

DR Availability Window: Proposed Solution Packages

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Market Design

Members Committee
February 20, 2025

The DR Availability Window issue was approved by the MRC in May 2024

Scope

Explore reforms to expand the current DR availability window and enhance the modeling of DR reduction capability and reliability value in all hours within the resource adequacy risk analysis and ELCC accreditation

Venue

MIC Proposals and Voting

Assigned
to the
MIC

Two packages were endorsed by the MIC. Both packages contain the same set of substantive reforms, but target different delivery years for implementation:

Package 1 (MRC Main Motion) for the 2027/28 BRA and Delivery Year passed with 77% in favor

Package 2 (Alternate Motion) for the 2026/27 BRA and Delivery Year passed with 54% in favor

For Firm Service Level (FSL) customers, Nominated Value and ICAP are based on the difference between customer's Peak Load and FSL in each season

Summer Nominated Value = PLC – SFSL (adjusted for loss factor)

- Peak Load Contribution (PLC) = customer's load usage during PJM system 5 summer coincident peak days and hours (EDC-specific calculation)
- Summer Firm Service Level (SFSL) = pre-defined level for which a customer's load can be reduced to when dispatched in the summer

Example:

PLC = 10 MW
 SFSL = 0 MW
 Summer Nominated Value = 10 MW

Winter Nominated Value = WPL x ZWWAF – WFSL (adjusted for loss factor)

- Winter Peak Load (WPL) = Average of customer's specific peak hourly load between HE7 through HE21 on the PJM defined 5 coincident peak winter days
- Zonal Winter Weather Adjustment Factor (ZWWAF) = Weather normalization factor
- Winter Firm Service Level (WFSL) = pre-defined level for which a customer's load can be reduced to when dispatched in the winter

Example:

WPL = 12 MW
 ZWWAF = 1.0
 WFSL = 0
 Winter Nominated Value = 12 MW

Annual ICAP of Demand Resources = lesser of Summer and Winter Nominated Values

- Demand Resources have performance windows that differ by season

Summer	Winter
10:00AM to 10:00PM EPT	6:00AM to 9:00PM EPT

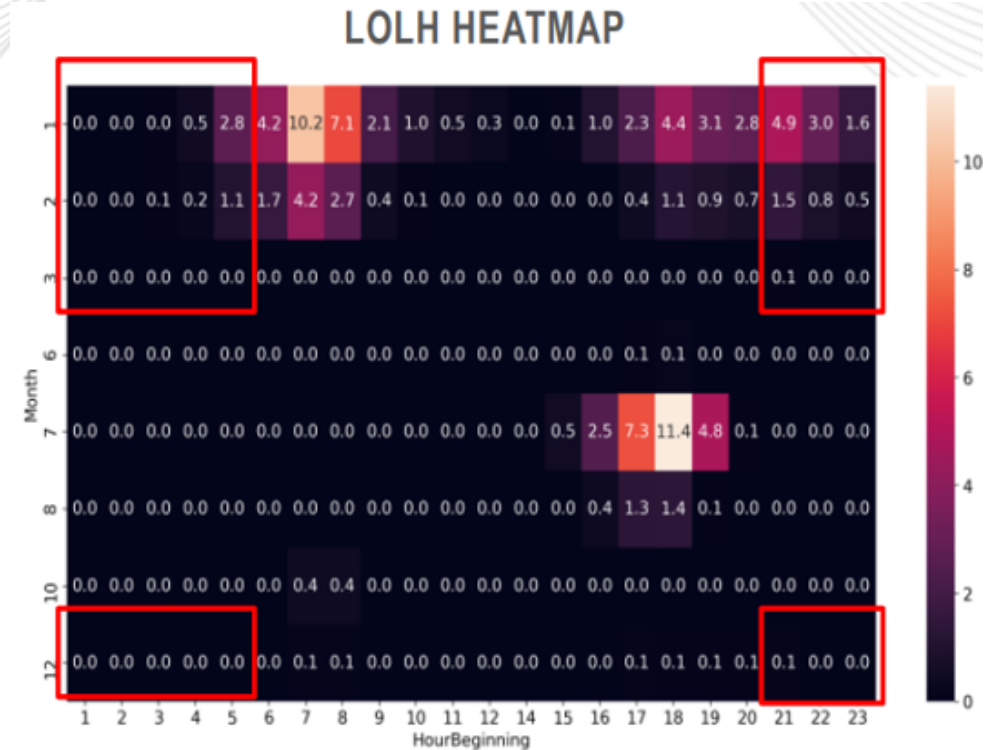
- In the ELCC analysis, DR availability during hours within the performance window is modeled to be scaled proportional to system load

