

# Sensitivity Results: Impact of Merging of Cold Temperature Bins on 2025/26 Resource Adequacy Metrics

Patricio Rocha Garrido  
Resource Adequacy Planning  
Market Implementation Committee  
April 3, 2024

Acronym	Term & Definition
BRA	<b>Base Residual Auction.</b> The Reliability Pricing Model includes a single Base Residual Auction for each Delivery Year. Base Residual Auctions are conducted in accordance with the auction schedule posted on the PJM website.
EUE	<b>Expected Unserved Energy</b> is a probabilistic resource adequacy metric that generally refers to the amount of expected unserved energy (e.g. in MWh) due to loss of load events during a certain time period (e.g. a year)
ELCC	<b>Effective Load Carrying Capability</b> is a probabilistic methodology that PJM uses to determine the Accredited UCAP value of capacity resources.
FPR	The PJM installed reserve margin expressed in unforced capacity terms. The <b>Forecast Pool Requirement</b> is applied to a peak load forecast in order to establish the level of unforced capacity (UCAP) that will provide an acceptable level of reliability.
IRM	The <b>Installed Reserve Margin</b> is the percentage value used to establish the level of installed capacity resources that provide an acceptable level of reliability.
RRS	<b>Reserve Requirement Study</b> is an annual resource adequacy study performed by PJM whose main objective is to determine the IRM and FPR for future delivery years
THI	<b>Temperature Humidity Index</b> is a parameter used by PJM to characterize weather conditions. Its mathematical definition can be found in PJM M19

- At the March MRC and MC meetings, PJM reviewed the updated IRM and FPR values for 2025/26
  - The committees endorsed those values with a Sector-Weighted Vote of 4.394 (MRC) and by Acclamation with 2 objections and 4 abstentions (MC)
- During the discussion at the above meetings, stakeholders raised some concerns about the impact of merging the cold temperature bins (in the step to derive performance for Unlimited and Variable resources) on the winter vs summer risk.



- For each day in the ELCC/RRS model, resource performance is drawn from days with similar RTO-wide THI (minimum daily THI for winter days, maximum daily THI for summer days)
  - Determination of “days with similar RTO-wide THI” is performed using a “binning” approach
  - Binning is performed on the minimum RTO-wide daily THI and maximum RTO-wide daily THI values since June 1<sup>st</sup>, 1993 by
    1. Using the Freedman Diaconis Estimator
    2. Merging bins with small sample size

## Unmerged (output of Freedman-Diaconis Estimator)

Bin	LowerBound (THI)	UpperBound (THI)	Count Since 1993-06-01	Count Since 2012-06-01	Members Since 1993-06-01	Members Since 2012-06-01
min0	-10.60	-8.14	1	0	"1994-01-19"	
min1	-8.14	-5.69	0	0		
min2	-5.69	-3.24	1	0	"1994-01-18"	
min3	-3.24	-0.79	3	2	"1994-01-16", "2014-01-07", "2015-02-20"	"2014-01-07", "2015-02-20"
min4	-0.79	1.67	7	1	"1994-01-15", "1994-01-10" and 5 more	"2019-01-31"
min5	1.67	4.12	9	6	"1997-01-19", "2007-02-06" and 7 more	"2014-01-22" and 5 more
min6	4.12	6.57	21	13	"1995-02-06", "1996-02-03" and 19 more	"2022-12-24" and 12 more

## Merged (min0, min1, min2, min3, min4 have been merged with min5)

Bin	LowerBound (THI)	UpperBound (THI)	Count Since 1993-06-01	Count Since 2012-06-01	Members Since 1993-06-01	Members Since 2012-06-01
min5	<b>-10.60</b>	4.12	<b>21</b>	<b>9</b>	<b>"1994-01-19", "1994-01-18" and 19 more</b>	<b>"2014-01-07" and 8 more</b>
min6	4.12	6.57	21	13	"1995-02-06", "1996-02-03" and 19 more	"2022-12-24" and 12 more

## Unmerged (output of Freedman-Diaconis Estimator)

Bin	LowerBound (THI)	UpperBound (THI)	Count Since 1993-06-01	Count Since 2012-06-01	Members Since 1993-06-01	Members Since 2012-06-01
min0	-10.60	-8.14	1	0	"1994-01-19"	
min1	-8.14	-5.69	0	0		
min2	-5.69	-3.24	1	0	"1994-01-18"	
min3	-3.24	-0.79	3	2	"1994-01-16", "2014-01-07", '2015-02-20"	"2014-01-07", '2015-02-20"
min4	-0.79	1.67	7	1	"1994-01-15", "1994-01-10" and 5 more	"2019-01-31"
min5	1.67	4.12	9	6	"1997-01-19", "2007-02-06" and 7 more	"2014-01-22" and 5 more
min6	4.12	6.57	21	13	"1995-02-06", "1996-02-03" and 19 more	"2022-12-24" and 12 more

Minimal merging must be performed on the bins above because performance for days such as 1994-01-19 or 1994-01-18 must be drawn from a day after 2012-06-01.

