

# Market Monitor Report

MC Webinar  
5/22/2023

IMM



Monitoring Analytics

# PJM Changes to the Reserve Requirements

- **On May 12, 2023, PJM took unilateral action to increase reserve requirements without stakeholder or FERC approval.**
- **PJM's stated reasons include**
  - **A decline in synchronized reserve event response rates since October 1, 2022.**
  - **A potential NERC Disturbance Control Standard violation on December 23, 2022.**
- **The initial reserve requirement increases were removed on May 16, 2023.**
- **Reserve increases were reinstated on May 19, 2023.**

# Synchronized Reserve Event Response

- **The data on synchronized reserve event recovery do not support the conclusion that there is an immediate need to change how reserves clear.**
- **It is not clear that PJM has the authority to or a valid basis for increasing the reserve requirements.**
- **If PJM insists on an immediate change, the focus should be on correcting the supply of reserves rather than increasing demand.**
  - **Lack of response means data inputs (ramp rates, time to start for condensers, and eco max) are not correct. It is the responsibility of market participants to correct their parameters.**

# Failure of Reserves to Respond

- **PJM approach:**
  - **Reserves are responding at an average rate of about 50 percent during spin events.**
  - **PJM solution is to buy twice as many MW of reserves.**
  - **PJM is overpaying for reserve MW**
  - **PJM is paying for 1 MW but receiving 0.5 MW**
  - **PJM solution is to pay for 2 MW in order to receive 1 MW**

# Failure of Reserves to Respond

- **IMM approach:**
  - **IMM solution is to pay for 0.5 MW from the underperforming unit**
    - Pay for unit specific MW
  - **IMM solution is to pay for 0.5 MW from each of two underperforming units**
  - **Result is to pay for 1 MW and to receive 1 MW of reserves.**
  - **IMM solution is to buy the correct amount of reserves.**
    - No increase in demand is required
    - There has been no change in the need for/demand for reserves

## Failure of Reserves to Respond

- **PJM focuses on the demand for reserves.**
  - **The demand for reserves is correctly defined and does not need to be doubled.**
- **PJM ignores the supply side**
  - **The issue is that resources have not provided the reserves that were offered and paid for.**
- **The solution is not to buy more MW of poorly performing reserves**
- **The solution is to accurately recognize the actual supply of reserves**
- **The solution is to buy the correct amount of reserves, accounting for the actual performance of supply.**

# Failure of Reserves to Respond

- **PJM solution should not be implemented.**
- **Focus on supply side should be implemented immediately:**
  - **Buy required reliable MW, based on actual performance**
  - **Pay only for reliable MW based on actual performance**
  - **Do not pay for MW not provided**
  - **Do not pay LOC for MW not provided and therefore with no LOC (lost opportunity cost)**
- **Demand for reserves does not need modification**
  - **PJM has not said that the need for reserves has changed.**

# Failure of Reserves to Respond

- **Detailed, unit by unit analysis of the reasons for poor performance is needed.**
- **Potential issues:**
  - **Discontinuities in offer curves**
  - **Accuracy of PJM ramp rates**
  - **Ambient derates**
  - **Fuel availability**
  - **Demand side resource response**
  - **Failure to follow dispatch**
  - **Incorrect eco max or spin max**



# Failure of Reserves to Respond

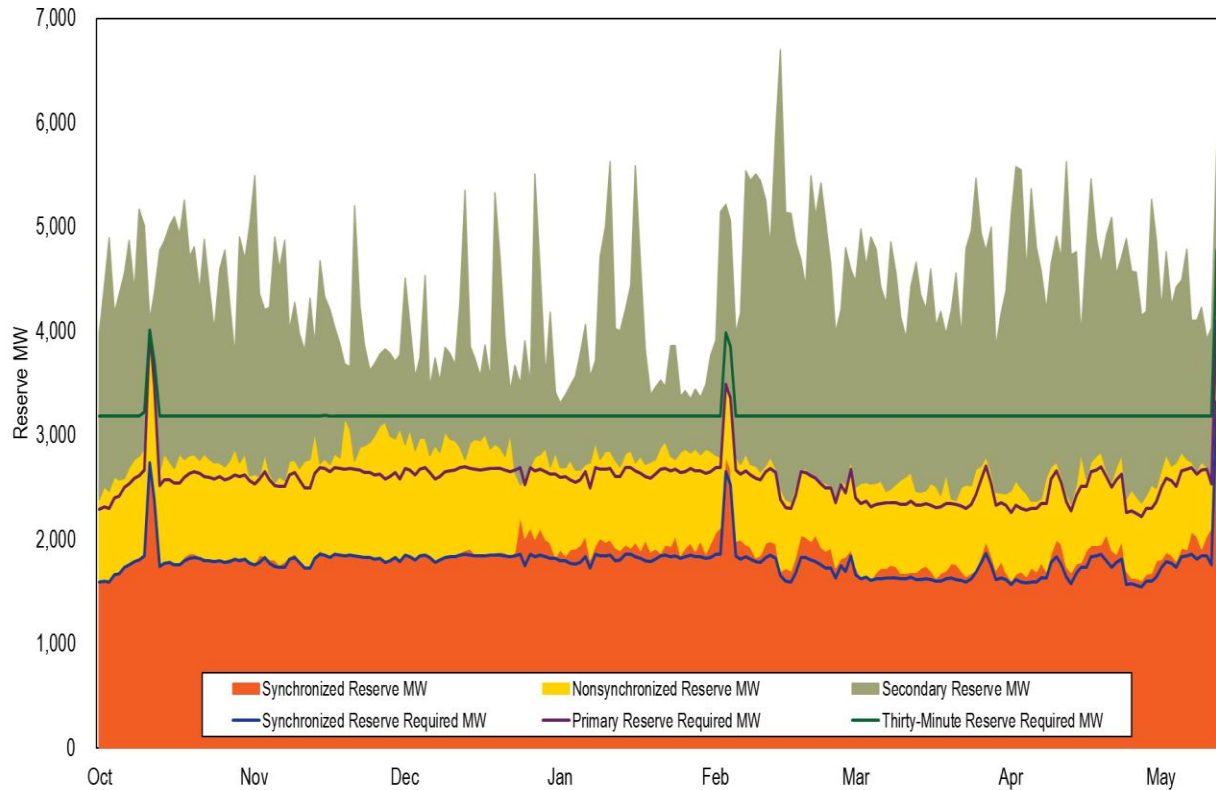
- **Generators have a reserve must offer requirement.**
- **Generators are required to submit accurate ramp rates.**
- **Generators are required to submit accurate ratings.**
- **Generators are required to follow PJM's instructions.**
- **Generators clearing reserves and not deploying them are physically withholding.**
- **Generators clearing reserves and not deploying them are in violation of the OATT. Unless there is a physical reason (forced outage).**

## Failure of Reserves to Respond

- **Synchronized reserve events are the only recurrent events in which unit performance is measured.**
- **Failure to deploy reserves is the same as not providing energy.**
- **Not providing energy/reserves when requested is a violation of the ICAP must offer requirement.**



# Real-Time Reserves and Requirements



# RTO Reserve MW

- **Real-time market clearing**

Year	Month	Synchronized Reserve MW	Nonsynchronized Reserve MW	Total Primary Reserve MW	Secondary Reserve MW	Total Thirty-Minute Reserve MW
2023	Jan	1,935	861	2,796	1,100	3,895
2023	Feb	1,975	718	2,693	2,295	4,988
2023	Mar	1,722	812	2,534	1,965	4,499
2023	Apr	1,788	771	2,559	2,265	4,824

- **Day-ahead market clearing**

Year	Month	Synchronized Reserve MW	Nonsynchronized Reserve MW	Total Primary Reserve MW	Secondary Reserve MW	Total Thirty-Minute Reserve MW
2023	Jan	1,904	1,403	3,308	11,940	15,248
2023	Feb	1,889	1,311	3,200	16,793	19,993
2023	Mar	1,682	1,179	2,861	15,073	17,934
2023	Apr	1,766	968	2,734	10,955	13,689

# MAD Reserve MW

- **Real-time market clearing**

Year	Month	Synchronized Reserve MW	Nonsynchronized Reserve MW	Total Primary Reserve MW	Secondary Reserve MW	Total Thirty-Minute Reserve MW
2023	Jan	1,933	792	2,725	NA	NA
2023	Feb	1,955	673	2,628	NA	NA
2023	Mar	1,695	678	2,374	NA	NA
2023	Apr	1,664	615	2,279	NA	NA

- **Day-ahead market clearing**

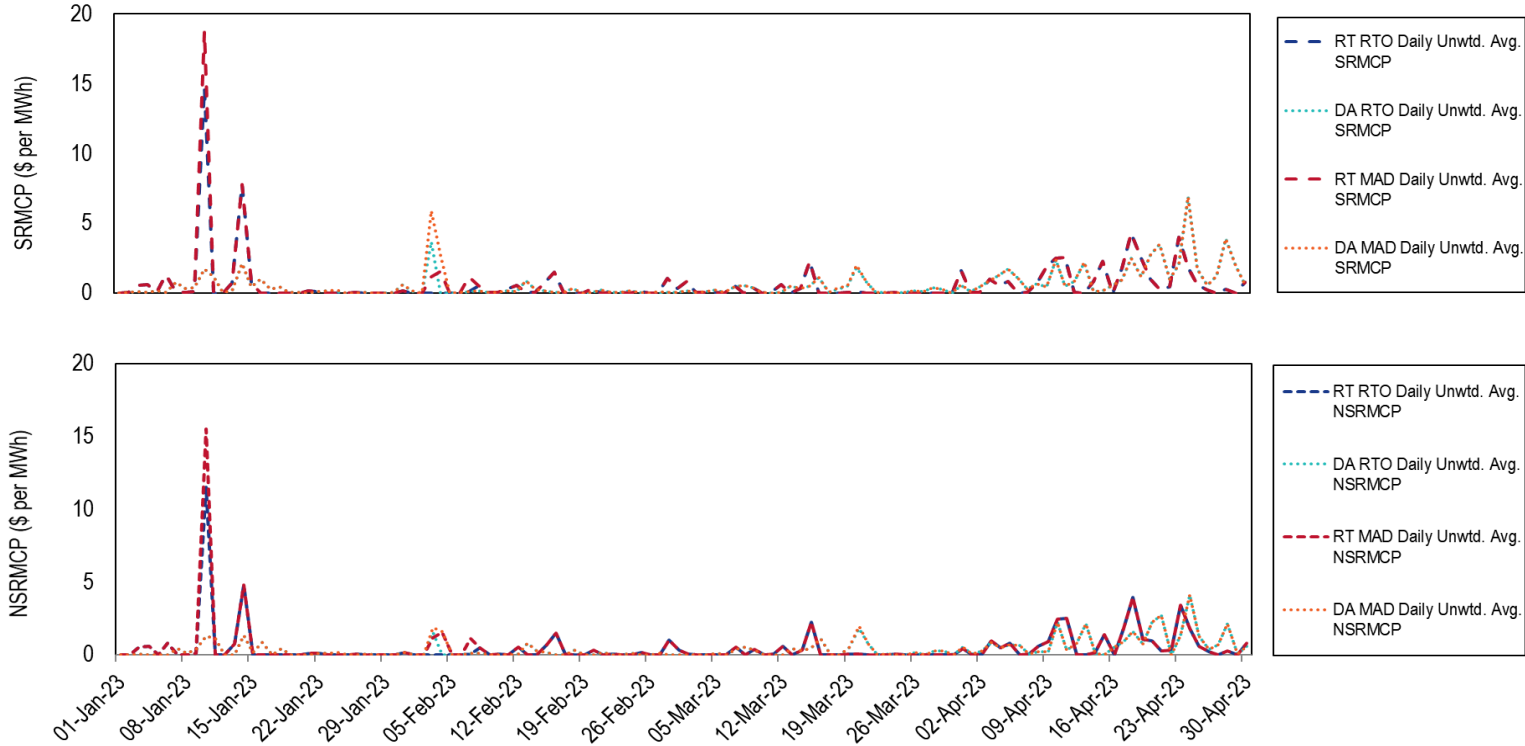
Year	Month	Synchronized Reserve MW	Nonsynchronized Reserve MW	Total Primary Reserve MW	Secondary Reserve MW	Total Thirty-Minute Reserve MW
2023	Jan	1,891	1,118	3,009	NA	NA
2023	Feb	1,874	992	2,866	NA	NA
2023	Mar	1,671	839	2,510	NA	NA
2023	Apr	1,690	684	2,374	NA	NA

