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2025 Summer Load Shape Analysis for 2026 NPCC Reliability Assessments

Introduction

The CP-8 Working Group (WG) uses the historical load shape based on the summer of 2021 for the months of May – September in NPCC multi-area probabilistic reliability assessments. The selection of the summer load shape assumption is reevaluated on a periodic basis.

This report compares the summer 2021 load shape currently in use with a corresponding representation of the 2025 load profile. Both profiles were scaled consistent with the load forecast assumptions used in the NPCC 2026 Summer Multi-Area Probabilistic Reliability Assessment.[1] The purpose of this evaluation is to determine if the load shape used in the Multi-Area Probabilistic Reliability Assessment is the most conservative for the NPCC Region. Since both the 2021 and 2025 load shapes are scaled to the Areas' 2026 load forecast, the most conservative load shape for the probabilistic assessment may not be the season in which the most severe weather was observed. **Appendix A** includes weather data for the Top 10 peak demand days of the summers 2021 and 2025.

Load Shapes

The 2025 load profiles were provided to GE by each of the five NPCC Areas, as well as by PJM for their own representation. These profiles reflect the actual load; with any demand response added back into the hourly load provided.

Load Scaling Adjustment Methodology

This report illustrates what the loads would be if used to model them in GE Multi-Area Reliability Simulations (MARS) for the 2026 NPCC Summer Multi-Area Probabilistic Reliability Assessment. The 2021 and 2025 shapes are compared in this analysis.

2021 Shape

The 2021 current load shape is the result of the model from the 2026 NPCC Summer Multi-Area Probabilistic Reliability Assessment (i.e., each month's Area peak loads scaled to match the Area's year 2026 demand and energy forecasts). For Québec and the Maritimes, monthly demand values are provided for the 2026 Summer Assessment. For New York, New England, and Ontario the summer peak is provided, and the monthly values are determined by scaling the 2021 load shape to match the 2026 summer peak.

2025 Shape

The 2025 shape is the resulting shape from the NPCC Area's, with each Area's sub-areas (or zones) scaled by a consistent ratio to achieve the same coincident peak as modeled in the

[1] Available in the 2026 NPCC Summer Reliability Assessment

2026 NPCC Summer Multi-Area Probabilistic Reliability Assessment when using the 2021 Shape. This represents the load shape methodology that would be used in the MARS program if the 2025 load shape was used in the 2026 Summer Assessment and the summer peak value was matched.

For a consistent evaluation across the two years, the shapes in this analysis for most of the NPCC Areas correspond to gross load values, i.e., the load without the effect of distributed energy resources (DER) applied to it. For Québec, Maritimes and Ontario, the amount of DER is currently negligible, and both years utilized gross load values. New York provided the load shape for the year 2025 with an estimate of DER generation added back in, which represents the gross load in 2025. For New England, the 2025 shape represents the net load (i.e., gross load minus DER). For consistency in this analysis to compare to the 2021 load shape, New England estimated what the hourly generation would have been of the amount of DER present in the 2026 summer assessment, by using irradiance and other weather data for the year 2021. That estimated DER generation was netted from the 2021 observed load to obtain the load shape for that year.[2]

Daily Peaks

The current NPCC CP-8 WG model utilizes the 2021 load shape for the summer months, May through September. A plot of the daily peaks for the months of June through September as represented in the 2026 NPCC Summer Multi-Area Reliability Assessment is shown in **Figure 1**. Traditionally, the Summer Load Shape Analysis has focused on the months June through August. In 2023, several NPCC Areas had their summer peak demand occur in September which prompted the CP-8 WG to consider the September load shape in this year's analysis. Note that these plots only show the summer-peaking Areas within the NPCC Region: New England, New York, Ontario, PJM, and the aggregated shape for the NPCC Region.

[2] To make the New England 2021 load shape consistent with the 2025 net load shape, the modeled DER from the 2026 summer assessment is subtracted out of the 2021 load profile.

