On Winter Extreme Loads in the ELCC Model

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Views expressed are my own and not necessarily those of any client

The ELCC Model Is Intended to Simulate Future Risk

Future risk is probabilistically simulated to estimate the resource adequacy contributions of resources that differ in performance and other characteristics.

Model structure, at a high level:

- Model future extreme summer and winter loads (and other load levels, but the extreme loads drive the results[1])
- Model resource performance under extreme load conditions (and at other times, but performance during extreme loads drives the results[1])

To build the representation of extreme loads and of performance under extreme loads, we use historical data. That is appropriate to the extent we believe the historical data is indicative of what we should expect going forward.

1. See PJM, 26-bra-info-for-loss-of-load-hours.xlsx workbook, ELCC page; 47% of load loss is a few days in January 1994; 63% of load loss is based on performance year 2014.

Various Assumptions Lead to Overstating Winter Risk

Various adopted assumptions tend to overstate winter risk in my opinion:[2]

1. Forced outage rates based on Polar Vortex 2014, Winter Storm Elliott 2022, that do not take into account changes that were made following those events.
2. Planned outages during winter peak (but not summer peak) conditions.[3]
3. Assumptions about future extreme weather and extreme load that overstate the likelihood and severity of future extreme winter temperature and load events.
4. Failure to recognize how some loads would react to forecasts of extreme cold.

This presentation addresses only the last two issues.

Overstating winter risk distorts accreditations and leads to procuring an inefficient and overly costly resource mix through RPM.

2. For more detail see Wilson, James F. affidavit in FERC ER24-99 (CIFP case).
3. See PJM, 26-bra-info-for-loss-of-load-hours.xlsx workbook, ELCC page; as much as 10,281 MW in January.

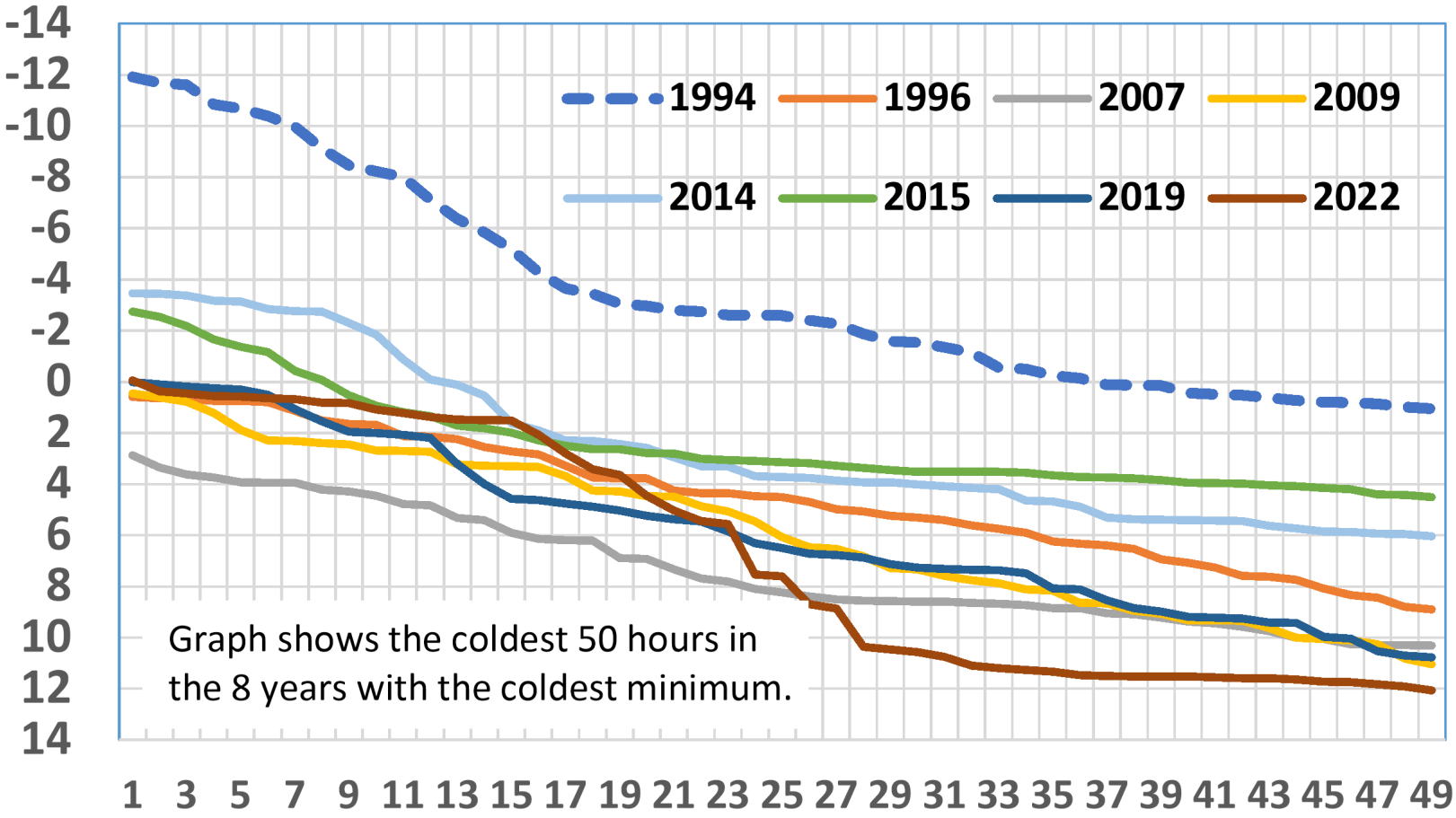
Modeling Future Extreme Winter Load Events

