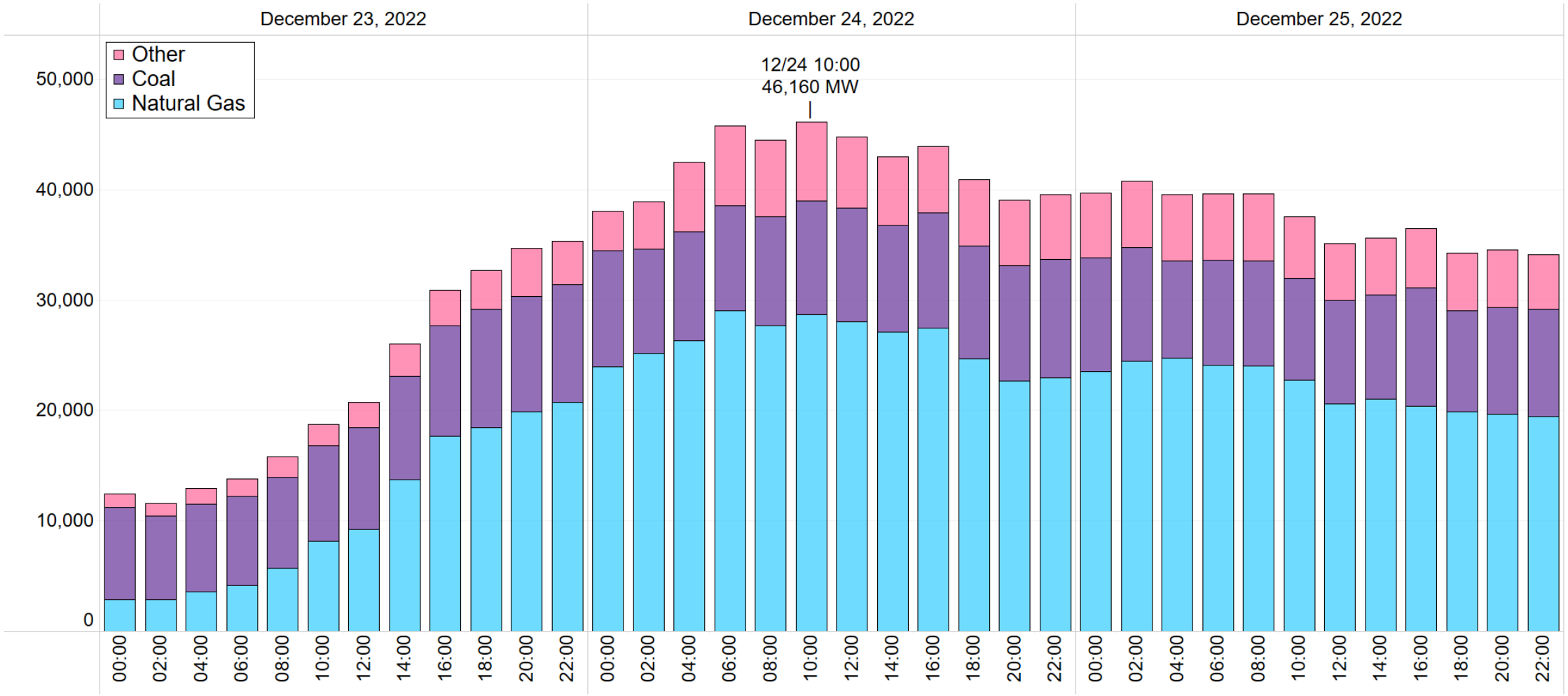
eDART Forced Outages by Fuel Type



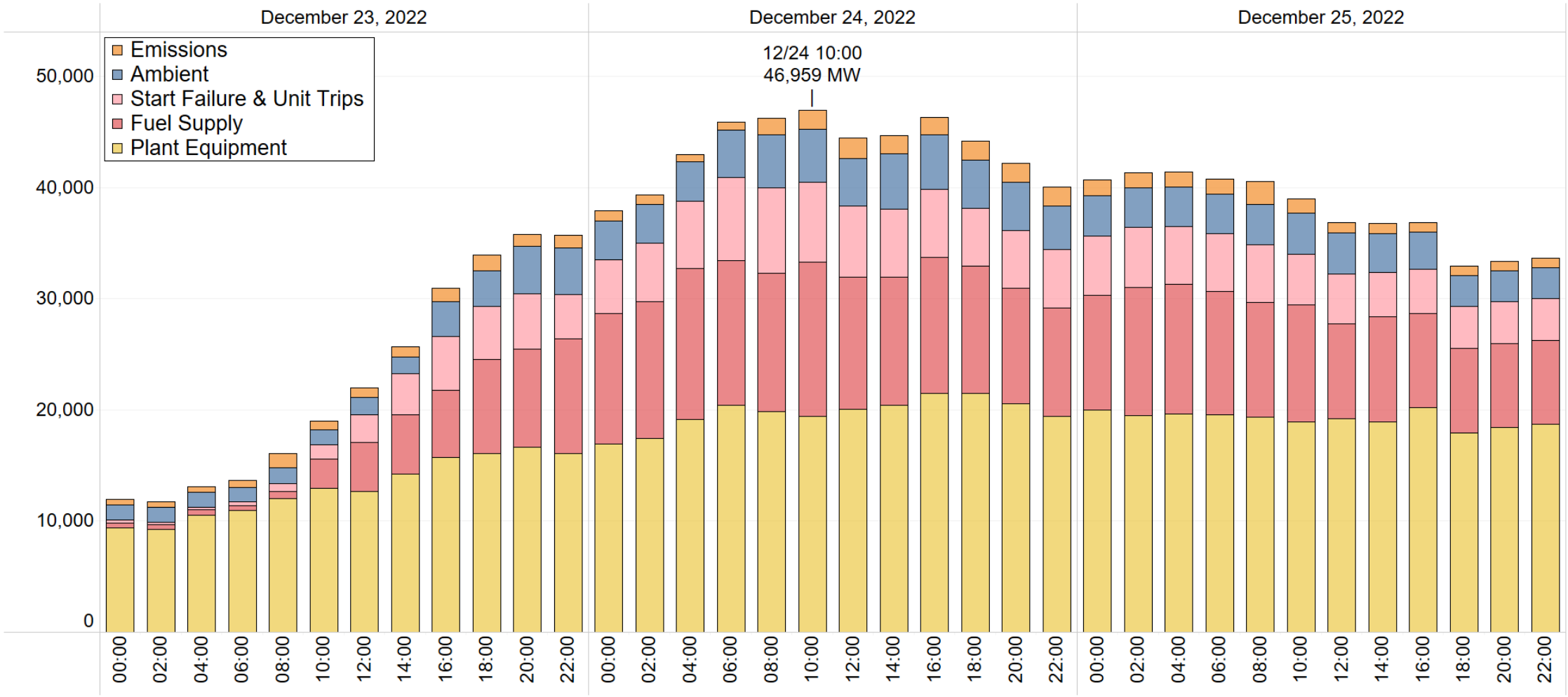
Preliminary data indicates 29GW of the 46GW had Day-Ahead Market commitments[1]