## Minimally Merged (min0, min1, and min2 have been merged with min3)

Bin	LowerBound (THI)	UpperBound (THI)	Count Since 1993-06-01	Count Since 2012-06-01	Members Since 1993-06-01	Members Since 2012-06-01
min3	<b>-10.60</b>	-0.79	<b>5</b>	<b>2</b>	<b>"1994-01-18", "1994-01-19" and 3 more</b>	<b>"2014-01-07", '2015-02-20"</b>
min4	-0.79	1.67	7	1	"1994-01-15", "1994-01-10" and 5 more	"2019-01-31"
min5	1.67	4.12	9	6	"1997-01-19", "2007-02-06" and 7 more	"2014-01-22" and 5 more
min6	4.12	6.57	21	13	"1995-02-06", "1996-02-03" and 19 more	"2022-12-24" and 12 more



## Minimally Merged (min0, min1, and min2 have been merged with min3)

Bin	LowerBound (THI)	UpperBound (THI)	Count Since 1993-06-01	Count Since 2012-06-01	Members Since 1993-06-01	Members Since 2012-06-01
min3	<b>-10.60</b>	-0.79	<b>5</b>	<b>2</b>	<b>"1994-01-18", "1994-01-19" and 3 more</b>	<b>"2014-01-07", '2015-02-20"</b>
min4	-0.79	1.67	7	1	"1994-01-15", "1994-01-10" and 5 more	"2019-01-31"
min5	1.67	4.12	9	6	"1997-01-19", "2007-02-06" and 7 more	"2014-01-22" and 5 more
min6	4.12	6.57	21	13	"1995-02-06", "1996-02-03" and 19 more	"2022-12-24" and 12 more

## Merged (min0, min1, min2, min3, min4 have been merged with min5)

Bin	LowerBoun (THI)	UpperBound (THI)	Count Since 1993-06-01	Count Since 2012-06-01	Members Since 1993-06-01	Members Since 2012-06-01
min5	<b>-10.60</b>	4.12	<b>21</b>	<b>9</b>	<b>"1994-01-19", "1994-01-18" and 19 more</b>	<b>"2014-01-07" and 8 more</b>
min6	4.12	6.57	21	13	"1995-02-06", "1996-02-03" and 19 more	"2022-12-24" and 12 more





# Sensitivity Analysis – Annual and Seasonal Metrics Results

Scenario	LOLE (days/year)	LOLE (Winter % / Summer %)	LOLH (hours/year)	LOLH (Winter % / Summer %)	EUE (MWh/year)	EUE (Winter % / Summer %)
Minimally Merged	0.1	61.4 / 38.6	0.36	78.3 / 21.7	1819.6	92.4 / 7.6
Merged	0.1	54.0 / 46.0	0.323	69.1 / 30.9	1452.6	86.9 / 13.1

In the Minimally Merged Scenario, the Winter share of the 3 metrics increases relative to the Merged Scenario

As a result, LOLH and EUE increase in the Minimally Merged Scenario

**PJM used the results of the Merged scenario in the calculation of the 2025/26 planning parameters.**

## Minimally Merged (min0, min1, and min2 have been merged with min3)

Bin	LowerBound (THI)	UpperBound (THI)	Count Since 1993-06-01	Count Since 2012-06-01	Members Since 1993-06-01	Members Since 2012-06-01
min3	<b>-10.60</b>	-0.79	<b>5</b>	<b>2</b>	<b>"1994-01-18", "1994-01-19" and 3 more</b>	<b>"2014-01-07", '2015-02-20"</b>
min4	-0.79	1.67	7	1	"1994-01-15", "1994-01-10" and 5 more	"2019-01-31"
min5	1.67	4.12	9	6	"1997-01-19", "2007-02-06" and 7 more	"2014-01-22" and 5 more
min6	4.12	6.57	21	13	"1995-02-06", "1996-02-03" and 19 more	"2022-12-24" and 12 more

## Merged (min0, min1, min2, min3, min4 have been merged with min5)

Bin	LowerBoun (THI)	UpperBound (THI)	Count Since 1993-06-01	Count Since 2012-06-01	Members Since 1993-06-01	Members Since 2012-06-01
min5	<b>-10.60</b>	4.12	<b>21</b>	<b>9</b>	<b>"1994-01-19", "1994-01-18" and 19 more</b>	<b>"2014-01-07" and 8 more</b>
min6	4.12	6.57	21	13	"1995-02-06", "1996-02-03" and 19 more	"2022-12-24" and 12 more

An important portion of the winter risk is driven by resource performance on 2014-01-07. While the number of days since 1993-06-01 where such a performance will be modeled for increases 4.2 times (21 divided by 5) in the Merged Scenario, the chance of drawing performance from 2014-01-07 in the Merged Scenario decreases 4.5 times (1/2 divided by 1/9)

**SME/Presenter:**

Patricio Rocha Garrido

[Patricio.Rocha-Garrido@pjm.com](mailto:Patricio.Rocha-Garrido@pjm.com)

**Chair:**

Foluso Afelumo

[Foluso.Afelumo@pjm.com](mailto:Foluso.Afelumo@pjm.com)

**Secretary:**

Amanda Martin

[Amanda.Martin@pjm.com](mailto:Amanda.Martin@pjm.com)

**Sensitivity Results: Impact of Merging of Cold Temperature Bins on 2025/26 Resource Adequacy Metrics**



**Member Hotline**

(610) 666 – 8980

(866) 400 – 8980

[custsvc@pjm.com](mailto:custsvc@pjm.com)

**PROTECT THE  
POWER GRID  
THINK BEFORE  
YOU CLICK!**



Be alert to  
malicious  
phishing emails.

**Report suspicious email activity to PJM.**  
(610) 666-2244 / [it\\_ops\\_ctr\\_shift@pjm.com](mailto:it_ops_ctr_shift@pjm.com)