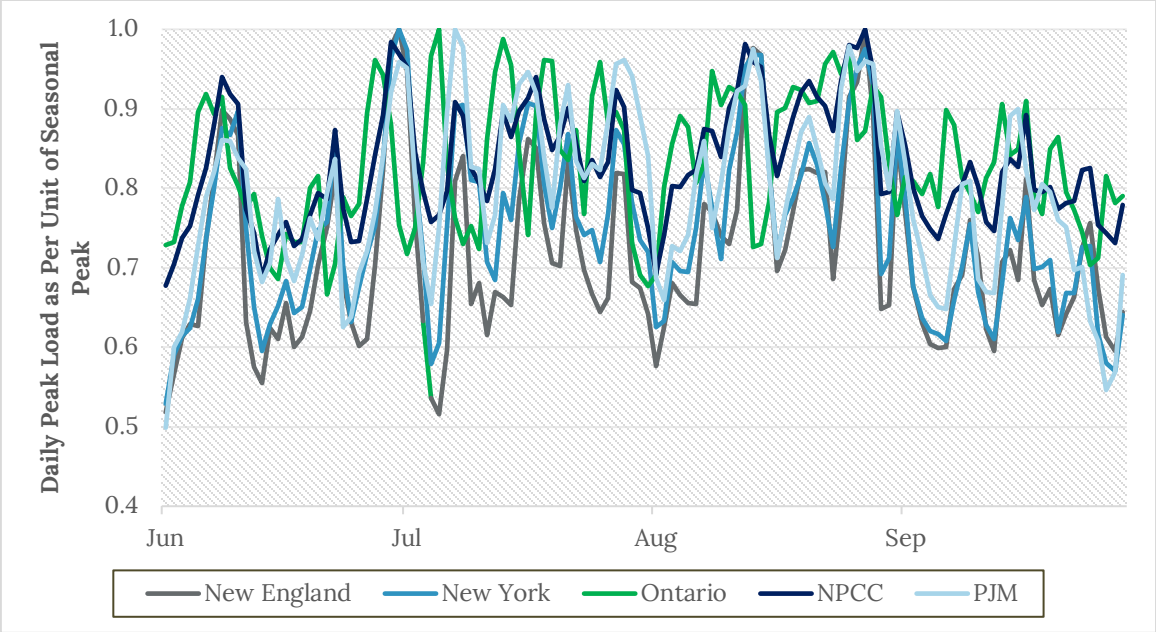

Figure 1 - Daily Peak Loads – 2021 Load Shape

Figure 2 shows the same plot, rendered for the 2025 load shape, after only scaling the sub-area non-coincident peaks to achieve the same Area annual coincident peaks as observed with the 2021 load shape. **Table 1** below shows the number of days above a percent of Area summer peak using this adjustment methodology.

Considering September data for the 2025 shape, 7, 16, and 28 days had a daily peak for the NPCC Region at or above 95%, 90% and 85% of the NPCC peak respectively. This is in comparison to the 2021 shape, where 9, 26, and 45 days were at or above 95%, 90%, and 85% of the NPCC peak, respectively.