Note 1: Preliminary data based on early January eDART outage submissions and is subject to change during the validation process

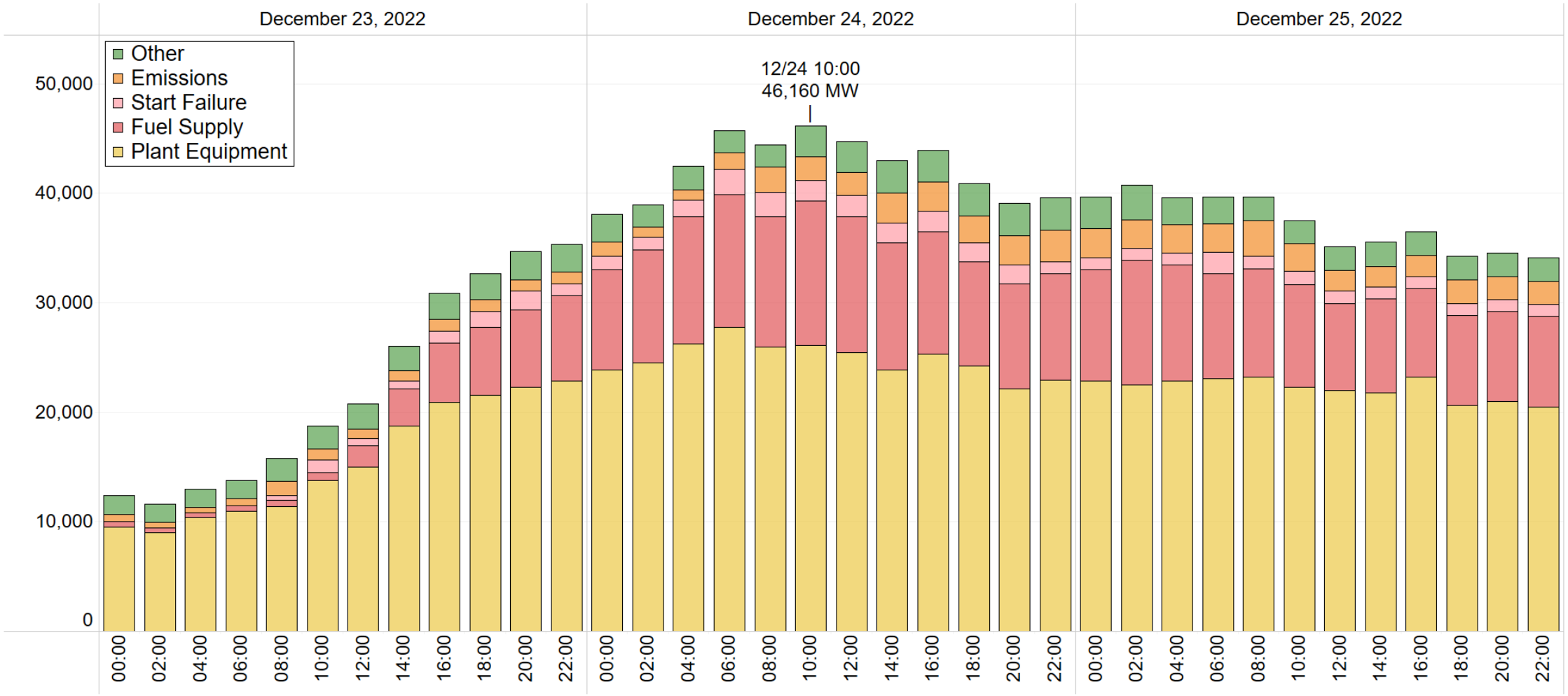
GADS Forced Outages by Fuel Type



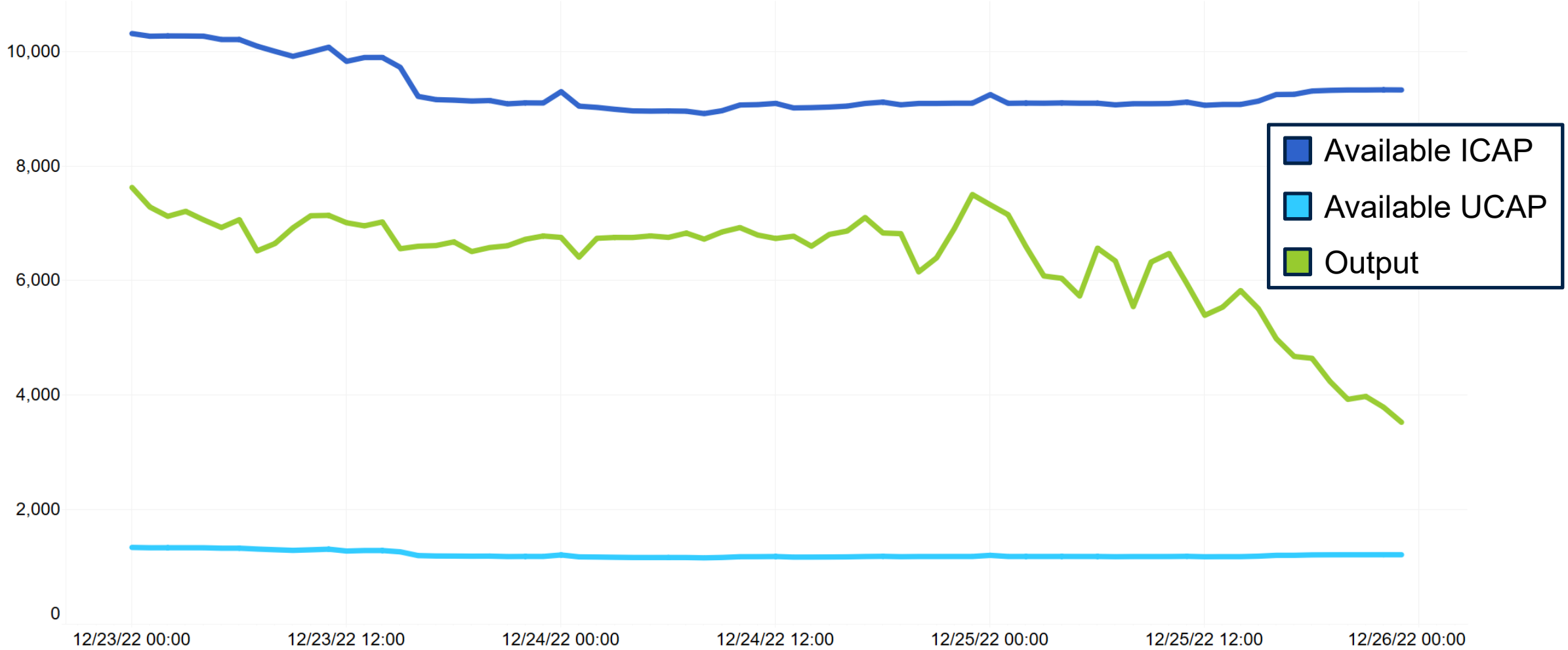
eDART Forced Outages by Cause



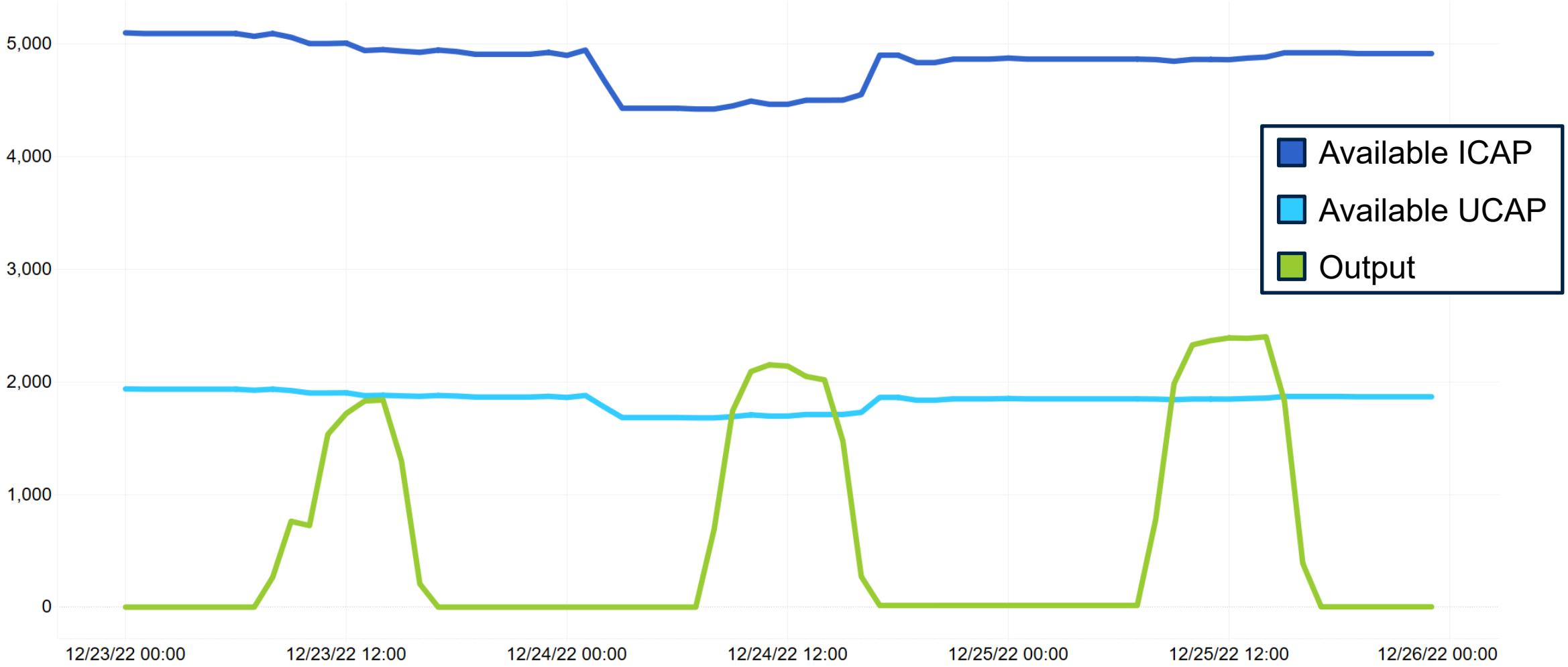
GADS Forced Outages by Cause



Wind Performance



Solar Performance



Peak Hour Performance

To evaluate generator performance based on fuel type, PJM evaluated the fuel mix for all peak hours from December 2022 and January 2023, then compared the event peaks to the non-event peaks.

The comparison of percent of fuel mix for these peaks shows how different fuels were used and performed during Winter Storm Elliott versus other winter peak hours.