# Reserve Settlements by Month

Product	Year	Month	Total Day-Ahead Credits	Total Balancing MCP Credits	Total LOC Credits	Total Shortfall Charges	Total Credits
Synchronized Reserve	2023	Jan	\$505,419	(\$114,061)	\$983,619	\$335,995	\$1,038,982
	2023	Feb	\$735,351	\$99,577	\$495,474	\$0	\$1,330,401
	2023	Mar	\$439,364	(\$5,106)	\$744,883	\$0	\$1,179,141
	2023	Apr	\$2,088,876	\$55,121	\$701,874	\$0	\$2,845,871
Nonsynchronized Reserve	2023	Jan	\$73,610	(\$155,466)	\$4,850	NA	(\$77,007)
	2023	Feb	\$72,133	(\$113,200)	\$31,094	NA	(\$9,973)
	2023	Mar	\$72,194	(\$37,214)	\$3,368	NA	\$38,348
	2023	Apr	\$220,075	(\$112,776)	\$59,662	NA	\$166,961
Secondary Reserve	2023	Jan	\$0	\$0	\$5,150	\$0	\$5,150
	2023	Feb	\$0	\$0	\$34,129	\$0	\$34,129
	2023	Mar	\$0	\$0	\$12,363	\$0	\$12,363
	2023	Apr	\$0	\$0	\$15,125	\$0	\$15,125

- For secondary reserve, the shortfall charge is part of the balancing MCP credit. For synchronized reserve, it is separate.
- The only spin events that were 10 minutes or longer happened in January, so only January has SR shortfall charges.

# Reserve Prices



- SecRMCP always \$0 per MWh, so far.
- Spikes on Jan. 10<sup>th</sup> due to shortage pricing.
- Spikes on Feb. 3<sup>rd</sup> & 4<sup>th</sup> due to conservative operations.

# Synchronized Reserve Event Analysis

- **Many spin events, defined by PJM, are longer than the corresponding DCS event.**
- **PJM frequently overshoots when recovering ACE.**
  - **PJM defines the end of spin events minutes after ACE has returned to NERC required levels.**





# DCS Events vs Spin Events: Start/End/Duration

DCS Start	DCS End	DCS Length	Spin Start	Spin End	Spin Length
2022-03-03 12:18	2022-03-03 12:24	00:06:03	2022-03-03 12:20	2022-03-03 12:27	00:07:21
2022-04-06 11:44	2022-04-06 11:49	00:05:12	2022-04-06 11:45	2022-04-06 11:55	00:09:43
2022-04-14 09:28	2022-04-14 09:34	00:05:40	2022-04-14 09:30	2022-04-14 09:38	00:08:07
2022-05-16 15:31	2022-05-16 15:37	00:06:12	2022-05-16 15:32	2022-05-16 15:43	00:11:05
2022-05-16 15:53	2022-05-16 15:56	00:03:18	2022-05-16 15:53	2022-05-16 16:03	00:09:34
2022-05-23 17:17	2022-05-23 17:20	00:03:17	2022-05-23 17:17	2022-05-23 17:32	00:15:00
2022-06-27 17:00	2022-06-27 17:04	00:04:16	2022-06-27 17:01	2022-06-27 17:10	00:09:03
2022-07-07 17:20	2022-07-07 17:24	00:03:27	2022-07-07 17:21	2022-07-07 17:29	00:07:52
2022-09-26 03:35	2022-09-26 03:42	00:06:16	2022-09-26 03:39	2022-09-26 03:45	00:06:02
2022-10-29 02:10	2022-10-29 02:15	00:04:42	2022-10-29 02:12	2022-10-29 02:24	00:11:52
2022-11-04 15:01	2022-11-04 15:04	00:02:58	2022-11-04 15:03	2022-11-04 15:07	00:04:25
2022-11-29 16:29	2022-11-29 16:38	00:08:23	2022-11-29 16:30	2022-11-29 16:47	00:16:45
2022-12-24 02:23	2022-12-24 02:28	00:05:15	2022-12-24 02:23	2022-12-24 02:54	00:30:35
2023-01-05 12:42	2023-01-05 12:47	00:04:56	2023-01-05 12:43	2023-01-05 12:55	00:11:33

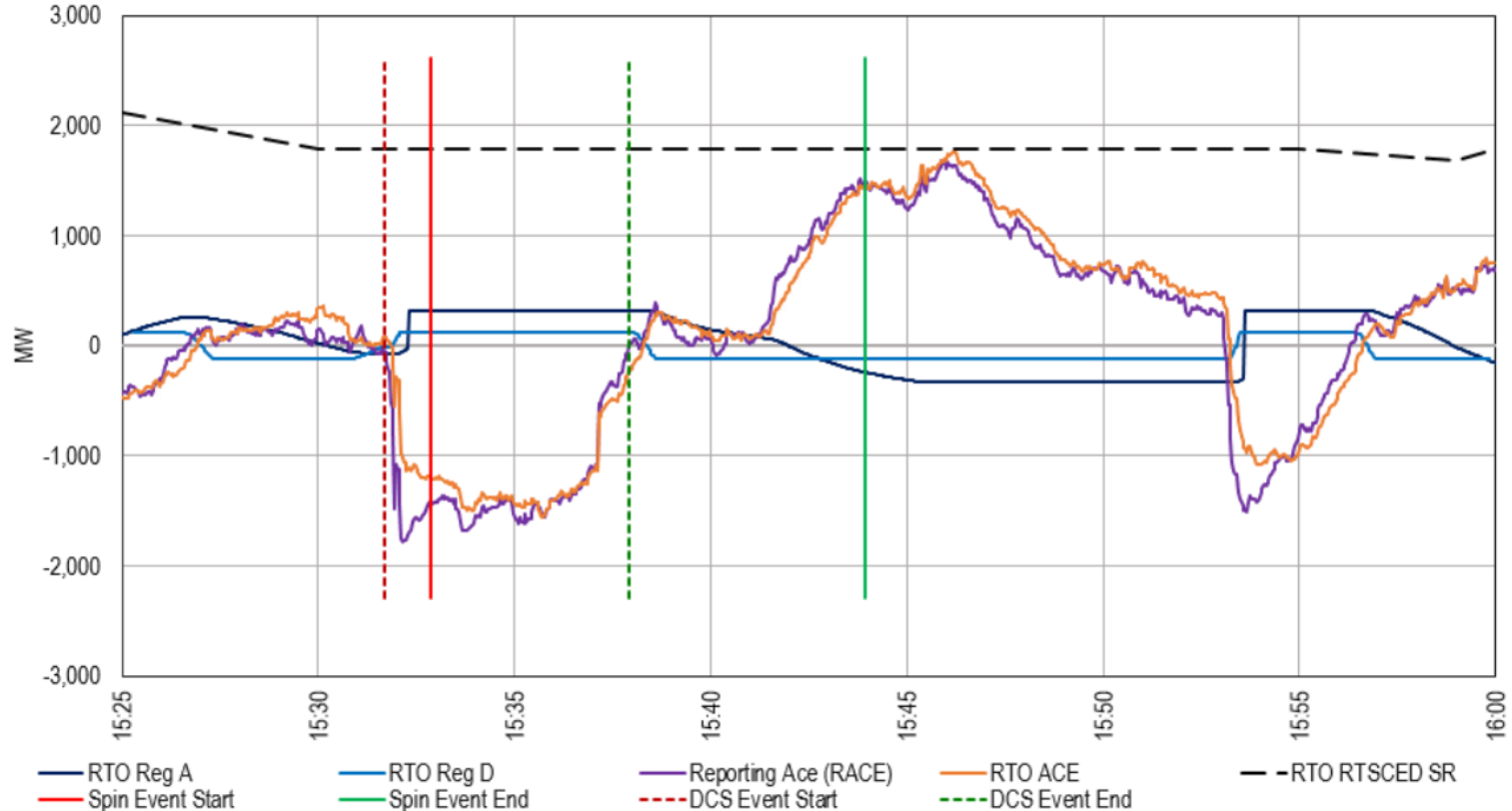


# DCS Events vs Spin Events: Start/End/Duration

DCS Start	DCS End	DCS Length	Spin Start	Spin End	Spin Length
2022-06-15 07:24	2022-06-15 07:30	00:05:39	<i>No corresponding spin event.</i>		
2022-07-04 02:04	2022-07-04 02:07	00:02:42	<i>No corresponding spin event.</i>		
2022-08-28 13:48	2022-08-28 13:49	00:01:40	<i>No corresponding spin event.</i>		
2022-12-11 09:18	2022-12-11 09:25	00:07:13	<i>No corresponding spin event.</i>		
2022-12-23 16:58	2022-12-23 17:14	00:15:52	<i>No corresponding spin event. Occurs during Low ACE event.</i>		
2022-12-24 15:26	2022-12-24 15:29	00:03:07	<i>No corresponding spin event.</i>		
2023-02-03 20:43	2023-02-03 20:47	00:03:53	<i>No corresponding spin event.</i>		

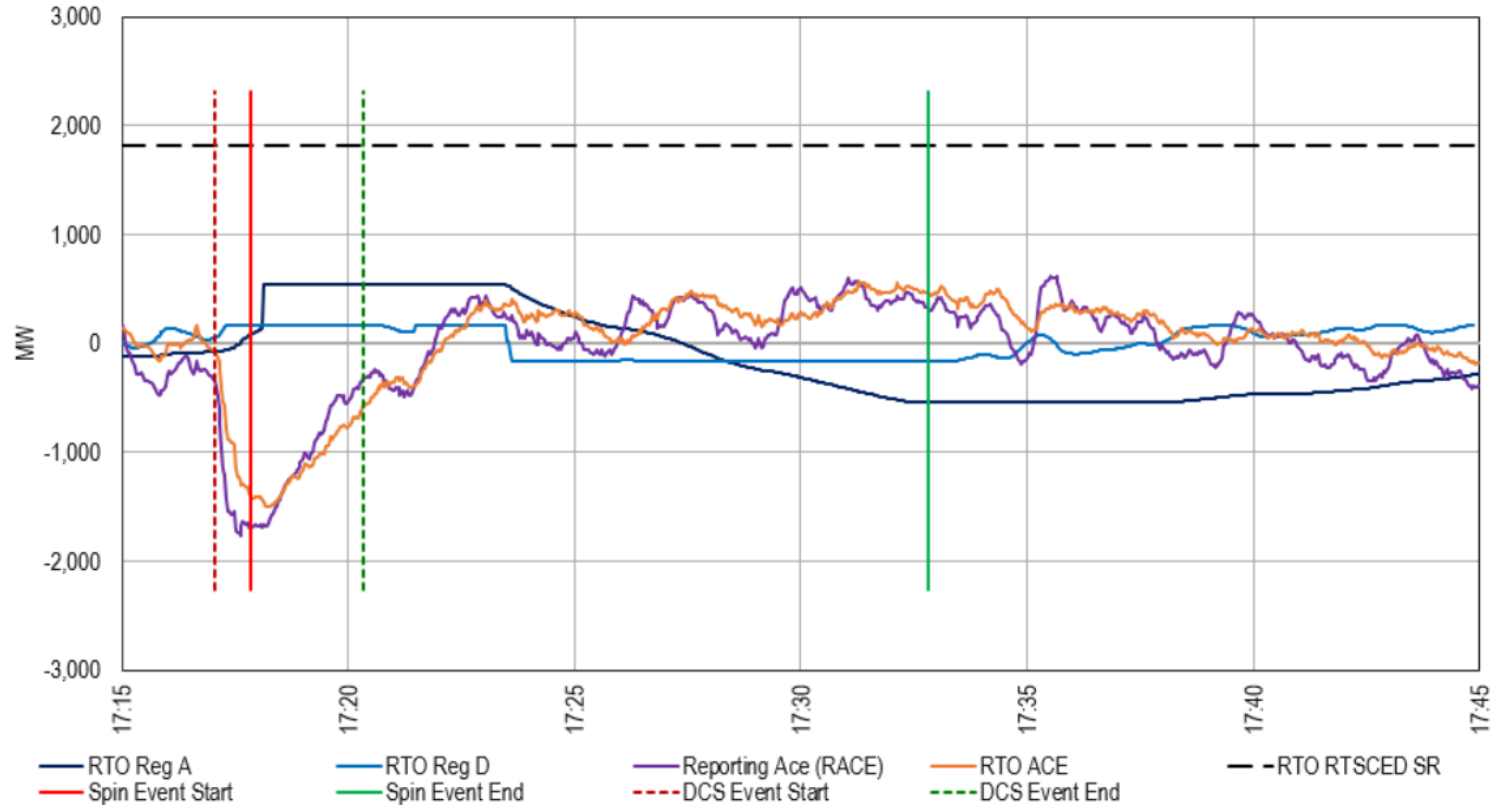
# 2022-05-16 (~6 min. DCS vs ~11 min. spin)