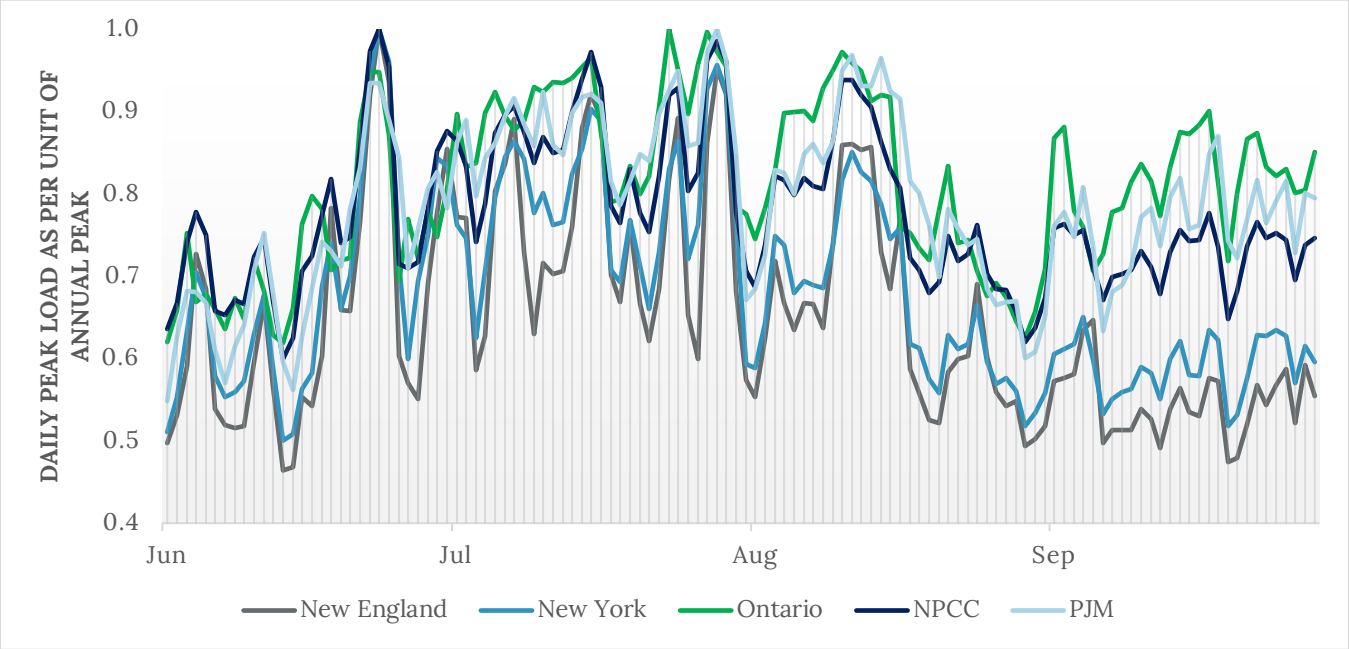

Figure 2 - Daily Peak Loads - 2025 Load Shape

Table 1 - Number of days above a percent of Area summer peak

	2021 Shape			2025 Shape		
Region	**95%**	**90%**	**85%**	**95%**	**90%**	**85%**
New England	5	9	16	2	6	16
New York	8	14	25	3	7	12
Ontario	11	31	50	10	27	47
PJM	10	23	37	5	19	34
NPCC	9	26	45	7	16	28

Statistics for the two profiles are shown in **Table 2** below. This table shows the peak load and load factor [3] for NPCC and the summer-peaking Areas. The statistics are shown for June, July, August, and September and provides a simple comparison of the monthly peaks across the two load shapes.

[3] Monthly load factor calculated by (Energy)/ (Peak * hours in month)

Table 2 - Statistics for 2021 and 2025 shapes, scaled to seasonal and monthly peaks [4]

		Month	June	July	August	September
New England	2021 Shape	Peak (MW)	26,866	26,715	25,939	20,295
		Energy (GWh)	10,181	10,788	11,504	9,370
		Load Factor (%)	52.6	54.3	59.6	64.1
	2025 Shape	Peak (MW)	26,866	25,577	23,119	17,362
		Energy (GWh)	10,333	12,209	10,531	8,981
		Load Factor (%)	53.4	64.2	61.2	71.8
New York	2021 Shape	Peak (MW)	31,990	31,151	31,178	25,267
		Energy (GWh)	14,364	16,190	16,543	13,560
		Load Factor (%)	62.4	69.9	71.3	74.5
	2025 Shape	Peak (MW)	31,990	30,583	27,215	20,797
		Energy (GWh)	13,176	15,779	13,312	11,483
		Load Factor (%)	57.2	69.3	65.7	76.7
Ontario	2021 Shape	Peak (MW)	23,043	23,974	23,293	21,816
		Energy (GWh)	11,788	12,853	13,217	12,056
		Load Factor (%)	71.1	72.1	76.3	76.8
	2025 Shape	Peak (MW)	22,723	23,974	23,318	21,583
		Energy (GWh)	10,991	13,629	12,243	12,161
		Load Factor (%)	67.2	76.4	70.6	78.3
PJM	2021 Shape	Peak (MW)	149,052	155,439	152,175	139,906
		Energy (GWh)	69,217	81,647	79,313	67,712
		Load Factor (%)	64.5	70.6	70.1	67.2
	2025 Shape	Peak (MW)	145,237	155,439	150,580	135,158
		Energy (GWh)	67,085	83,742	75,777	71,989
		Load Factor (%)	64.2	72.4	67.6	74.0
NPCC	2021 Shape	Peak (MW)	97,056	93,931	**98,616**	87,927
		Energy (GWh)	49,696	54,979	56,498	49,218
		Load Factor (%)	71.1	78.7	77.0	77.7
	2025 Shape	Peak (MW)	**104,584**	103,013	98,167	81,194
		Energy (GWh)	49,191	57,226	51,391	47,650
		Load Factor (%)	65.3	74.7	70.4	81.5

Table 3 shows the day of the NPCC peak load for summer 2025 and the corresponding Area's percent of peak load for that day when using the 2021 and 2025 load shapes.