- **Event Peaks**: AM and PM peak hours for December 23rd – December 25th 2022
- **Non-Event Peaks**: AM and PM peak hours for December 1st, 2022 – January 31st, 2023 excluding December 23rd, 24th, and 25th 2022

Peak Hour Performance

Fuel Type	Non-Event Peaks		Event Peaks	
	Median Percent of Fuel Mix	Median MW	Median Percent of Fuel Mix	Median MW
Natural Gas	42%	43,620	31.5%	39,534
Coal	17%	17,784	26%	32,682
Nuclear	31%	32,921	26%	33,037
Oil	0%	221	5%	6,364
Wind	4%	3,876	5%	6,763
Solar	0%	24	0%	15
Other	4%	4,629	3.5%	5,607

Continuing Analysis

- PJM and Monitoring Analytics will continue to collaborate to validate outage data and generator performance
- PJM is continuing to evaluate the following:
  - Outage causes by specific fuel type
  - Forced outage rates on units with and without day-ahead commitments
  - Forced outage rates by capacity commitment status
  - Performance relative to unit specific cold weather operating limits

Findings will be shared with stakeholders as they become available

Appendix

PJM Data Sharing Rules

In order to ensure that market sensitive data is not revealed and prevent potential misuse of such data, PJM will only post market data to the extent that it meets the following criteria:

- ***More than three market participants' data in a particular category is being aggregated for posting.***
- ***The data to be posted is aggregated over a geographic area no smaller than a PJM transmission zone.***

In any report or publication of sequence of events and/or lessons learned relative to an event, disturbance, or unusual operating condition on the transmission system (for example, a severe weather event or an event that required the shedding of firm load), PJM may publish in the public domain certain information on the status of resources involved in the event, disturbance, or condition.

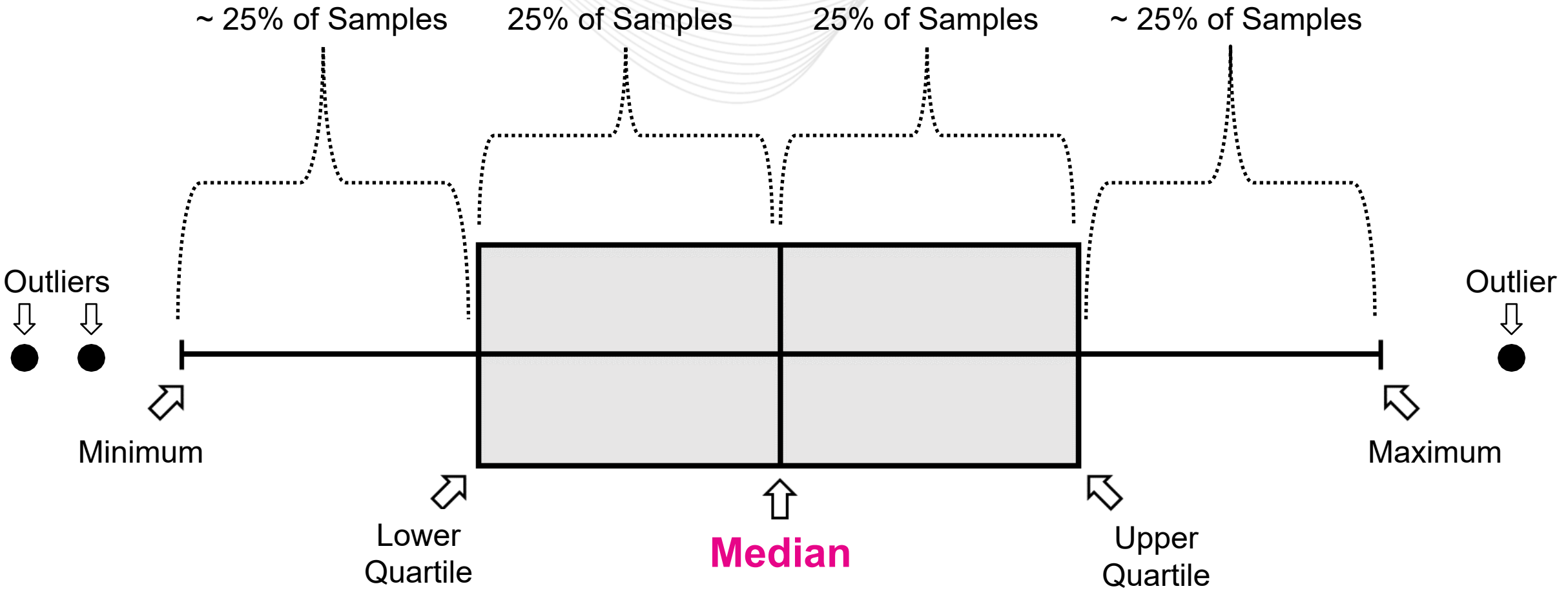
- ***Provided that the report is published no less than 60 days after the event, disturbance, or condition, the following information shall be deemed already in the public domain:***
  - ***Resource name***
  - ***Resource Owner/Operator***
  - ***Status including change in status (available, unavailable, operating, outage type (planned, maintenance, forced, etc.) during the period of the 24 hours prior to the event to the 24 hours after the event***