$$\frac{\text{Simulated HourlyLoad}_i}{50/50 \text{ Simulated Peak Load Forecast}} \times \text{ICAP of DR}$$

- DR availability during hours outside of the performance window is assumed to be zero

The current DR availability window excludes a number of hours that see loss-of-load risk in the ELCC analysis, particularly in the winter (about 17% of LOLH observed in winter hours outside the current availability window), which has a significant impact on the ELCC accreditation value of DR

2025/26 BRA DR ELCC Rating: 76%



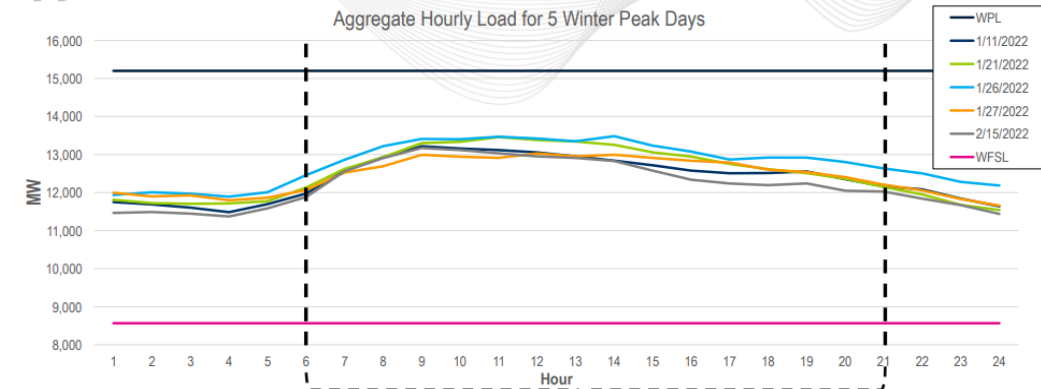
DR Analysis and Observations: Winter Peak Load (WPL)

- Winter Peak Load (WPL) values are used to determine the winter nominated value of DR customers and registrations
 - The current WPL calculation uses the average of each customer's specific maximum hourly load between HE7 through HE21 on the five PJM defined winter coincident peak days (5WCP), with limited exception
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- When this formula is used for many individual customers, it results in a total WPL that overstates the expected load and corresponding reduction capability of the DR fleet in any one hour, as different customers experience their peak loads at different times of the day
 - This issue is illustrated in the simple example at right
 - Observed in DR registration data for different DYs when comparing aggregate WPL to the total hourly loads of customers during the 5 winter peak days

Example	Customer Load (kW) during 5 winter peak days					
Customer	7AM	8AM	9AM	5PM	6PM	Max
A	500	600	500	500	500	600
B	500	700	1000	400	400	1000
C	500	500	500	1000	900	1000
Total	1500	1800	2000	1900	1800	2600