Table 3 – NPCC Peak Load Day

	Date	Québec	Maritimes	New England	New York	Ontario
2021 Shape	27-AUG-2026	100%	99%	100%	97%	87%
2025 Shape	23-JUN-2026	92%	97%	100%	100%	95%

[4] Highlighted Area values represent the non-coincident summer peak. The **NPCC highlighted** values represent the coincident peak for NPCC (which do not match because the values are matched at the individual Area level).

Comparison to Historical Years for the Top 31 Days of the Summer Period

Figure 3 shows the results using the Annual Load Scaling Adjustment methodology. This represents the load shape methodology that would be used in the MARS program.

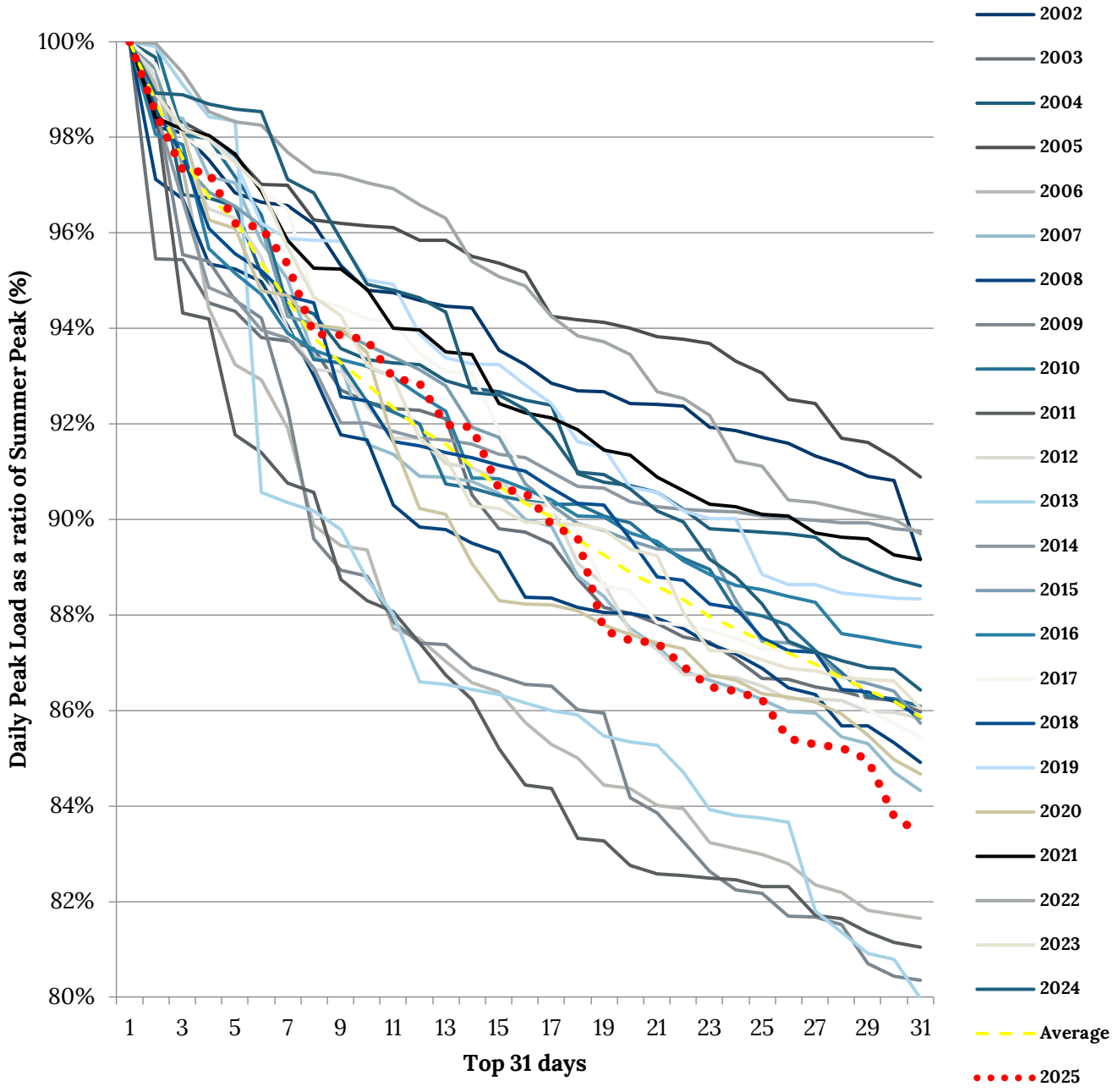

Figure 3 - Comparison of NPCC Summer (May-Sep) Peak Loads for 2002 through 2025 [5]

[5] The 31st day of the 2002 load shape drops to 84% (from 91%).

Systemic stress is fundamentally determined by the frequency of days performing at or near seasonal peaks, as these sustained periods of high demand represent the highest risk for loss-of-load events. is most likely to occur. **Figure 3** shows a duration plot of the NPCC peak loads for the top 31 days of the summer periods of the years 2002 through 2025. [6]

Figure 4 isolates the 2021 and 2025 shapes for a more direct comparison. The curves have been normalized to the respective seasonal peak.