Spin Event: 2022-05-16 from 15:32 to 15:43 EPT (followed quickly by another event)



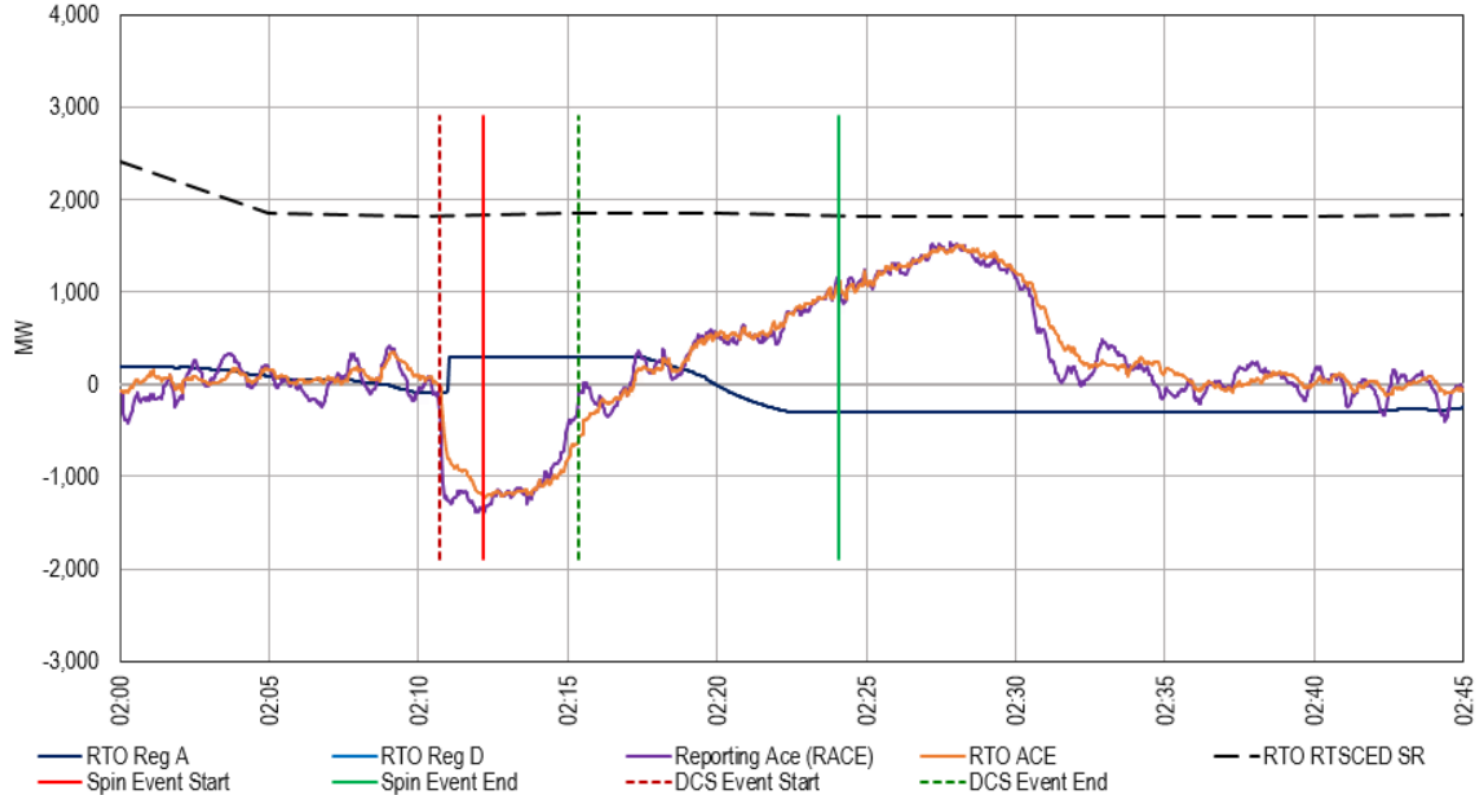
# 2022-05-23 (~3 min. DCS vs ~15 min. spin)