Total WPL = 2600 kW, while maximum total hourly load is 2000 kW

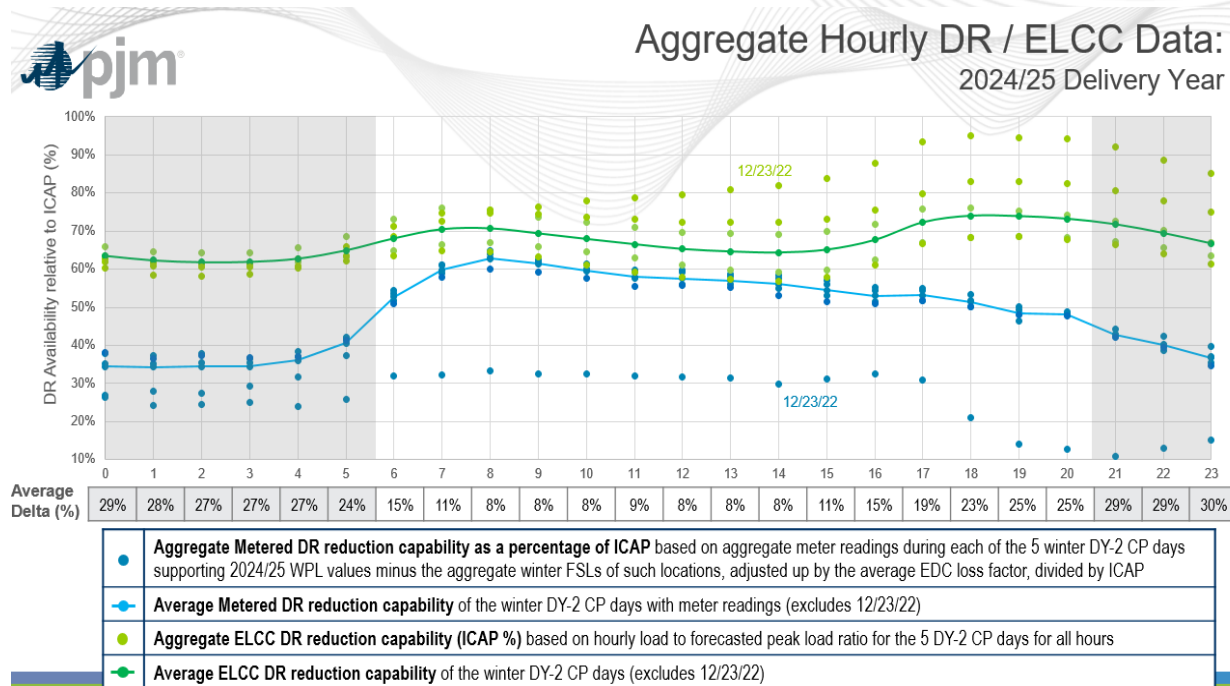
Aggregate Hourly Load Data from DY-2 WPL: 2023/2024 DY



Current Winter availability window is 6am to 9pm EPT

Winter Nominated ICAP of FSL customers is 7,758.9 MW

DR Analysis and Observations: Winter ELCC Modeling vs. Historical Loads



Presented at the Aug. 7 MIC, the figure above compares the estimated reduction capability of DR based on the aggregate hourly metered loads of customers during the 5 winter peak days minus winter FSL (in blue) to the reduction capability used in the ELCC analysis during those same days (in green), as a percentage of winter ICAP for the 2024/25 DY. ELCC heuristic (in green) shown for all hours, but zero reduction value used in analysis during the shaded hours outside current performance window.

- The current ELCC heuristic (green line in figure) tends to overestimate the reduction capability of DR during winter hours within the performance window, and would further overestimate reduction value if extended for hours outside the current performance window
- There is a fairly significant amount of load above the WFSL from DR customers today in hours outside the current performance window, such that expanding the window to include those hours could provide substantially more reduction capability and reliability value from DR that is not captured today
- The aggregate hourly load shape of DR customers in the winter tends to have a different shape than the system load (slow decline after the morning peak with no second peak)

Design Component	Status Quo	Solution Option
DR Availability Window	<p>Summer: 10AM-10PM EPT</p> <p>Winter: 6AM-9PM EPT</p>	<p>Extend the current DR performance window to 24 hours and reflect expected reduction capability in all hours in ELCC analysis and other RA studies.</p> <p>Key Benefits</p> <ul style="list-style-type: none"> • Captures the load and curtailment capability of existing DR customers in the risk analysis and accreditation during hours of reliability risk outside the current window • Improves incentives to have CSPs sign up customers that are capable of responding during any hour of reliability risk and sets performance expectations for existing / new DR customers to respond at such times • Improves parity with generation resources that have 24x7 performance obligations <p><i>Note: This solution option would only be considered in conjunction with other reforms to improve modeling of DR capability in extended winter hours.</i></p>