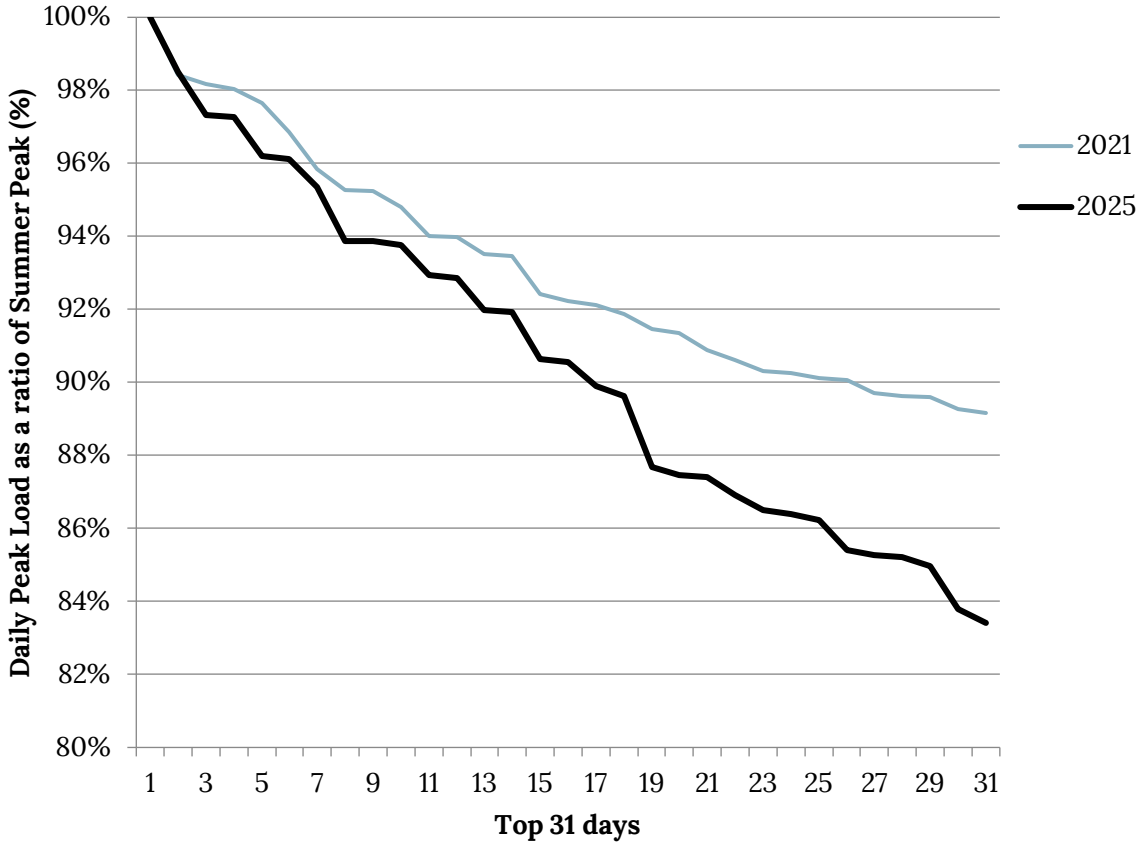

Figure 4 - Comparison of Normalized NPCC Summer Peak Loads for 2021 and 2025

[6] The 2002 and 2013-2025 data were provided by the NPCC Areas. NPCC loads for 2003 through 2012 were sourced from ABB – Velocity Suite.