To build the representation of extreme winter loads, historical weather data from 1993-2024 is being used. The data set includes extreme cold January 18-19 1994 far beyond anything seen since, and without any adjustment for upward temperature trends (a clear "outlier"; see graph next page).

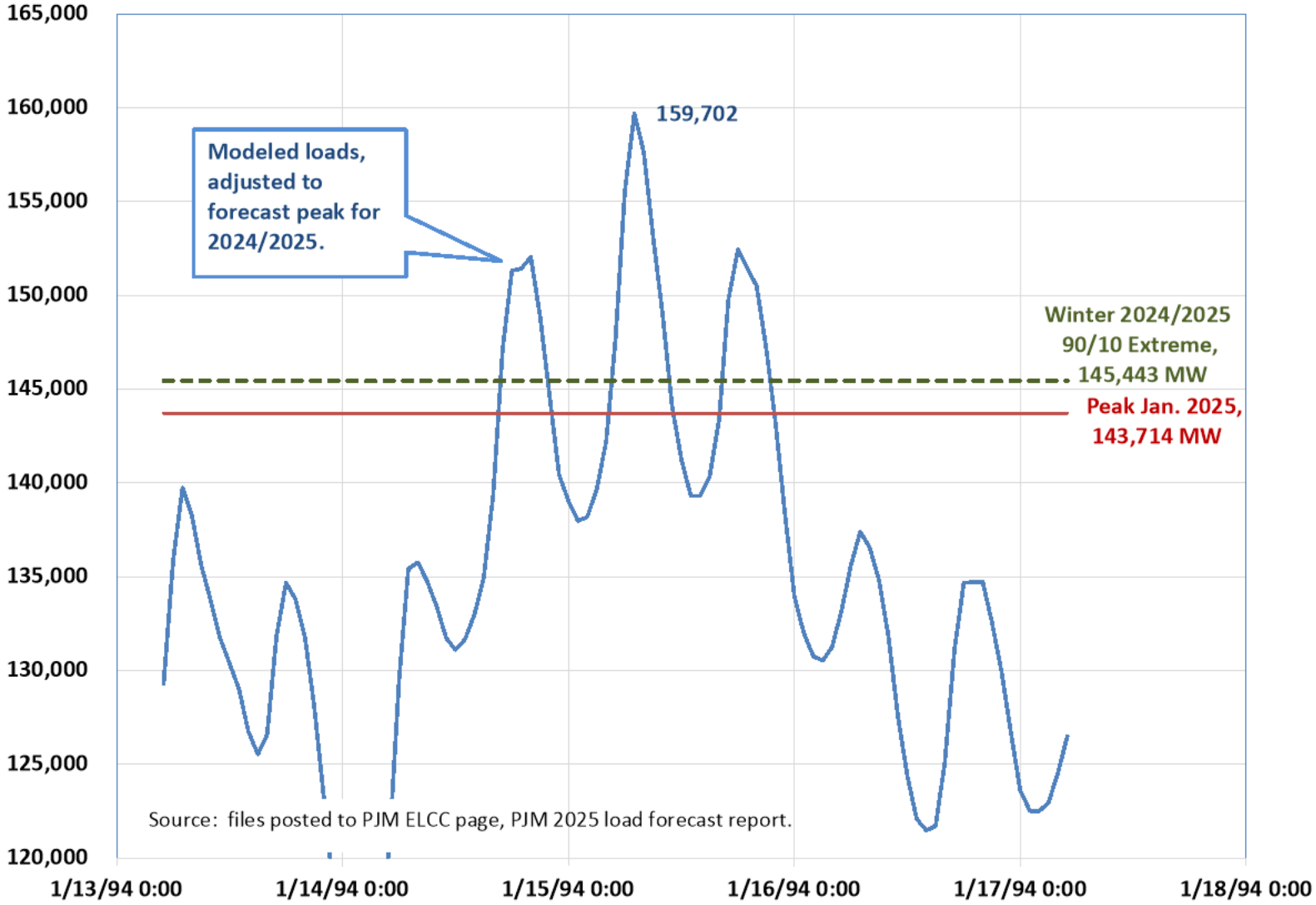
In using historical data to understand patterns and likely future outcomes, the usual practice is to identify any outliers in the data, evaluate why they are abnormal, and add variables as needed to explain them. For example, among July weekdays, July 4 is an outlier because it is a holiday. If we fail to identify the explanation for an outlier, we often will exclude it from the data set to not distort the results.

And it is also challenging to estimate how load should now be expected to increase under such extreme weather conditions even if they do occur.

Extreme Cold Temperature (WWP) Duration



Modeled Extreme Winter Peak based on January 1994



Load Response Under The Most Extreme Cold?

Even if such "1 in ??" extreme temperature conditions were to occur, the assumed extreme load levels would not occur:

- Load response to temperature is attenuated at the most extreme temperatures; there is nothing more to turn on to stay warm.
- In addition, extreme cold is forecast days in advance; many schools and businesses will remain closed.

Even if you believe such extreme temperature conditions and the assumed loads could occur with some probability, PJM and the EDCs can and should make sure these load levels do not occur, by putting special programs in place:

- Temperature trigger; notification over a day in advance
- Customers agree to remain closed and reduce loads
- Payment for commitment, for actual call; penalty for non-performance

Appeals to the public would also be effective under such rare forecasts.

Conclusions

The ELCC results are now driven by outliers – an instance of extreme temperatures assumed to cause extreme loads, a few instances with extreme performance outcomes. Rather than the outliers being excluded, they are driving the results.

As a result, the ELCC model results are both highly suspect, and not robust. Even if such extreme temperature conditions were to occur, the assumed extreme load levels would not occur. We should not be selecting resources and planning the system based on situations that are not going to occur as modeled.

Possible solutions:

- Remove outliers or assign more appropriate (much lower) probabilities
- Institute programs to ensure that very likely closures under extreme cold can be counted on for planning purposes

The goal should be for the model to plan for something much closer to the forecast 90/10 extreme winter loads.