Design Component	Status Quo	Solution Option
DR ICAP: Winter Nominated Value	<p>Winter Nominated Value = (WPL * ZWWAF – WFSL) * Loss Factor</p> <p>WPL (Winter Peak Load) based on each customer's peak usage between HE7 through HE21 during 5WCP days</p> <p>ZWWAF (Zonal Winter Weather Adjustment Factor)</p> <p>WFSL (Winter Firm Service Level)</p>	<p>Modify the WPL calculation to be based on the customer's load during a consistent peak hour across the 5WCP days to address overstated WPL issue.</p> <p>Initially proposing to use an hour during the morning peak of the winter (i.e. HE9) where we see the highest aggregate load levels of DR customers, most of the winter loss-of-load risk, and most of the recent historical winter coincident peak hours (to be reviewed over time).</p> <p><i>Note: CSPs will still be required to provide PJM 24 hour metered load data during the 5WCP days to inform ELCC load profiles and reduction capability of DR customers in the winter.</i></p>

Design Component	Status Quo	Solution Option																					
ELCC Analysis: Modeling of Hourly DR Availability and Reduction Capability	Hourly DR availability and reduction capability scaled up and down proportional to system load $\frac{Simulated\ HourlyLoad_i}{50/50\ Simulated\ Peak\ Load\ Forecast} \times ICAP\ of\ DR$	Winter: Determine a forecasted level of DR Winter Nominated Value to use in the ELCC analysis. Shape the hourly DR load and reduction capability in the ELCC analysis based on the aggregate hourly load profiles provided in support of WPL values from recent registrations to address the differences observed between system load shape and DR loads. Summer: Status quo (risk concentrated in peak hours during summer; looking to collect additional information in DR registrations in future on summer hourly load profiles during summer peak days)																					
	Winter Example: Forecasted Winter Nominated DR = 8,000 MW , assuming WPL = 8,000 MW and WFSL = 0 for simplicity																						
123456789101112131415161718192021222324																							
Aggregate average hourly DR load profile (relative to WPL in HE9) during PJM defined 5 winter coincident peak days:																							
0.650.630.630.630.650.720.850.931.00.980.970.950.950.930.920.880.850.850.830.80.770.730.680.65																							
Aggregate hourly DR reduction capability in winter:																							
520050405040504052005760680074408000784077607600760074407360704068006800664064006160584054405200																							

1. Extend the DR availability window to include all hours

- Improves reliability and parity with generation by setting a performance obligation on committed DR during any hour of reliability risk during the year (not just those hours within the current window), and captures the load and reduction capability DR provides in those additional hours outside the current window within the risk analysis and accreditation
- Improves incentives for CSPs to sign up customers that are capable of responding during any hour of risk

2. Address overstated WPL by requiring a consistent peak hour be used across customers during the 5 WCP days in the calculation

- Improves reliability by better modeling the expected hourly winter load levels and reduction capability of DR in the risk analysis and accreditation, and improves the calculation of the actual reduction value provided by DR in winter performance assessments

3. Improve winter hourly shaping of DR load and reduction capability in ELCC analysis

- Improves reliability by better modeling the expected hourly winter load levels and reduction capability of DR in the risk analysis and accreditation

- **Package 1 (MRC Main Motion):** Implement with the **2027/28 BRA** scheduled for Dec. 2025
 - **Package 2 (MRC Alternate Motion):** Implement with the **2026/27 BRA** scheduled for July 2025
 - Targeted date for FERC Filing: March 1, 2025
 - PJM would request a waiver of the 60-day notice requirement so that the proposed enhancements can be effective prior to the posting deadline for the 2026/27 BRA planning parameters. PJM is considering how to best manage the posting of the planning parameters while maintaining the current auction date.
- ~~PJM's preferred implementation is with the 2026/27 BRA (Package 2) given the reliability benefits and enhancements to the risk modeling provided by these set of reforms.~~

- **Reliability Assurance Agreement (RAA):** RAA redlines are posted and reflect the proposed reforms to the seasonal availability windows for Demand Resources and the update to the Winter Peak Load calculation.
- **PJM Manual 20A Resource Adequacy Analysis:** Manual 20A redlines are also posted to capture the proposed reforms to the modeling of Demand Resources in the ELCC analysis. These would ultimately be contingent upon FERC approval of DR reforms.
- If the proposed DR reforms are approved and accepted by the Commission, PJM will develop additional conforming redlines needed in the PJM Manuals (e.g. Manual 18: PJM Capacity Market).