Spin Event: 2022-05-23 from 17:17 to 17:32 EPT

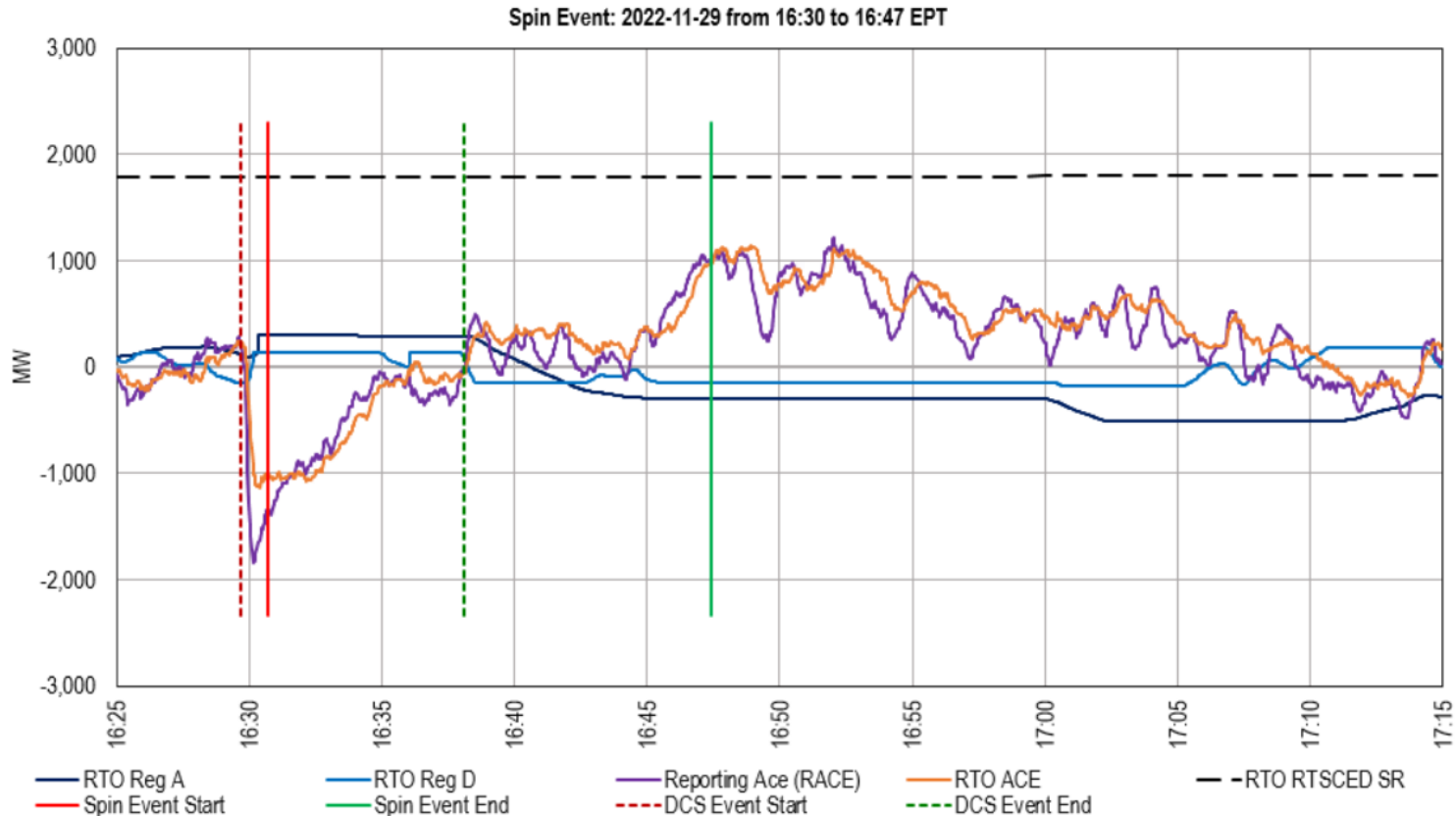


# 2022-10-29 (~5 min. DCS vs ~12 min. spin)

Spin Event: 2022-10-29 from 02:12 to 02:24 EPT

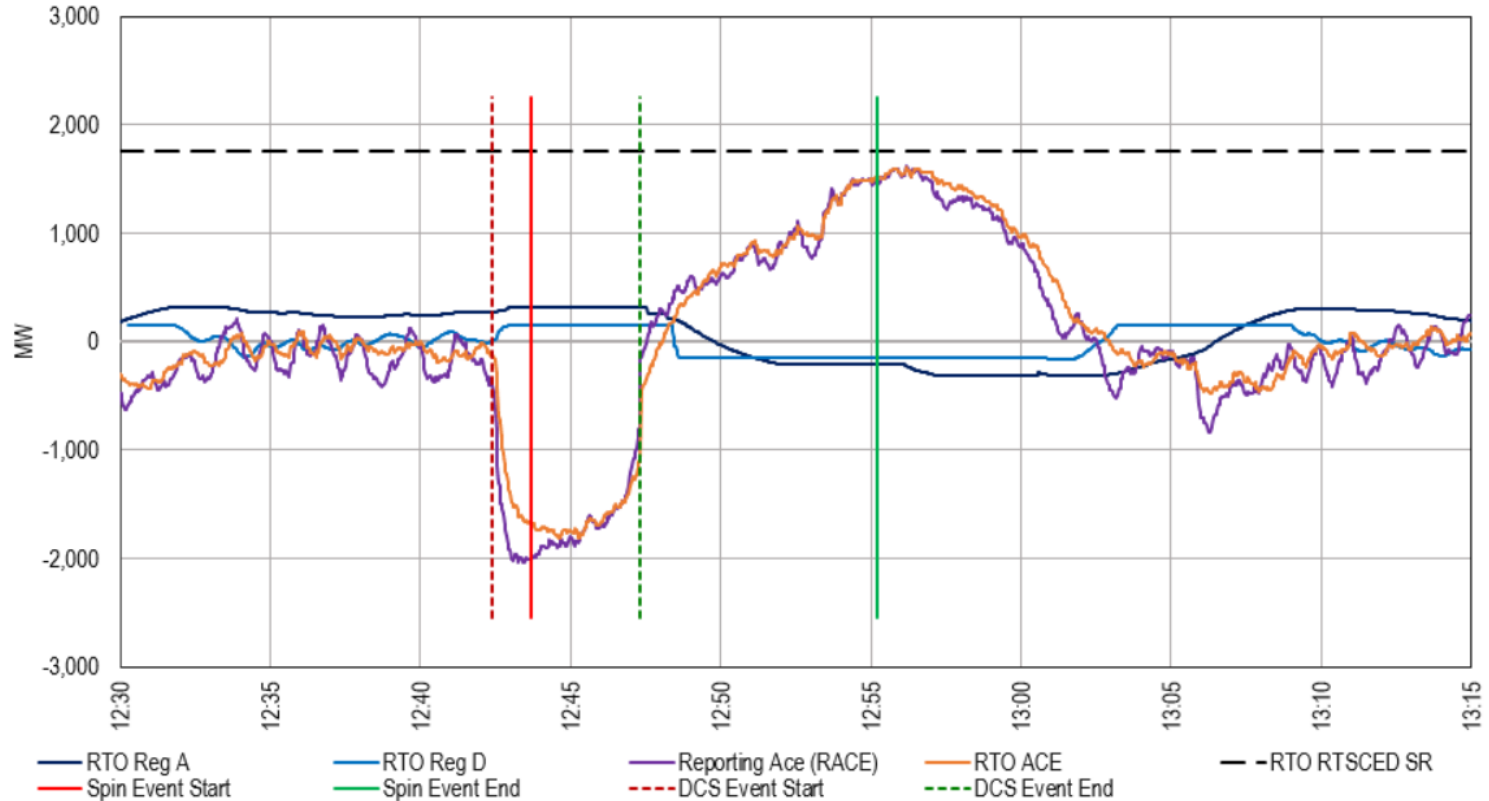


# 2022-11-29 (~8 min. DCS vs ~17 min. spin)

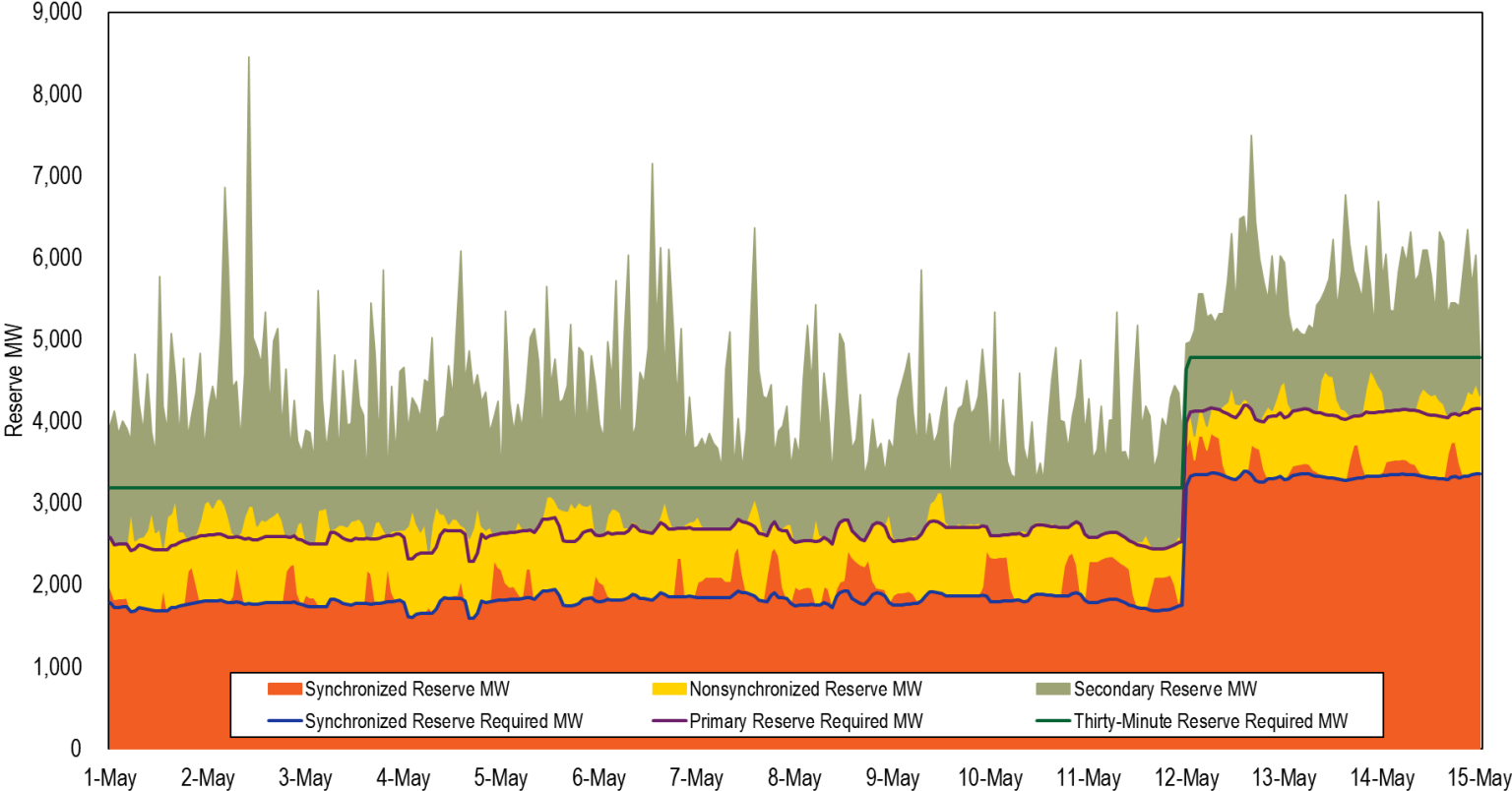


# 2023-01-05 (~5 min. DCS vs ~12 min. spin)

Spin Event: 2023-01-05 from 12:43 to 12:55 EPT

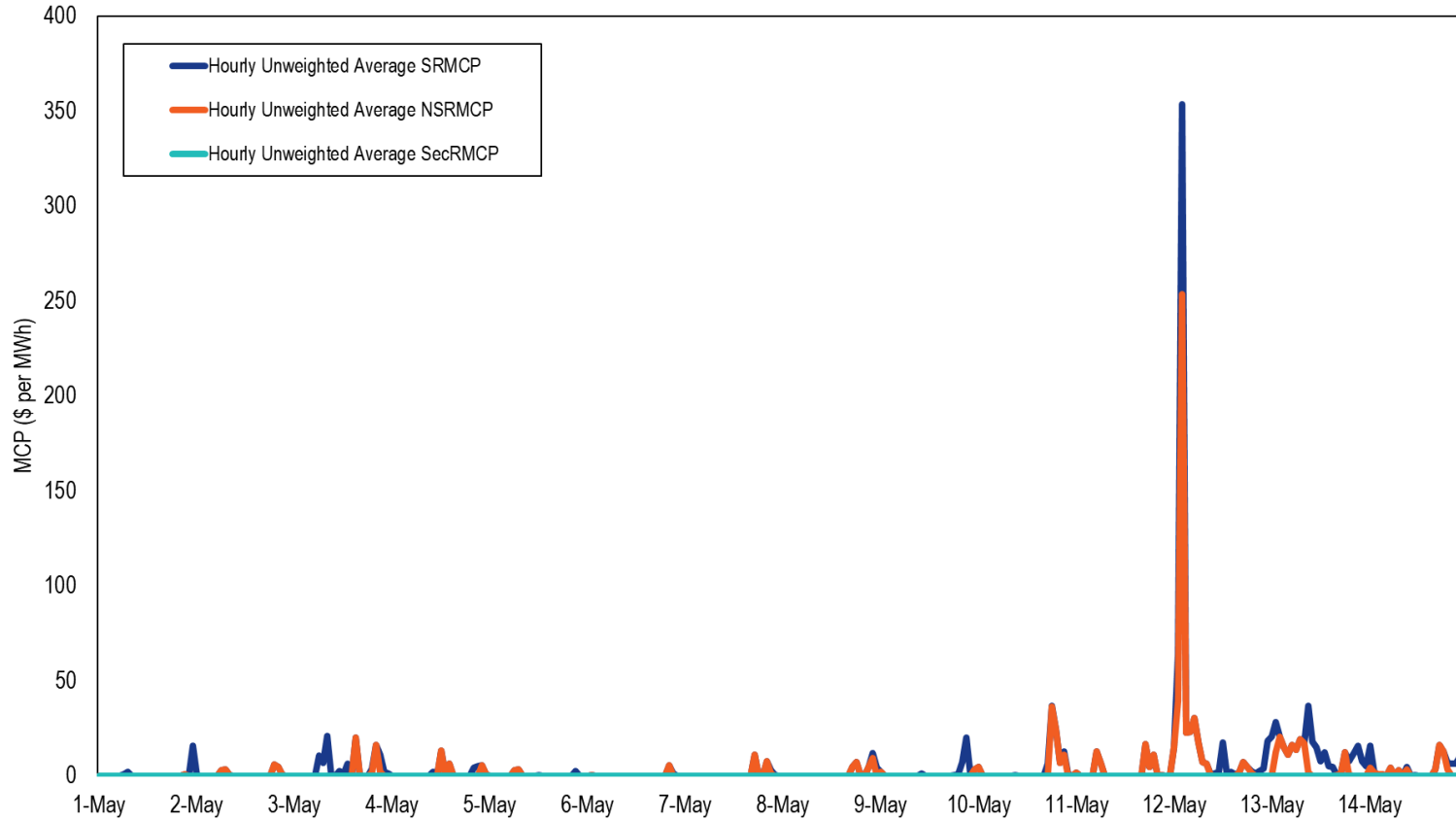


# Recent RTO Hourly Average Requirements/Cleared MW

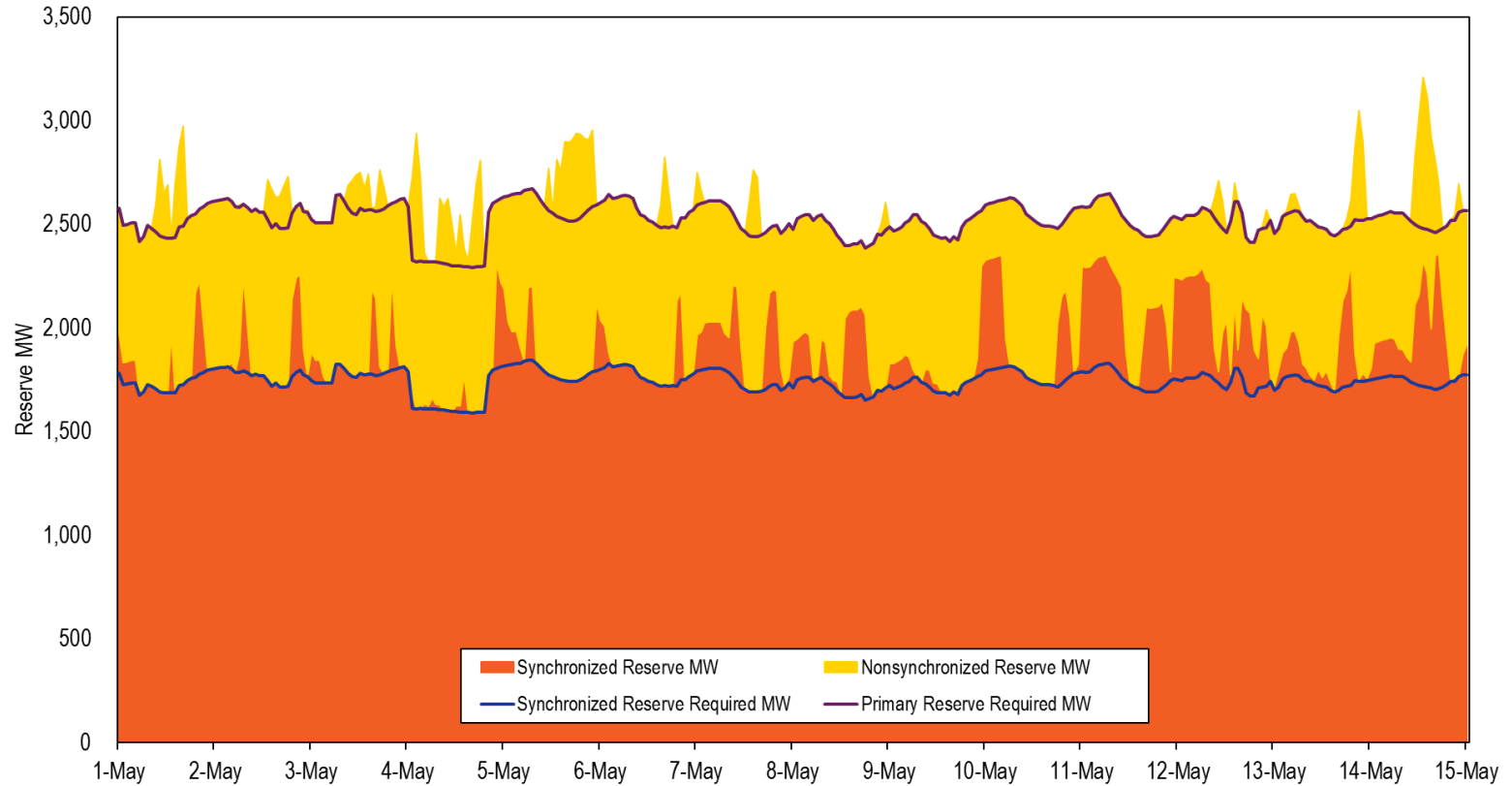