PJM Manual 33 Section 6.1

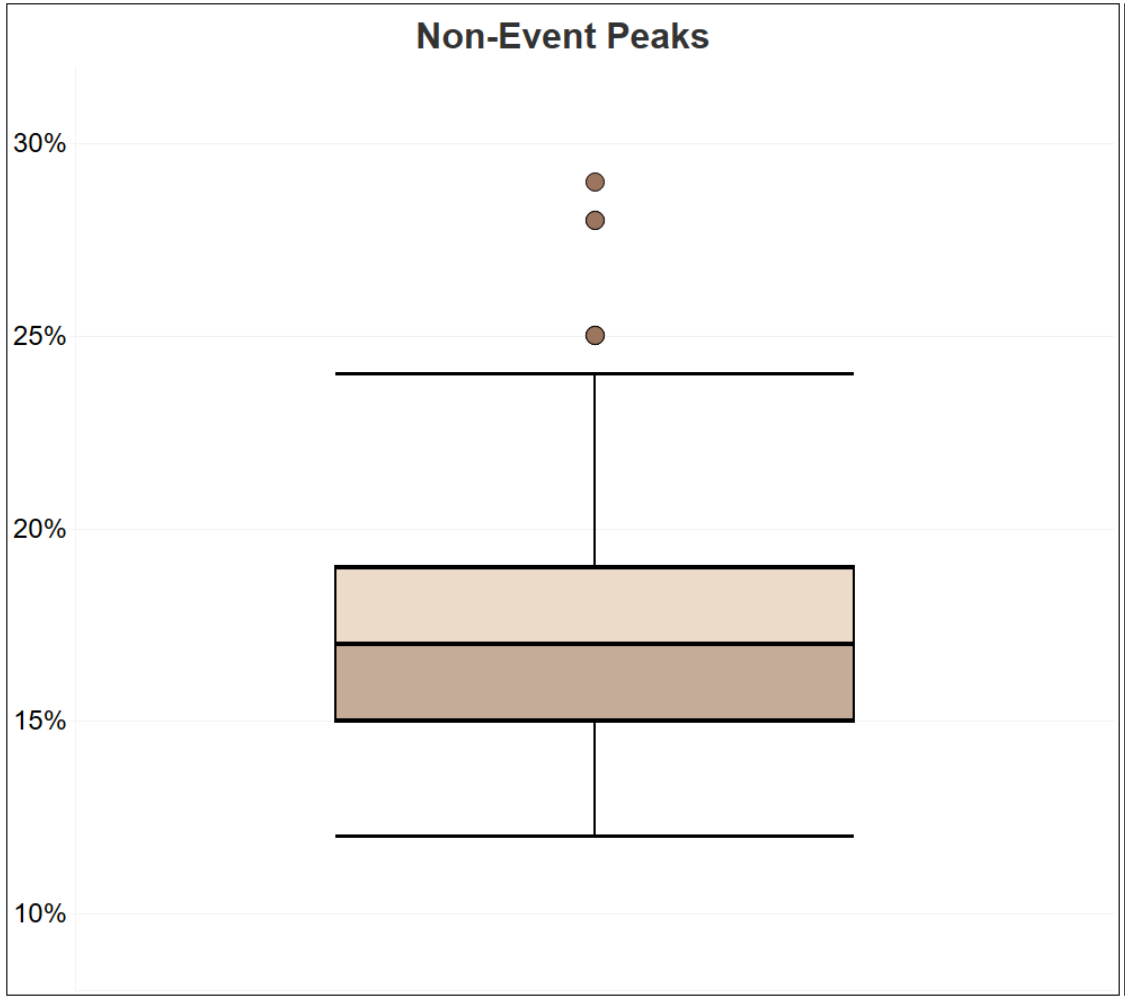
eDART & GADS Event Type Comparison

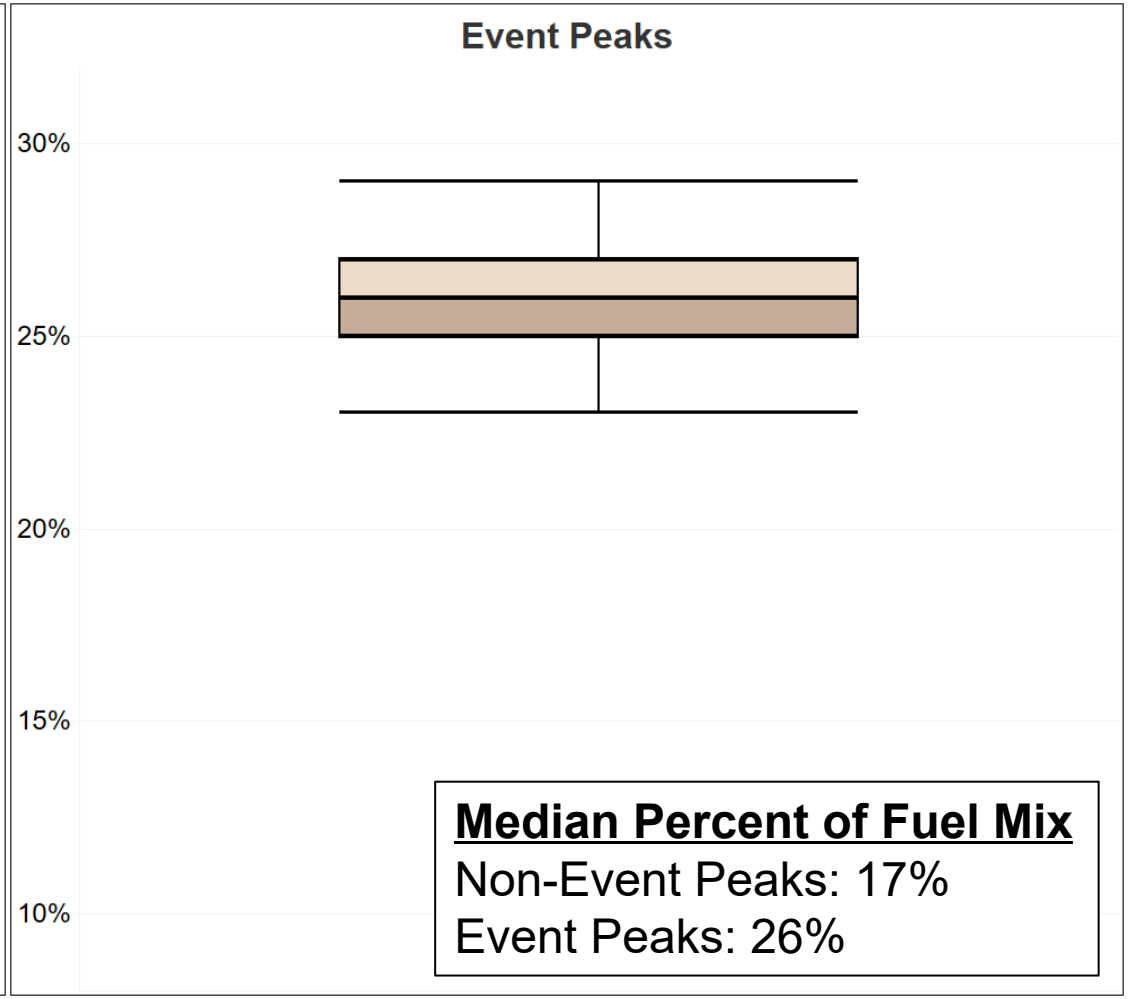
	eDART Outage Type			
	Planned Outage	Maintenance Outage	Unplanned (Forced) Outage	No eDART Analog
GADS Event Types	• Planned Outage (**PO**) • Planned Outage Extension (**PE**) • Planned Derating (**PD**) • Planned Derating Extension (**DP**)	• Maintenance Outage (**MO**) • Maintenance Outage Extension (**ME**) • Maintenance Derating (**D4**) • Maintenance Derating Extension (**DM**)	• Startup Failure (**SF**) • Unplanned (Forced) Outage (**U1**, **U2**, **U3**) • Unplanned (Forced) Derating (**D1**, **D2**, **D3**)	• Inactive Reserve (**IR**) • Mothballed (**MB**) • Non-Curtailing (**NC**) • Reserve Shutdown (**RS**)