Appendix: ELCC Sensitivities and Reference Materials

ELCC Sensitivities under Proposed DR Reforms

ELCC Runs	Status quo	Sensitivity 1	Sensitivity 2
ELCC DR Modeling (Based on original 26/27 BRA Run)	<ul style="list-style-type: none"> • DR ICAP = 7954 MW • DR reduction capability scaled proportional to system load within performance window • DR reduction set to zero outside window 	<ul style="list-style-type: none"> • DR ICAP = 5705 MW • WPL and winter hourly profile / reduction capability based on 24/25 registration data • Assumes no change to nominated winter FSL • 24/7 performance window 	<ul style="list-style-type: none"> • DR ICAP = 7954 MW • Similar to Sensitivity 1, except winter FSL reduced and Winter Nominated Value scaled up to equal original forecasted DR ICAP
FPR	0.9367	0.9573	0.9577
DR ELCC Rating	74%	92%	94%

ELCC Sensitivities under Proposed DR Reforms (cont'd)

ELCC Runs	EUE	LOLH	LOLE
Status quo	W:87% S:13%	W:71% S:29%	W:55% S:45%
Sensitivity 2 <i>(near identical results observed in Sensitivity 1)</i>	W:83% S:17%	W:66% S:34%	W:51% S:49%

- Majority of ratings remain unchanged or move +/- 1% or +/- 2%, largely driven by decrease in winter share of loss of load risk
- After DR, storage classes see largest increase in rating, largely driven by relatively shorter loss of load events observed in the winter compared to status quo

Class	Status Quo	Sensitivity 2	Delta
Onshore Wind	34%	32%	-2%
Offshore Wind	61%	57%	-4%
Solar Fixed	8%	9%	1%
Solar Tracking	13%	14%	1%
Landfill Gas Intermittent	54%	55%	1%
Hydro Intermittent	38%	38%	0%
4-hr Storage	57%	67%	10%
6-hr Storage	65%	76%	11%
8-hr Storage	68%	77%	9%
10-hr Storage	78%	86%	8%
DR	74%	94%	20%
Nuclear	95%	95%	0%
Coal	84%	84%	0%
Gas CC	78%	79%	1%
Gas CT	68%	70%	2%
Gas CT Dual	79%	80%	1%
Diesel Utility	91%	91%	0%
Steam	74%	75%	1%