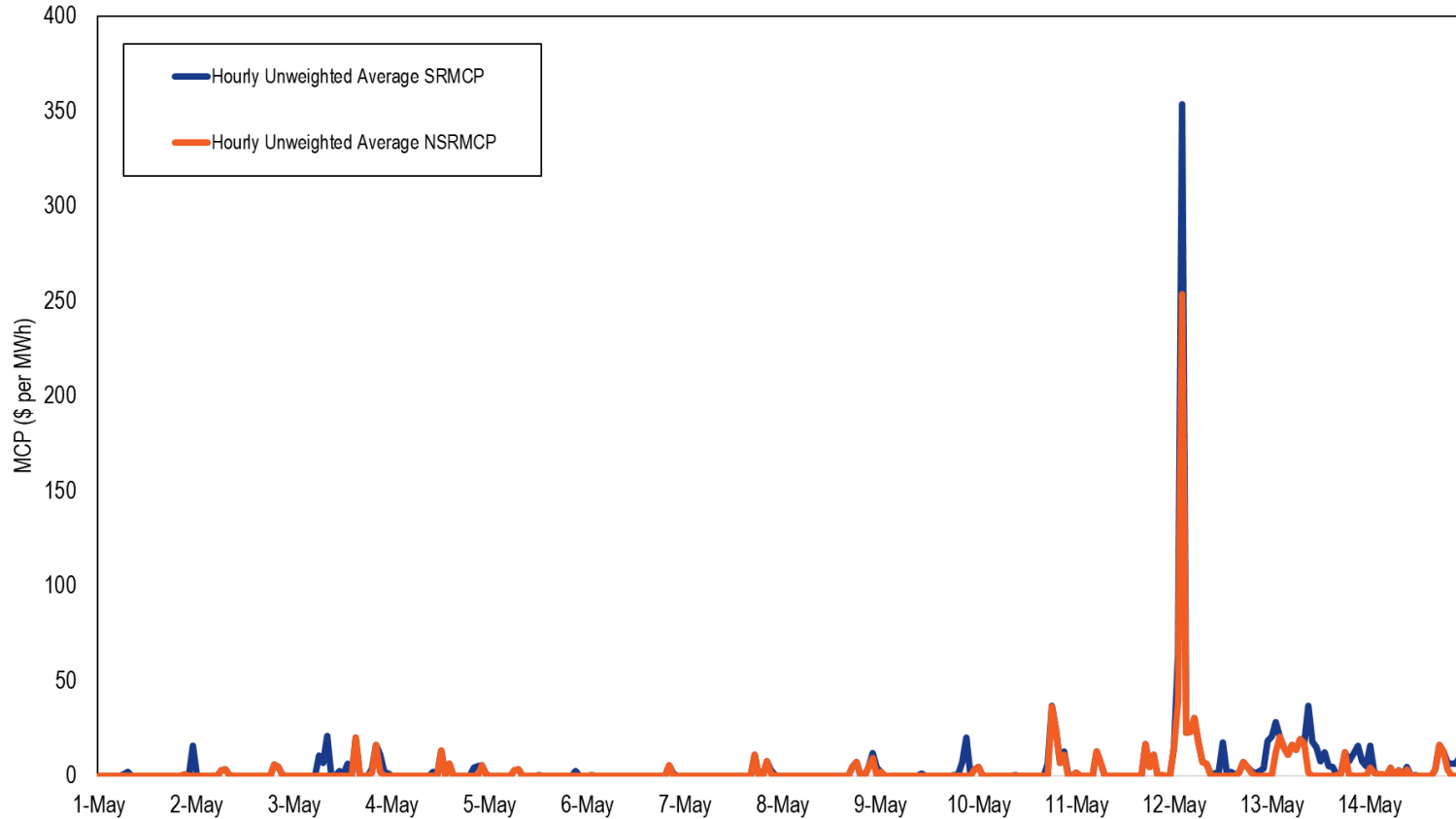
# Recent RTO Hourly Unweighted Average MCPs



# Recent MAD Hourly Average Requirements/Cleared MW



# Recent MAD Hourly Unweighted Average MCPs



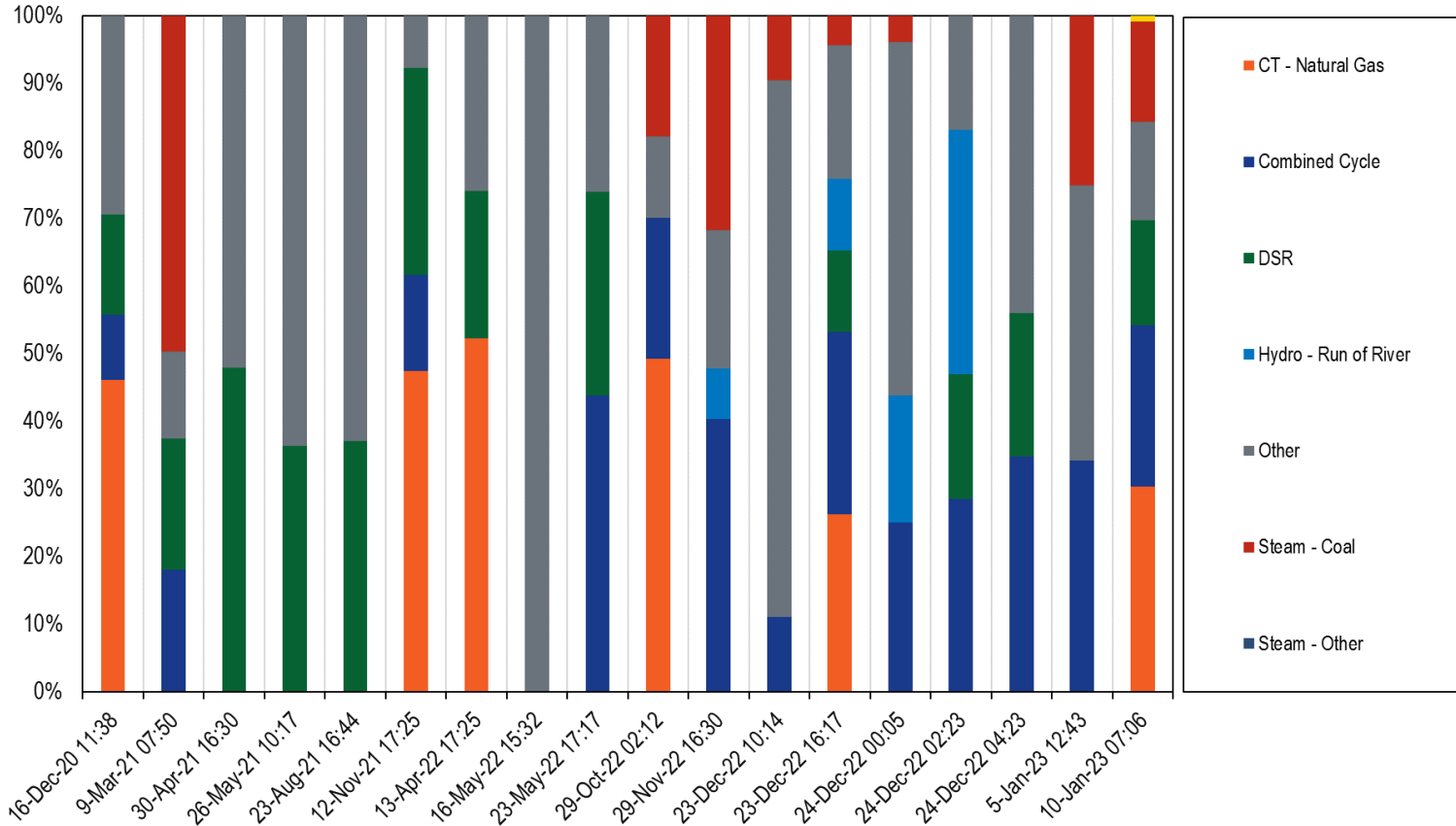
# Distribution of Shortfall MW: October 2022 through April 2023 (excluding Winter Storm Elliot)

## Events included:

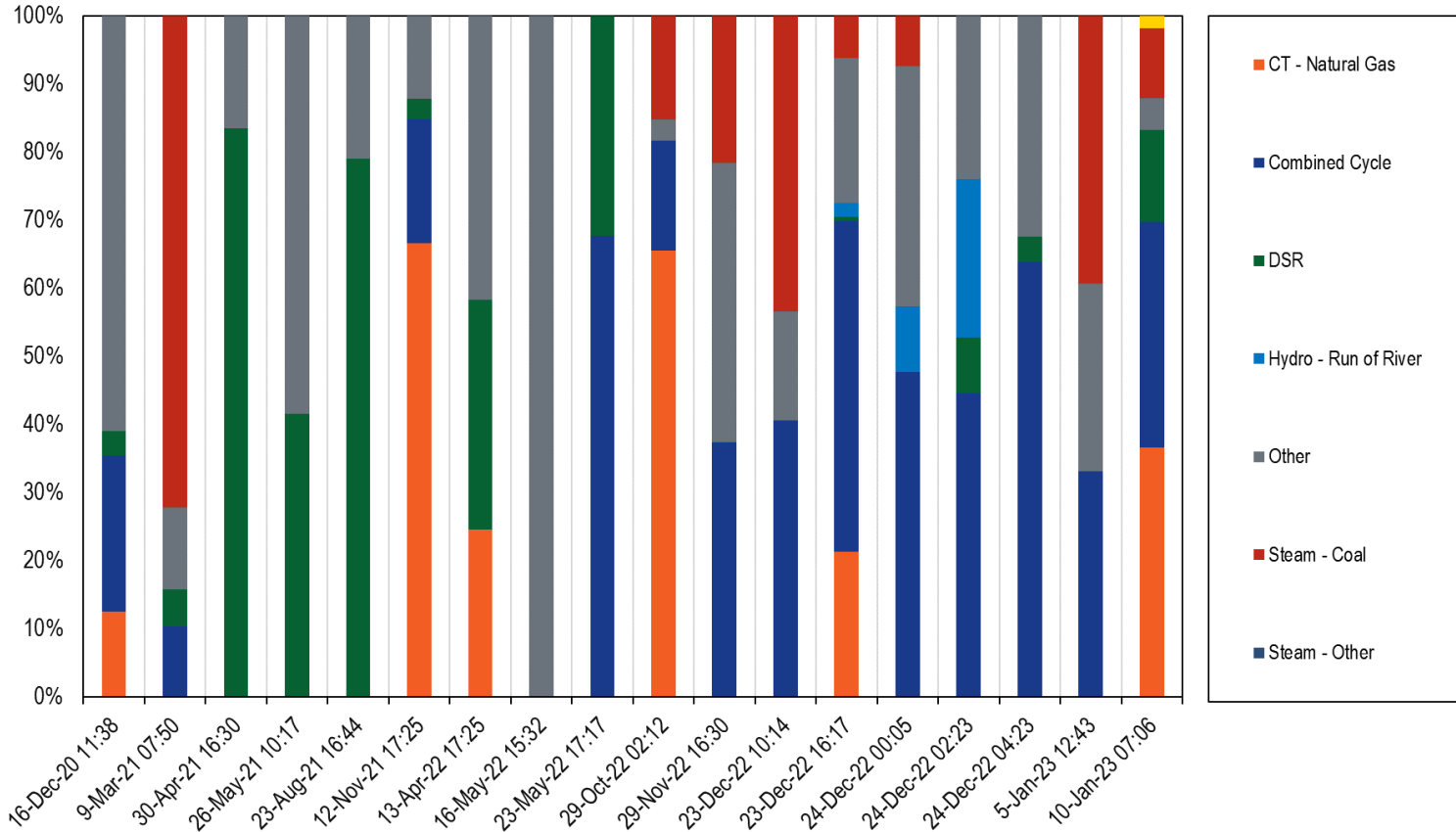
- **October 29, 2022**
- **November 29, 2022**
- **January 5, 2023**
- **January 10, 2023**