Reading a Box & Whisker Plot



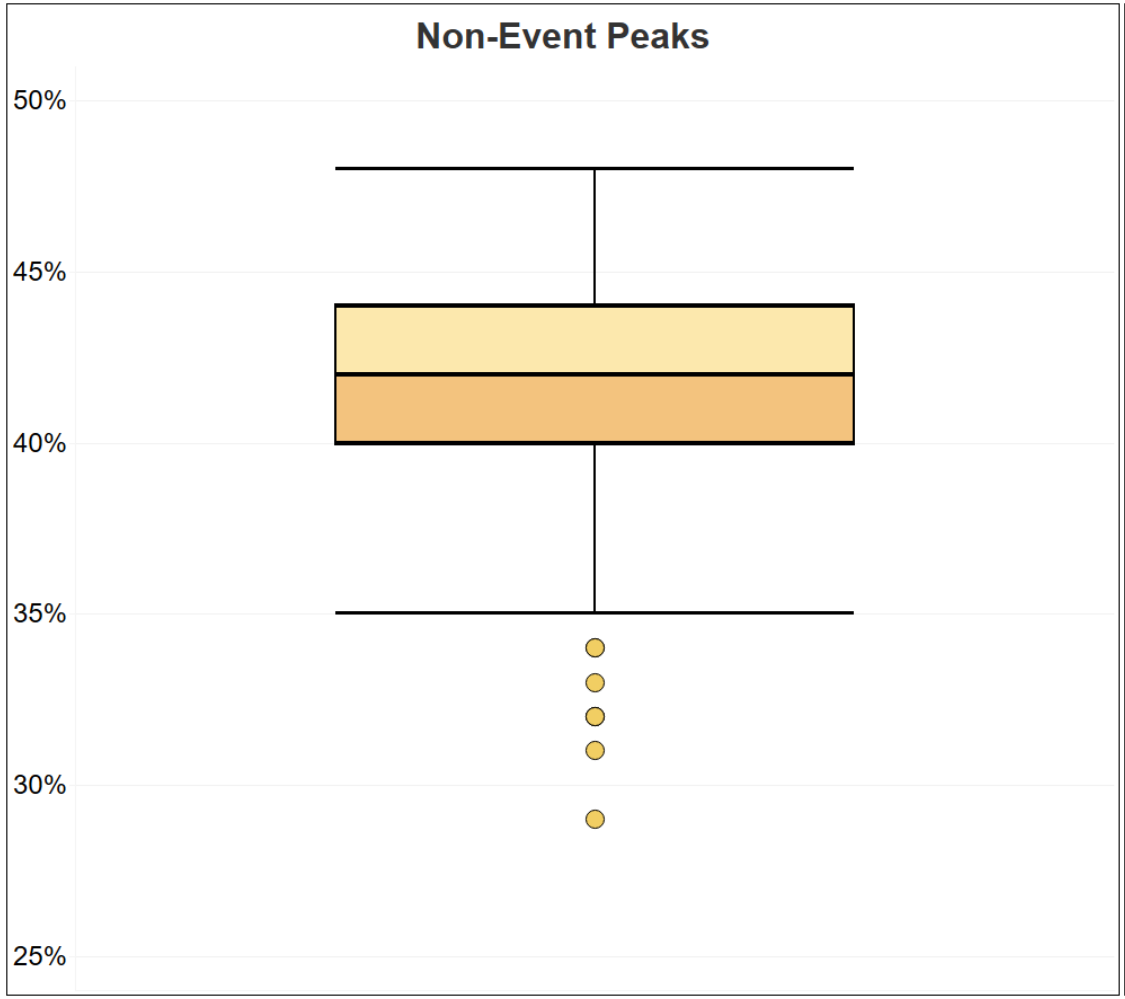
Coal Peak Hour Performance

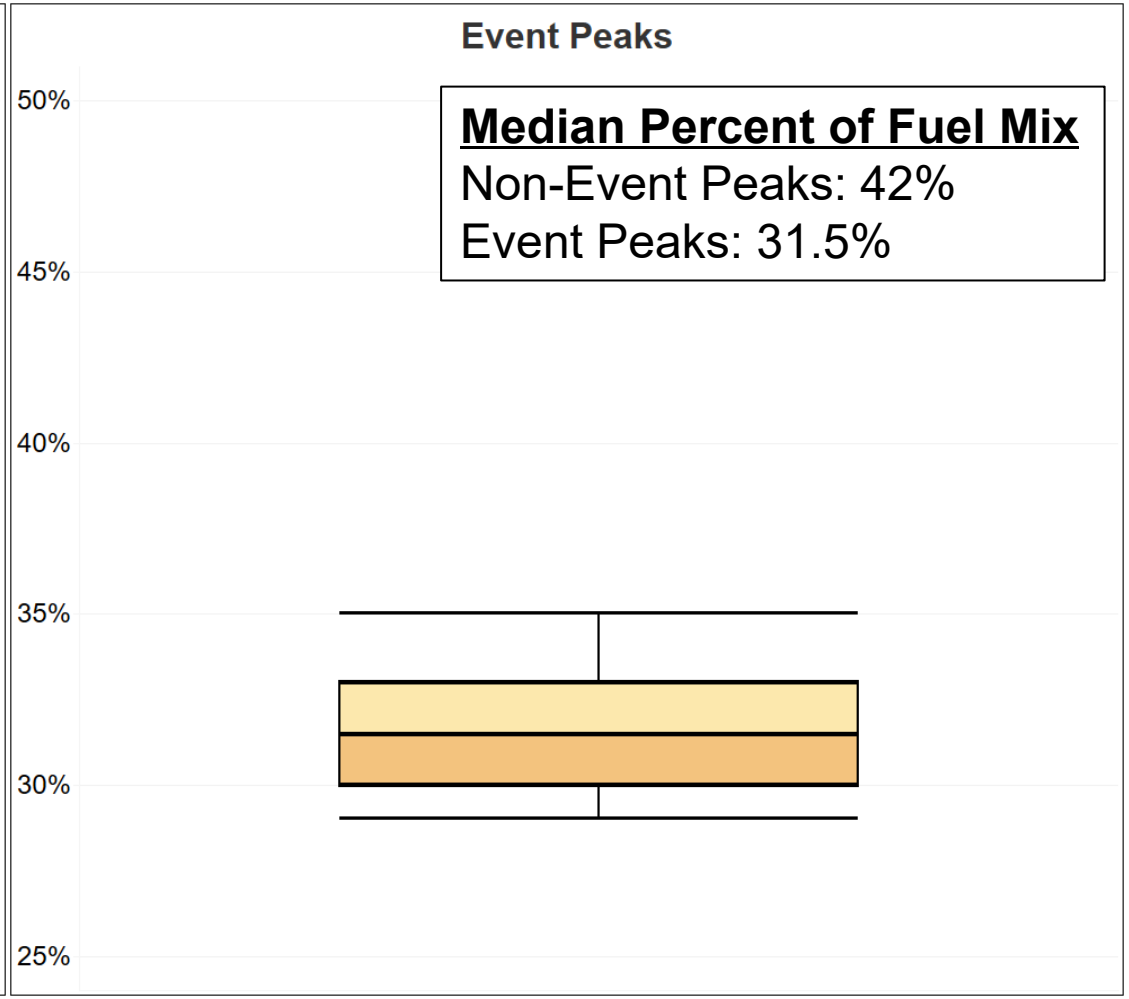