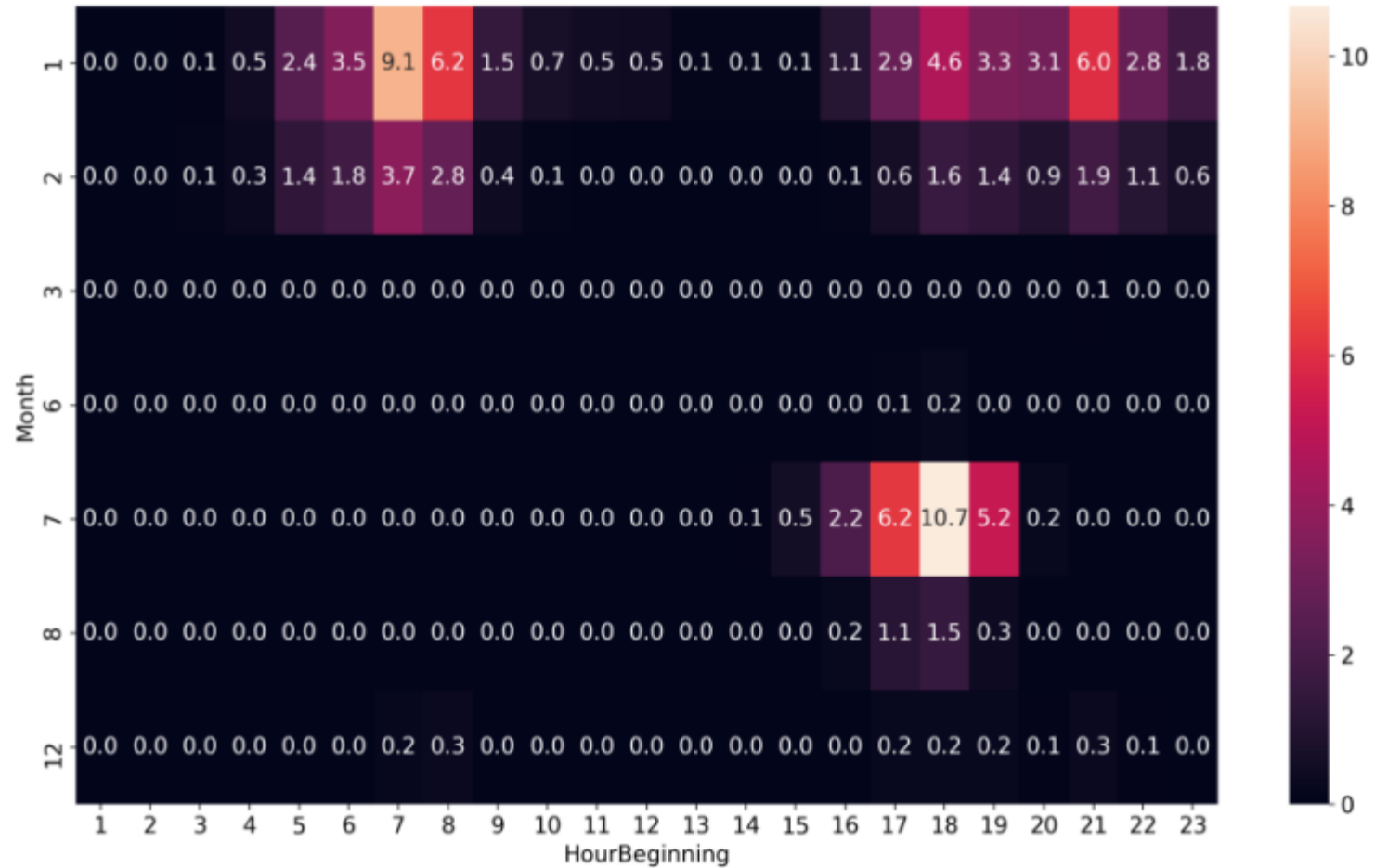
ELCC Sensitivities under Proposed DR Reforms (cont'd)