Resource/Fuel Type	Shortfall MW	Percent of Total
CT - Natural Gas	1,604.2	41.8%
Combined Cycle	1,108.5	28.9%
Steam - Coal	761.5	19.8%
DSR	188.4	4.9%
Other	174.7	4.6%

# Percentages of Event Scheduled MW



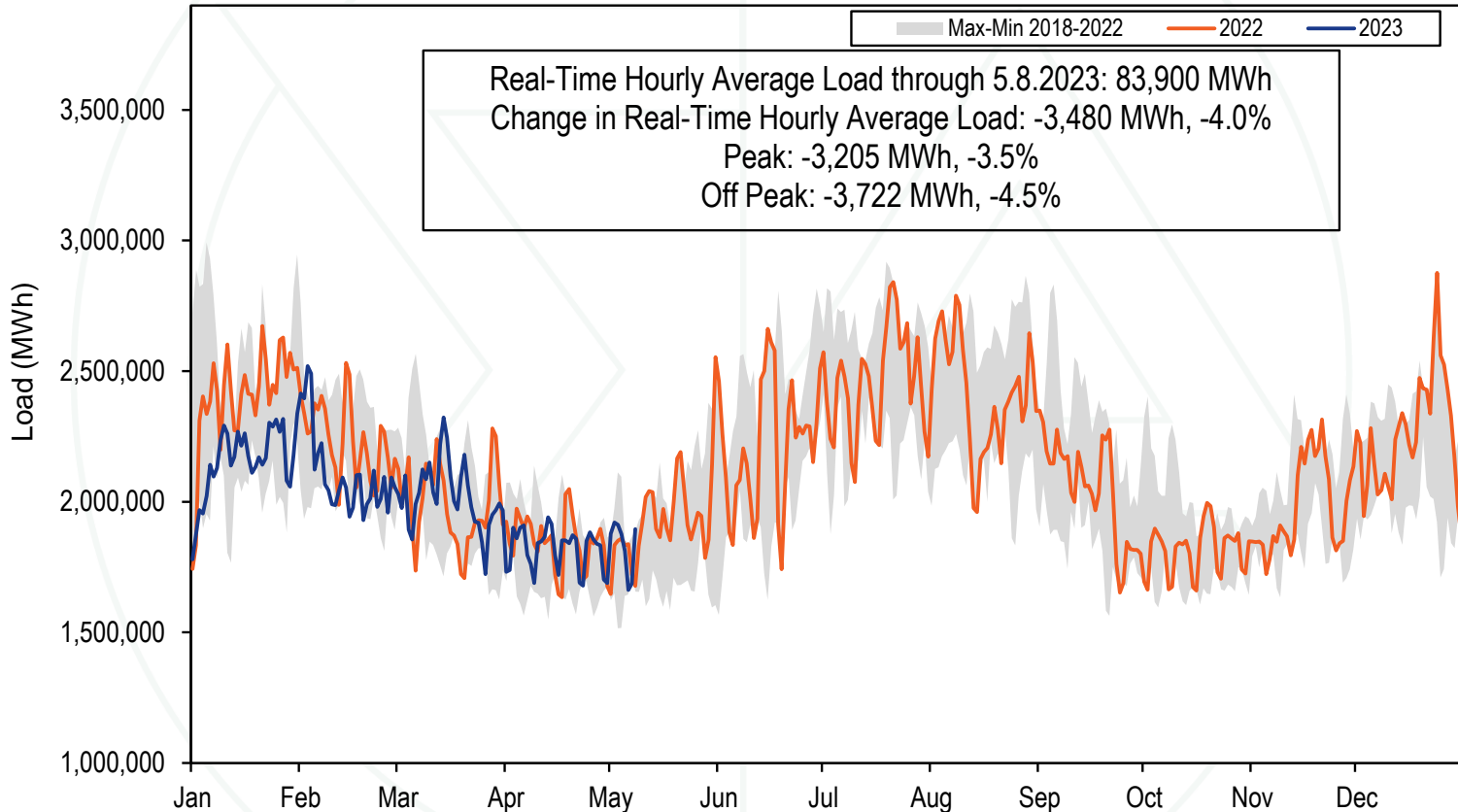
# Percentages of Event Shortfall MW



# Share of Reserves (Sched) vs. Shortfall (SF)

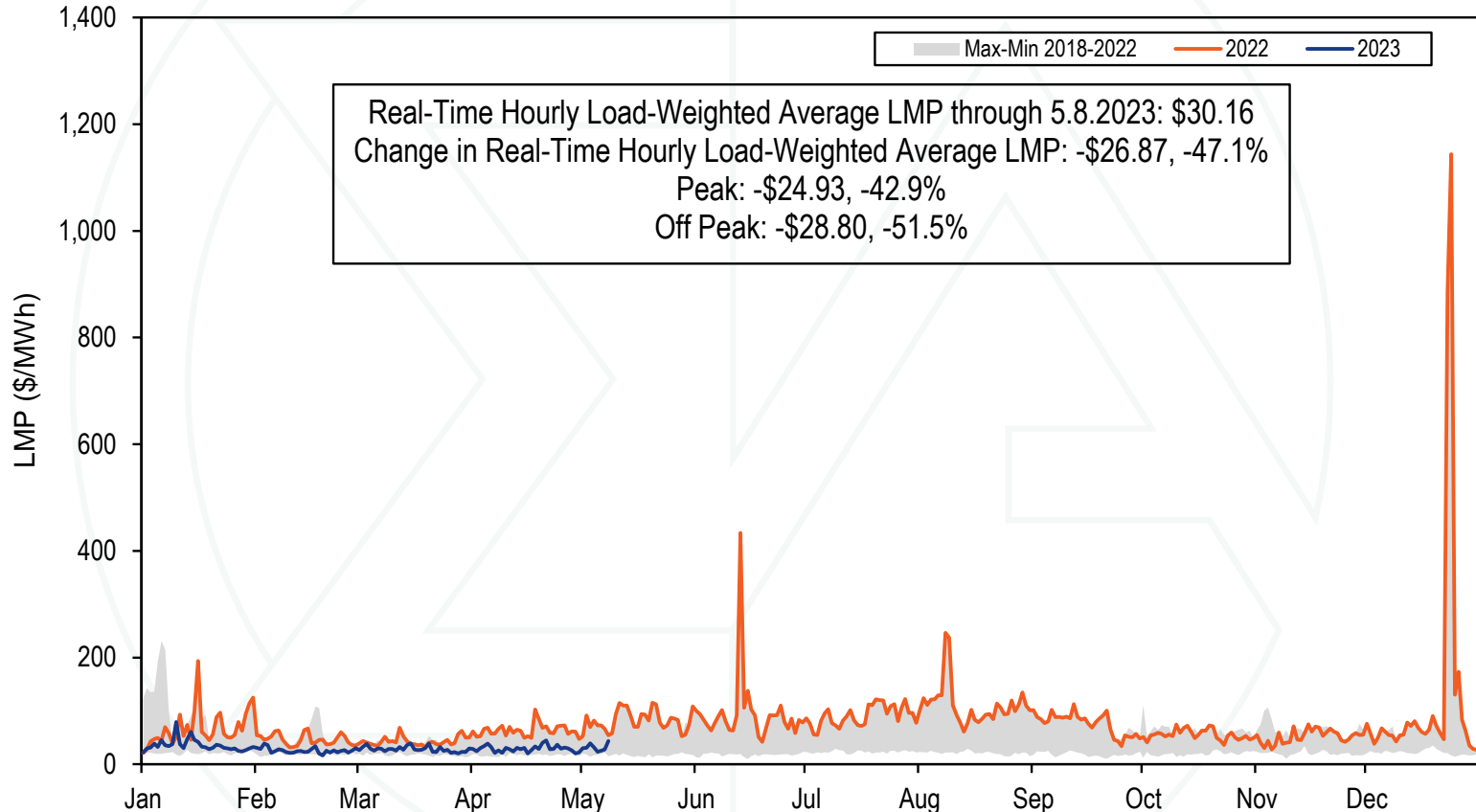
	CT - Natural Gas			Combined Cycle			DSR			Hydro - Run of River			Other			Steam - Coal			Steam - Other		
	Sched.	SF	Diff.	Sched.	SF	Diff.	Sched.	SF	Diff.	Sched.	SF	Diff.	Sched.	SF	Diff.	Sched.	SF	Diff.	Sched.	SF	Diff.
2020-12-16 11:38	0.46	0.12	0.34	0.10	0.23	(0.13)	0.15	0.04	0.11				0.29	0.61	(0.32)						
2021-03-09 07:50				0.18	0.10	0.08	0.19	0.05	0.14				0.13	0.12	0.01	0.50	0.72	(0.22)			
2021-04-30 16:30							0.48	0.83	(0.35)				0.52	0.17	0.35						
2021-05-26 10:17							0.36	0.42	(0.05)				0.64	0.58	0.05						
2021-08-23 16:44							0.37	0.79	(0.42)				0.63	0.21	0.42						
2021-11-12 17:25	0.47	0.67	(0.19)	0.14	0.18	(0.04)	0.31	0.03	0.28				0.08	0.12	(0.05)						
2022-04-13 17:25	0.52	0.25	0.28				0.22	0.34	(0.12)				0.26	0.42	(0.16)						
2022-05-16 15:32													1.00	1.00	0.00						
2022-05-23 17:17				0.44	0.68	(0.24)	0.30	0.32	(0.02)				0.26	0.00	0.26						
2022-10-29 02:12	0.49	0.66	(0.16)	0.21	0.16	0.05							0.12	0.03	0.09	0.18	0.15	0.03			
2022-11-29 16:30				0.40	0.37	0.03				0.08	0.00	0.07	0.20	0.41	(0.20)	0.32	0.22	0.10			
2022-12-23 10:14				0.11	0.41	(0.30)							0.79	0.16	0.63	0.10	0.43	(0.34)			
2022-12-23 16:17	0.26	0.21	0.05	0.27	0.49	(0.22)	0.12	0.01	0.12	0.11	0.02	0.08	0.20	0.21	(0.02)	0.04	0.06	(0.02)			
2022-12-24 00:05				0.25	0.48	(0.23)				0.19	0.10	0.09	0.52	0.35	0.17	0.04	0.07	(0.04)			
2022-12-24 02:23				0.29	0.45	(0.16)	0.18	0.08	0.10	0.36	0.23	0.13	0.17	0.24	(0.07)						
2022-12-24 04:23				0.35	0.64	(0.29)	0.21	0.04	0.18				0.44	0.32	0.11						
2023-01-05 12:43				0.34	0.33	0.01							0.41	0.28	0.13	0.25	0.39	(0.14)			
2023-01-10 07:06	0.30	0.37	(0.06)	0.24	0.33	(0.09)	0.16	0.13	0.02				0.14	0.05	0.10	0.15	0.10	0.05	0.01	0.02	(0.01)