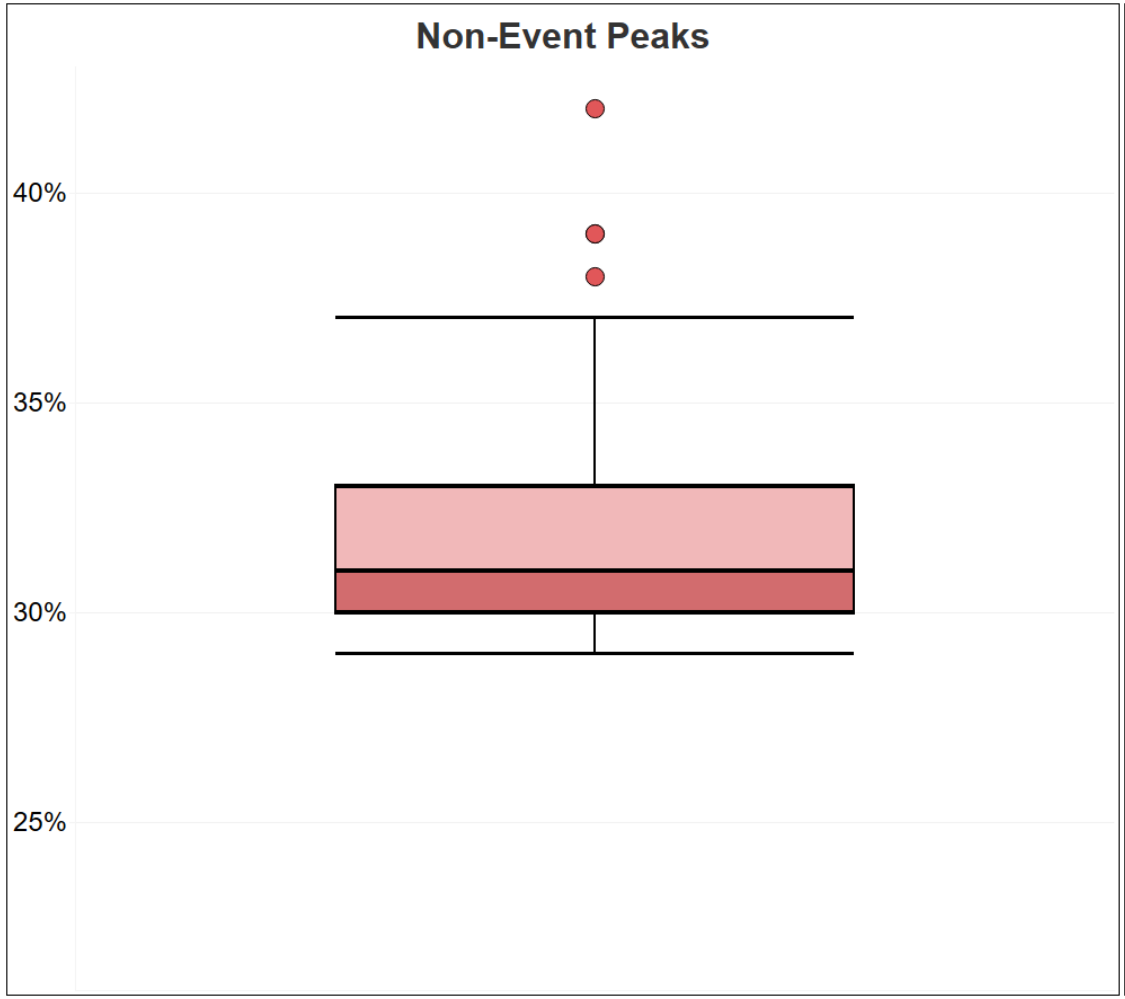
Median Percent of Fuel Mix
Non-Event Peaks: 17%
Event Peaks: 26%