Additional ELCC Sensitivities based on official 2025/26 3rd IA run

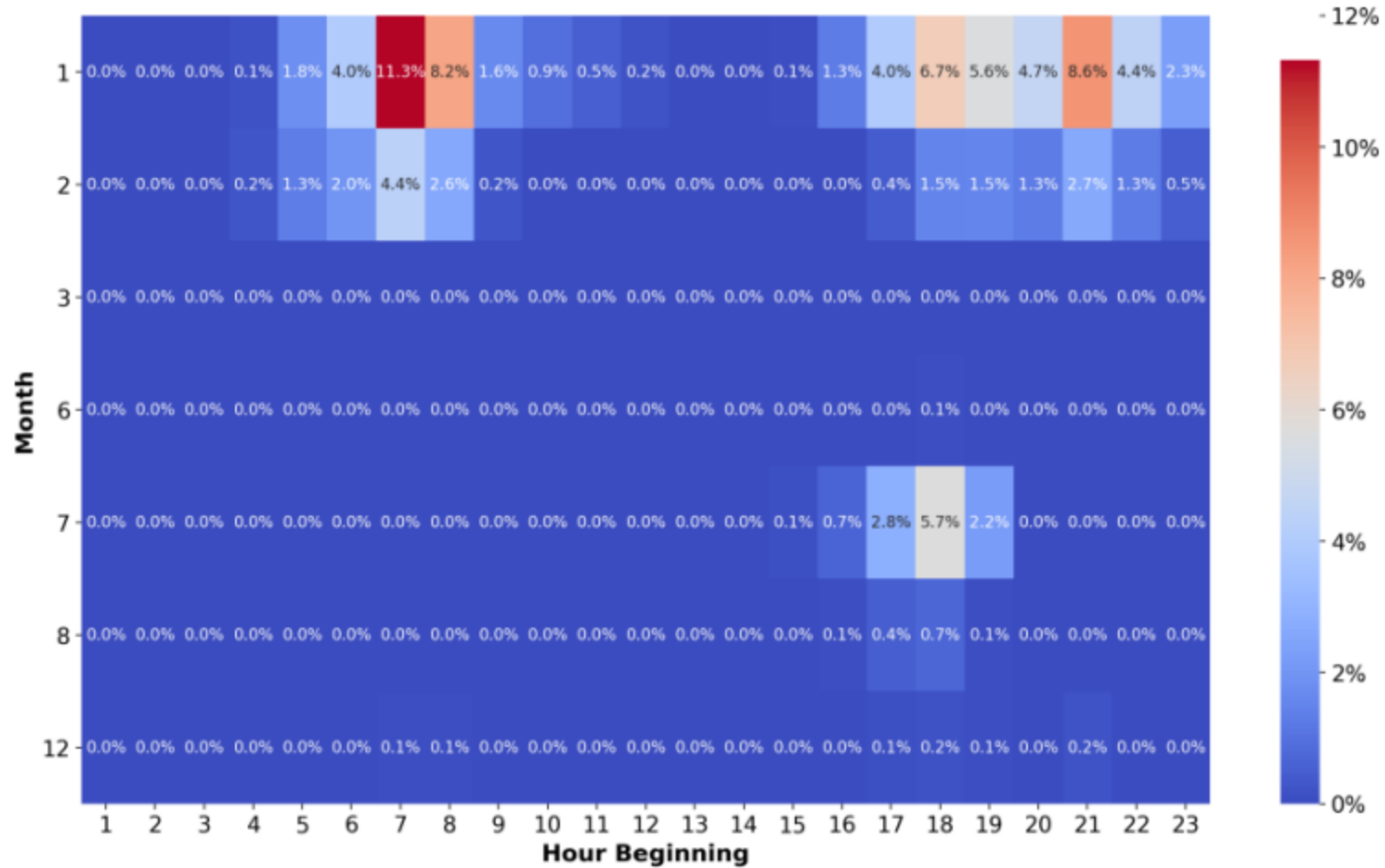
	Status Quo	Sens 1	Sens 2
ICAP	188920	186691	188920
Solved Load	158357	156401	158630
IRM	17.8%	17.9%	17.6%
FPR	.9380	~.9587	~.9565
Winter LOLH Share	71%	66%	66%

Class	Status Quo	Sens 1	Delta	Sens 2	Delta
Onshore Wind	38%	35%	-3%	36%	-2%
Offshore Wind	62%	58%	-4%	58%	-4%
Fixed-Tilt Solar	10%	11%	1%	11%	1%
Tracking Solar	14%	17%	3%	16%	2%
Landfill Intermittent	51%	52%	1%	52%	1%
Hydro Intermittent	37%	37%	0%	36%	-1%
4-hr Storage	55%	64%	9%	62%	7%
6-hr Storage	65%	74%	9%	72%	7%
8-hr Storage	68%	75%	7%	74%	6%
10-hr Storage	77%	83%	6%	82%	5%
DR	77%	93%	16%	93%	16%
Nuclear	95%	95%	0%	95%	0%
Coal	83%	84%	1%	84%	1%
Gas CC	78%	79%	1%	79%	1%
Gas CT	63%	65%	2%	65%	2%
Gas CT Dual	79%	80%	1%	80%	1%
Diesel Utility	92%	92%	0%	92%	0%
Steam	74%	76%	2%	76%	2%

26/27 BRA LOLH Month/Hour Heatmap



26/27 BRA EUE Month/Hour Heatmap



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DR Availability Window



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