# 2023 YTD PJM Real-Time Daily Load





# 2023 YTD PJM Real-Time Daily LMP

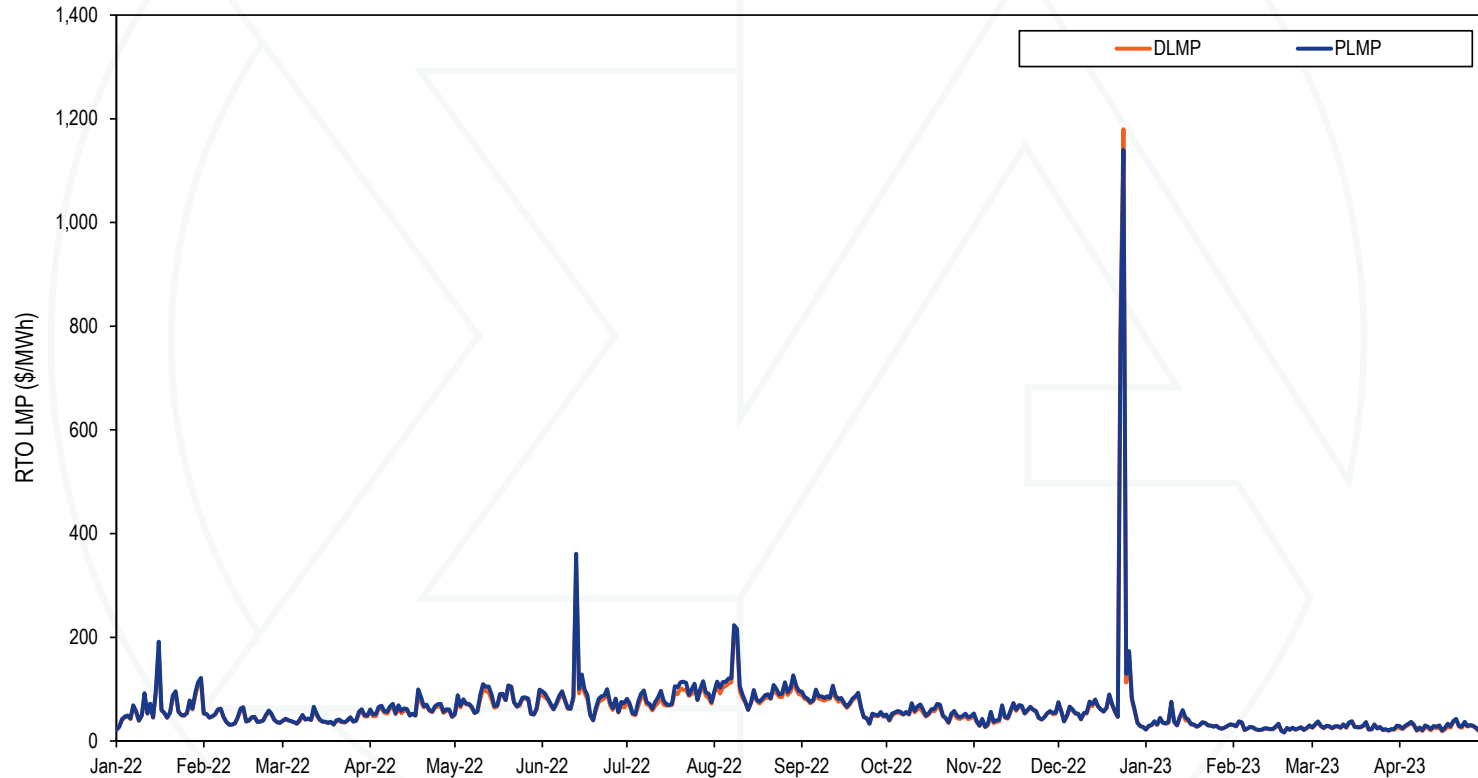


# Monthly Average Load-Weighted DLMP and PLMP

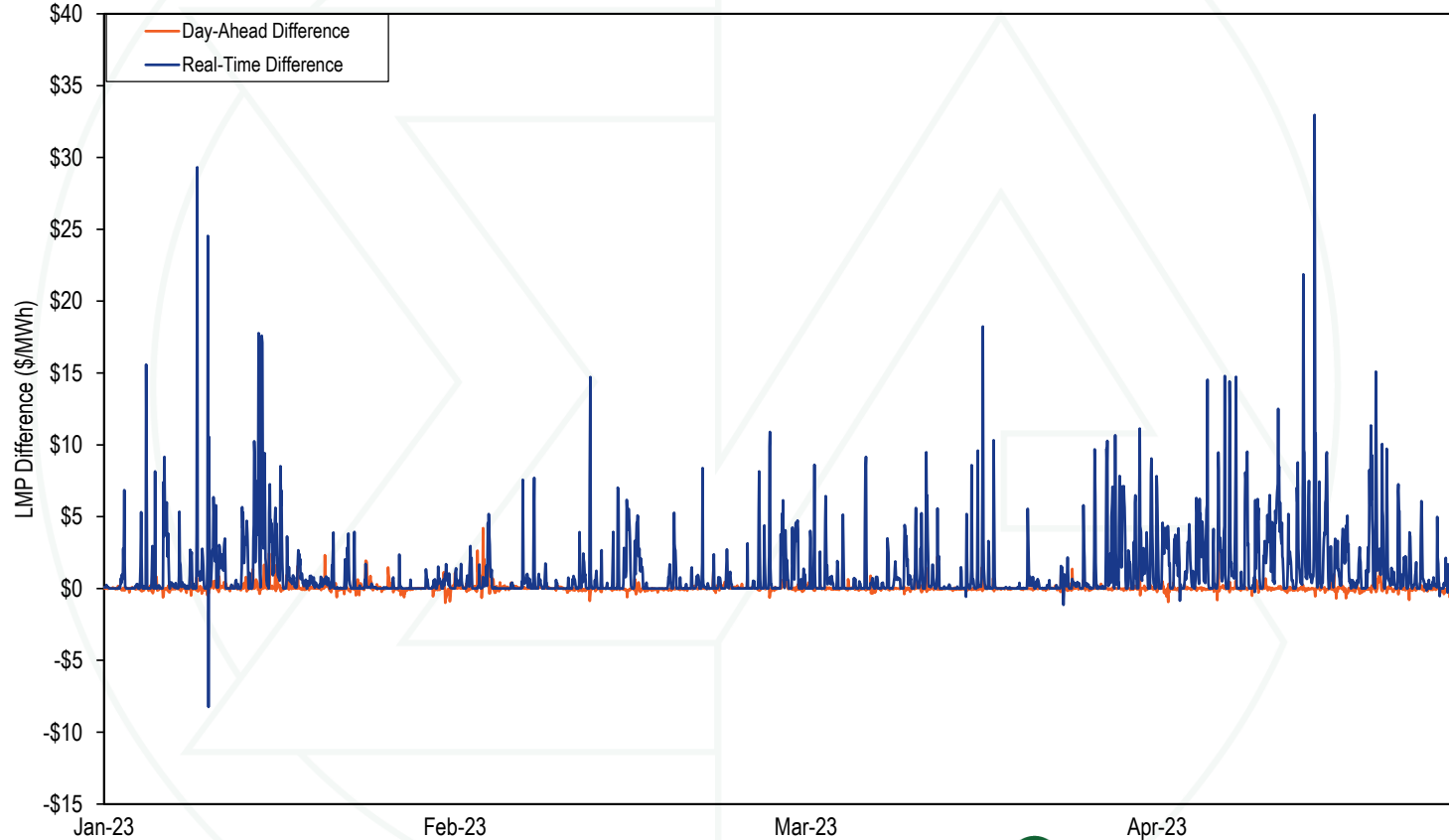
Year	Month	Day-Ahead Load-Weighted Average				Real-Time Load-Weighted Average			
		DLMP	PLMP	Difference	Percent Difference	DLMP	PLMP	Difference	Percent Difference
2022	Jan	\$64.57	\$64.80	\$0.22	0.3%	\$66.43	\$69.06	\$2.64	4.0%
2022	Feb	\$49.96	\$50.35	\$0.39	0.8%	\$45.93	\$46.76	\$0.83	1.8%
2022	Mar	\$45.25	\$45.50	\$0.25	0.6%	\$41.83	\$43.56	\$1.73	4.1%
2022	Apr	\$64.10	\$64.18	\$0.08	0.1%	\$60.38	\$63.91	\$3.52	5.8%
2022	May	\$83.17	\$83.24	\$0.06	0.1%	\$79.04	\$83.16	\$4.12	5.2%
2022	Jun	\$90.24	\$90.54	\$0.29	0.3%	\$91.44	\$97.89	\$6.46	7.1%
2022	Jul	\$96.07	\$96.38	\$0.32	0.3%	\$84.03	\$92.48	\$8.45	10.1%
2022	Aug	\$106.18	\$106.07	(\$0.10)	(0.1%)	\$105.68	\$113.74	\$8.06	7.6%
2022	Sep	\$82.86	\$82.80	(\$0.06)	(0.1%)	\$74.08	\$78.29	\$4.22	5.7%
2022	Oct	\$58.30	\$58.37	\$0.07	0.1%	\$52.27	\$55.90	\$3.63	6.9%
2022	Nov	\$56.29	\$55.24	(\$1.05)	(1.9%)	\$50.86	\$52.93	\$2.07	4.1%
2022	Dec	\$93.02	\$93.39	\$0.37	0.4%	\$143.65	\$142.22	(\$1.42)	(1.0%)
2022	Jan - Dec	\$75.35	\$75.44	\$0.08	0.1%	\$76.34	\$80.14	\$3.80	5.0%
2023	Jan	\$36.53	\$36.58	\$0.05	0.1%	\$34.66	\$35.75	\$1.09	3.1%
2023	Feb	\$31.16	\$31.22	\$0.06	0.2%	\$25.47	\$26.04	\$0.57	2.2%
2023	Mar	\$28.39	\$28.41	\$0.02	0.1%	\$27.58	\$28.42	\$0.85	3.1%
2023	Apr	\$29.81	\$29.81	(\$0.00)	(0.0%)	\$27.09	\$29.32	\$2.22	8.2%
2023	Jan - Apr	\$31.60	\$31.63	\$0.03	0.1%	\$28.91	\$30.06	\$1.16	4.0%



# Daily Average Real-Time DLMP and PLMP



# Hourly Difference: PLMP – DLMP



# Fast Start Units as a Percent of Marginal Units

Year	Month	Dispatch Run				Pricing Run			
		CT	Diesel	Wind	All Fast Start Units	CT	Diesel	Wind	All Fast Start Units
2022	Jan	1.3%	0.3%	0.2%	1.8%	4.9%	0.9%	0.2%	6.2%
2022	Feb	0.6%	0.2%	0.3%	1.1%	3.2%	0.5%	0.3%	4.0%
2022	Mar	0.5%	0.2%	0.4%	1.1%	3.4%	0.5%	0.4%	4.4%
2022	Apr	0.8%	0.1%	0.1%	1.2%	4.4%	0.3%	0.1%	5.0%
2022	May	1.4%	0.7%	0.1%	2.4%	6.6%	1.2%	0.1%	8.1%
2022	Jun	2.3%	0.3%	0.1%	2.6%	9.3%	0.8%	0.1%	10.2%
2022	Jul	2.7%	0.6%	0.1%	3.3%	16.3%	1.4%	0.0%	17.7%
2022	Aug	2.0%	0.4%	0.0%	2.4%	12.0%	1.3%	0.0%	13.3%
2022	Sep	0.8%	0.3%	0.1%	1.2%	5.6%	1.0%	0.1%	6.7%
2022	Oct	2.2%	0.2%	0.3%	2.6%	6.6%	0.9%	0.2%	7.7%
2022	Nov	1.3%	0.2%	0.2%	1.7%	5.1%	0.9%	0.2%	6.1%
2022	Dec	1.3%	0.7%	0.2%	2.2%	6.3%	1.5%	0.2%	8.0%
2022	Jan - Dec	1.4%	0.3%	0.2%	2.0%	7.0%	0.9%	0.1%	8.1%
2023	Jan	1.6%	0.5%	0.1%	2.1%	6.2%	2.8%	0.0%	9.0%
2023	Feb	0.9%	0.2%	0.0%	1.1%	3.1%	0.6%	0.0%	3.7%
2023	Mar	0.8%	0.4%	0.1%	1.2%	3.0%	0.7%	0.1%	3.8%
2023	Apr	2.5%	0.4%	0.2%	3.2%	8.1%	0.8%	0.2%	9.1%
2023	Jan - Apr	1.4%	0.4%	0.1%	1.9%	5.1%	1.2%	0.1%	6.4%