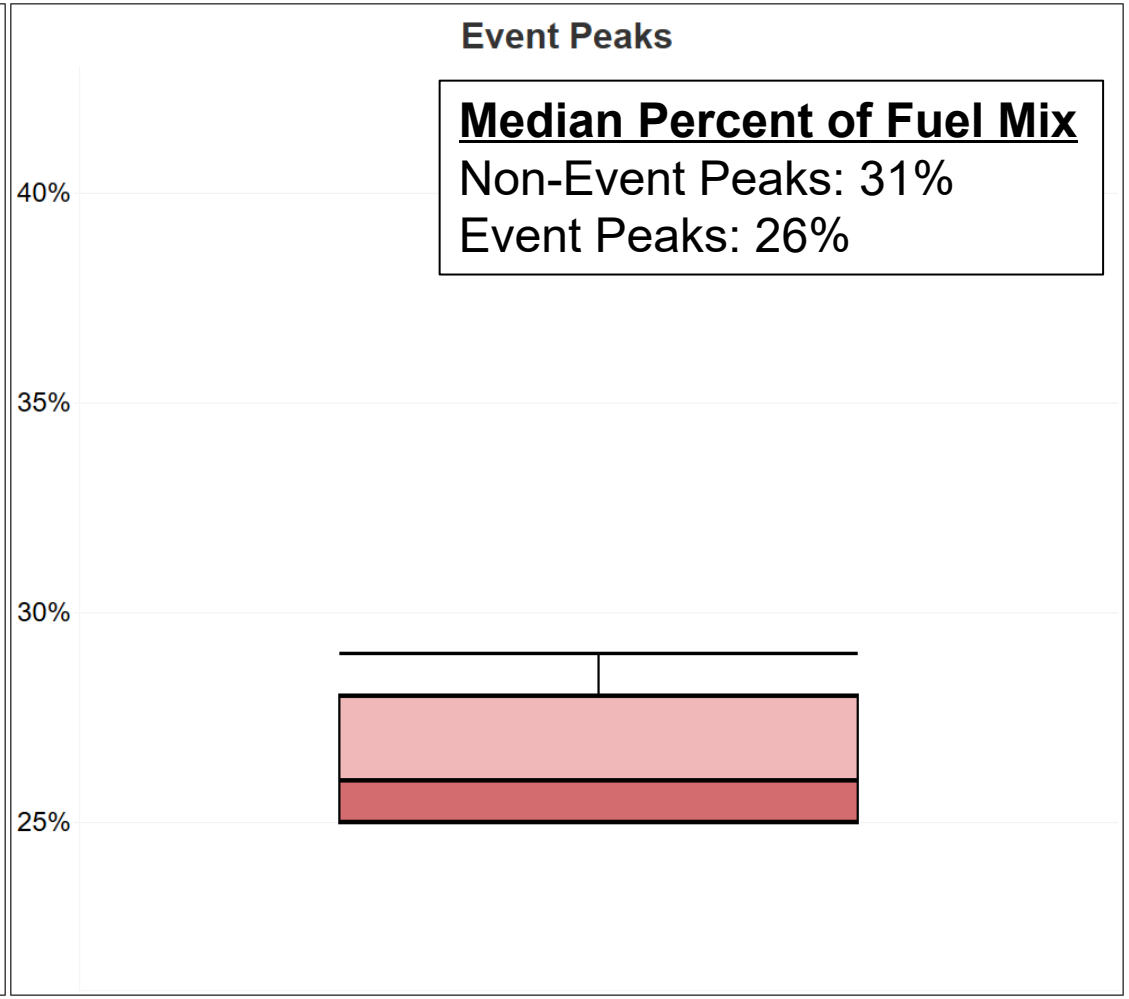
Natural Gas Peak Hour Performance



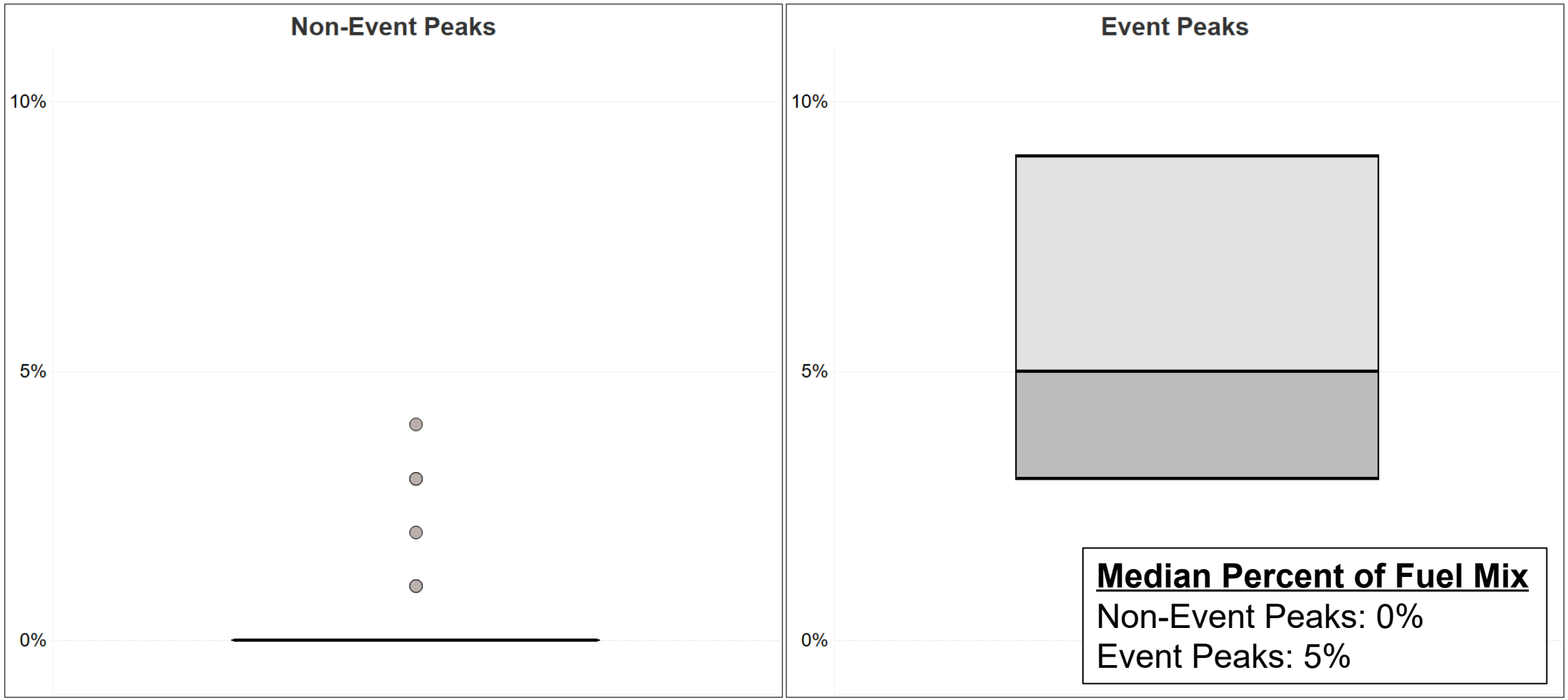


Nuclear Peak Hour Performance





Oil Peak Hour Performance



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