# Fast Start Impacts: Zonal Average Differences

2023 Jan - Apr								
Zone	Day-Ahead				Real-Time			
	Average DLMP	Average PLMP	Difference	Percent Difference	Average DLMP	Average PLMP	Difference	Percent Difference
ACEC	\$27.09	\$27.11	\$0.02	0.1%	\$24.68	\$25.63	\$0.95	3.8%
AEP	\$31.15	\$31.18	\$0.03	0.1%	\$28.51	\$29.65	\$1.14	4.0%
APS	\$32.11	\$32.13	\$0.02	0.1%	\$28.80	\$29.99	\$1.19	4.1%
ATSI	\$31.28	\$31.32	\$0.04	0.1%	\$28.44	\$29.59	\$1.15	4.0%
BGE	\$36.17	\$36.20	\$0.03	0.1%	\$31.10	\$32.36	\$1.26	4.1%
COMED	\$24.75	\$24.78	\$0.03	0.1%	\$23.08	\$24.08	\$1.00	4.3%
DAY	\$32.46	\$32.50	\$0.03	0.1%	\$29.66	\$30.84	\$1.17	4.0%
DUKE	\$31.74	\$31.78	\$0.04	0.1%	\$29.08	\$30.23	\$1.15	4.0%
DOM	\$35.65	\$35.67	\$0.02	0.1%	\$34.20	\$35.43	\$1.23	3.6%
DPL	\$27.82	\$27.88	\$0.07	0.2%	\$25.78	\$27.07	\$1.29	5.0%
DUQ	\$30.73	\$30.77	\$0.04	0.1%	\$28.15	\$29.28	\$1.13	4.0%
EKPC	\$31.24	\$31.27	\$0.03	0.1%	\$28.84	\$29.98	\$1.14	3.9%
JCPLC	\$27.53	\$27.55	\$0.02	0.1%	\$25.05	\$26.00	\$0.95	3.8%
MEC	\$29.83	\$29.85	\$0.02	0.1%	\$26.64	\$27.76	\$1.12	4.2%
OVEC	\$30.77	\$30.81	\$0.03	0.1%	\$28.39	\$29.51	\$1.12	4.0%
PECO	\$26.17	\$26.19	\$0.02	0.1%	\$24.00	\$24.90	\$0.90	3.8%
PE	\$31.01	\$30.98	(\$0.02)	(0.1%)	\$27.57	\$28.70	\$1.13	4.1%
PEPCO	\$35.14	\$35.16	\$0.02	0.1%	\$30.13	\$31.36	\$1.23	4.1%
PPL	\$27.73	\$27.75	\$0.02	0.1%	\$25.12	\$26.08	\$0.96	3.8%
PSEG	\$28.00	\$28.02	\$0.02	0.1%	\$25.23	\$26.19	\$0.96	3.8%
REC	\$29.53	\$29.55	\$0.02	0.1%	\$26.35	\$27.35	\$0.99	3.8%

# Fast Start Impacts: Hub Average Differences

2023 Jan - Apr									
Hub	Day-Ahead				Real-Time				
	Average DLMP	Average PLMP	Difference	Percent Difference	Average DLMP	Average PLMP	Difference	Percent Difference	
AEP GEN HUB	\$30.59	\$30.64	\$0.05	0.2%	\$28.40	\$29.19	\$0.80	2.8%	
AEP-DAYTON HUB	\$31.01	\$31.05	\$0.05	0.1%	\$28.81	\$29.60	\$0.79	2.7%	
ATSI GEN HUB	\$30.78	\$30.83	\$0.05	0.2%	\$28.25	\$29.05	\$0.80	2.8%	
CHICAGO GEN HUB	\$26.43	\$26.47	\$0.04	0.2%	\$25.27	\$25.98	\$0.72	2.8%	
CHICAGO HUB	\$26.85	\$26.89	\$0.04	0.1%	\$25.71	\$26.43	\$0.72	2.8%	
DOMINION HUB	\$33.65	\$33.69	\$0.04	0.1%	\$30.73	\$31.57	\$0.85	2.8%	
EASTERN HUB	\$29.43	\$29.50	\$0.07	0.3%	\$27.38	\$28.46	\$1.08	4.0%	
N ILLINOIS HUB	\$26.68	\$26.72	\$0.04	0.1%	\$25.54	\$26.26	\$0.71	2.8%	
NEW JERSEY HUB	\$28.80	\$28.83	\$0.02	0.1%	\$26.25	\$26.90	\$0.65	2.5%	
OHIO HUB	\$30.88	\$30.92	\$0.05	0.1%	\$28.69	\$29.47	\$0.78	2.7%	
WEST INT HUB	\$32.01	\$32.05	\$0.04	0.1%	\$29.36	\$30.16	\$0.80	2.7%	
WESTERN HUB	\$33.13	\$33.13	(\$0.00)	(0.0%)	\$29.31	\$30.13	\$0.82	2.8%	

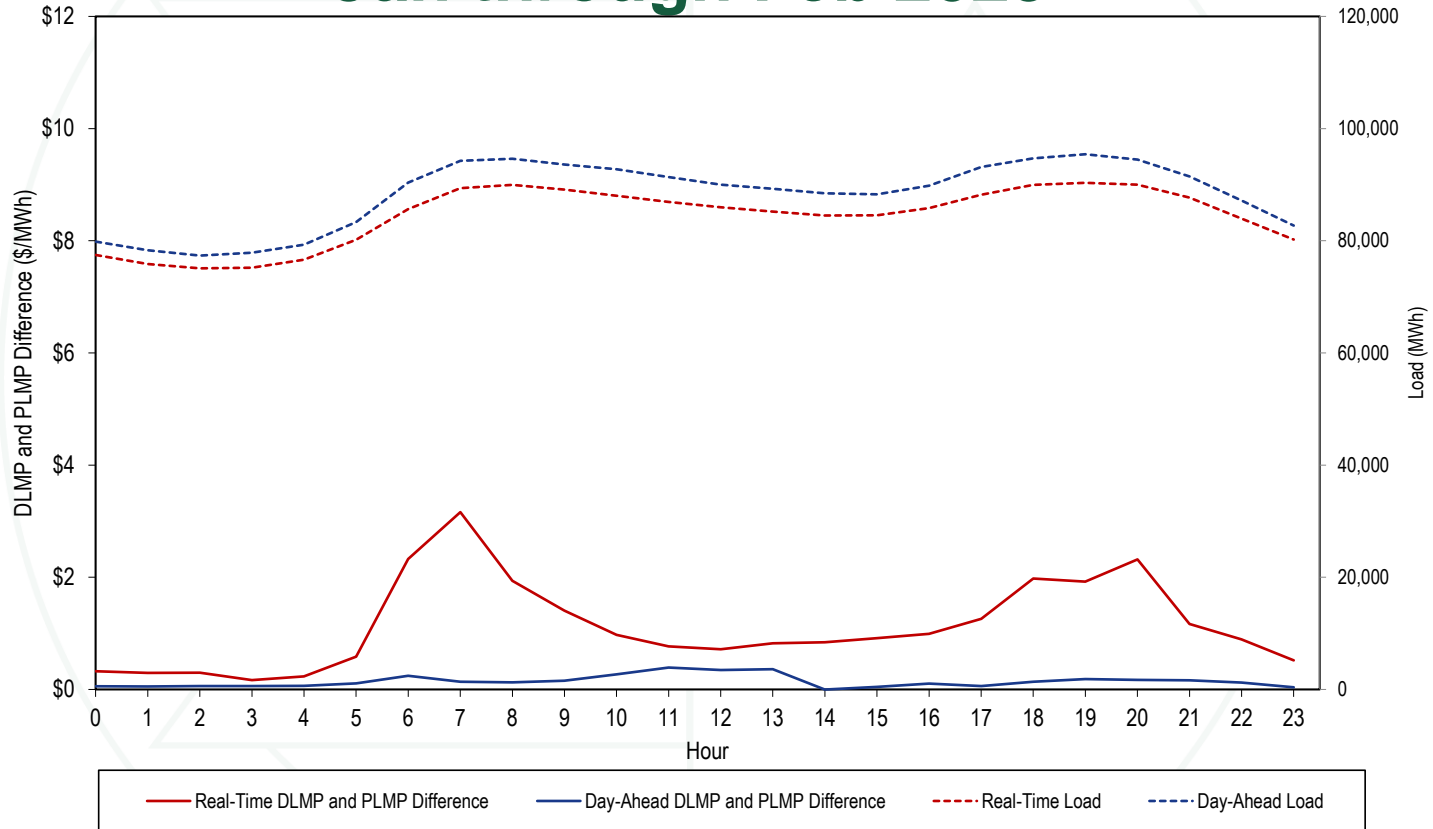
# Zonal PLMP-DLMP Difference Frequency

Zone	2023 Jan - Apr									
	< (\$50)	(\$50) to (\$10)	(\$10) to \$0	\$0	\$0 to \$10	\$10 to \$20	\$20 to \$50	\$50 to \$100	\$100 to \$200	>= \$200
PJM-RTO	0.0%	0.0%	0.4%	56.0%	42.3%	1.0%	0.3%	0.0%	0.0%	0.0%
ACEC	0.0%	0.0%	5.3%	56.4%	37.0%	0.9%	0.2%	0.0%	0.0%	0.0%
AEP	0.0%	0.0%	0.7%	56.5%	41.5%	1.0%	0.3%	0.0%	0.0%	0.0%
APS	0.0%	0.0%	0.7%	56.3%	41.5%	1.1%	0.3%	0.0%	0.0%	0.0%
ATSI	0.0%	0.0%	0.6%	56.1%	42.0%	1.0%	0.3%	0.0%	0.0%	0.0%
BGE	0.0%	0.0%	4.3%	56.0%	38.1%	1.1%	0.4%	0.1%	0.0%	0.0%
COMED	0.0%	0.0%	1.1%	56.6%	41.1%	0.8%	0.3%	0.0%	0.0%	0.0%
DAY	0.0%	0.0%	0.6%	56.3%	41.7%	1.0%	0.3%	0.0%	0.0%	0.0%
DUKE	0.0%	0.0%	0.7%	56.5%	41.5%	0.9%	0.3%	0.0%	0.0%	0.0%
DOM	0.0%	0.0%	2.0%	56.3%	40.1%	1.1%	0.3%	0.1%	0.0%	0.0%
DPL	0.0%	0.0%	6.9%	56.4%	34.8%	0.9%	0.3%	0.4%	0.4%	0.0%
DUQ	0.0%	0.0%	0.7%	56.1%	41.9%	1.0%	0.3%	0.0%	0.0%	0.0%
EKPC	0.0%	0.0%	0.8%	56.4%	41.5%	0.9%	0.3%	0.0%	0.0%	0.0%
JCPLC	0.0%	0.0%	4.0%	56.4%	38.5%	0.9%	0.2%	0.0%	0.0%	0.0%
MEC	0.0%	0.0%	2.0%	55.9%	40.2%	1.5%	0.4%	0.0%	0.0%	0.0%
OVEC	0.0%	0.0%	0.9%	56.5%	41.3%	0.9%	0.3%	0.0%	0.0%	0.0%
PECO	0.0%	0.0%	6.9%	56.3%	35.6%	0.9%	0.2%	0.0%	0.0%	0.0%
PE	0.0%	0.0%	0.7%	55.9%	42.0%	1.1%	0.3%	0.0%	0.0%	0.0%
PEPCO	0.0%	0.0%	2.5%	56.3%	39.6%	1.1%	0.4%	0.1%	0.0%	0.0%
PPL	0.0%	0.0%	4.3%	56.0%	38.5%	0.8%	0.2%	0.0%	0.0%	0.0%
PSEG	0.0%	0.0%	3.5%	56.3%	39.1%	0.9%	0.2%	0.0%	0.0%	0.0%
REC	0.0%	0.0%	3.3%	56.1%	39.4%	0.9%	0.3%	0.0%	0.0%	0.0%





# Hourly Average Load and LMP Difference: Jan through Feb 2023



# Real-Time Load-Weighted Average LMP

	2022				2023			
	Off Peak	On Peak	Difference	Percent Difference	Off Peak	On Peak	Difference	Percent Difference
Jan	\$74.99	\$62.54	(\$12.46)	(16.6%)	\$33.20	\$38.53	\$5.32	16.0%
Feb	\$45.70	\$47.86	\$2.16	4.7%	\$23.45	\$28.67	\$5.22	22.3%
Mar	\$41.58	\$45.41	\$3.83	9.2%	\$26.96	\$29.78	\$2.82	10.5%
Apr	\$55.93	\$71.89	\$15.96	28.5%	\$24.08	\$35.00	\$10.92	45.4%
May	\$66.12	\$100.85	\$34.73	52.5%				
Jun	\$61.63	\$126.83	\$65.20	105.8%				
Jul	\$71.83	\$114.14	\$42.31	58.9%				
Aug	\$85.89	\$136.31	\$50.42	58.7%				
Sep	\$66.36	\$89.76	\$23.40	35.3%				
Oct	\$47.61	\$64.50	\$16.90	35.5%				
Nov	\$45.48	\$60.50	\$15.01	33.0%				
Dec	\$153.54	\$129.51	(\$24.03)	(15.7%)				

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