Figure 5 also shows the 2021 and 2025 shapes, but the curves have not been normalized. The figures show the actual MW of peak daily load for the highest 31 days.

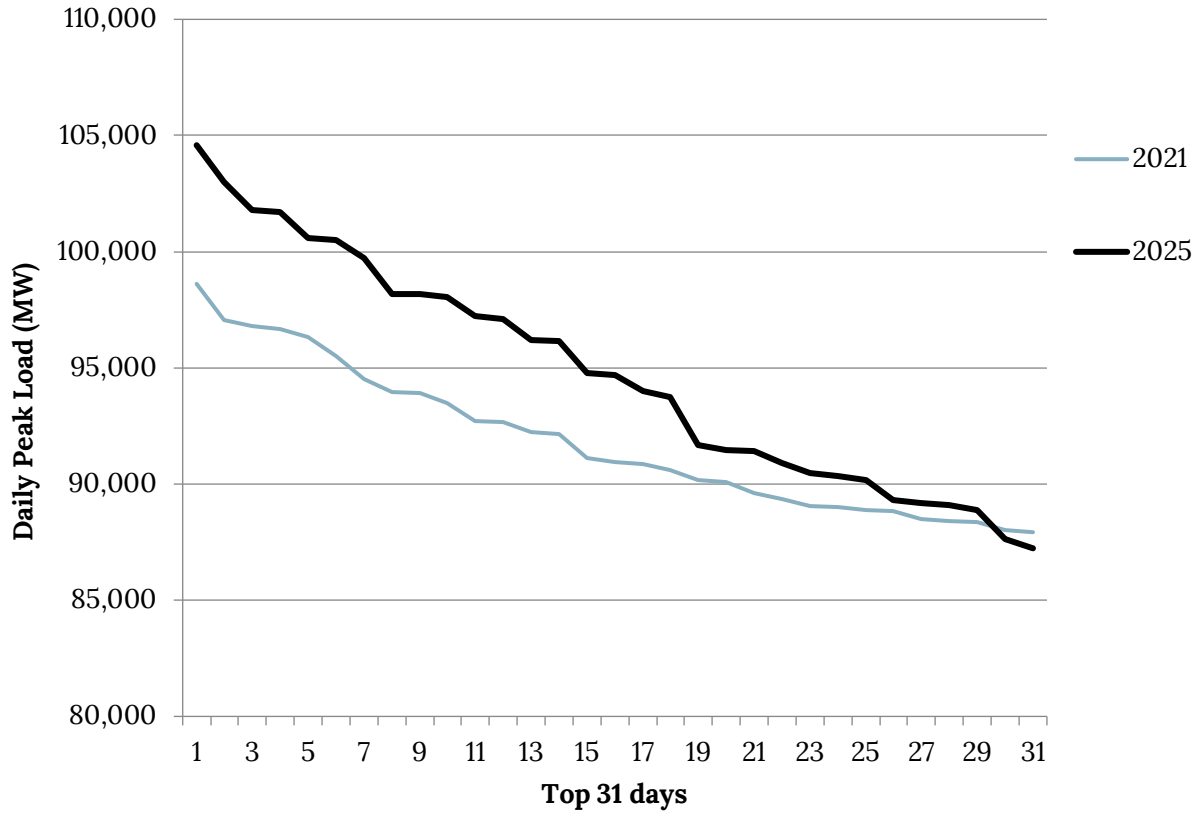

Figure 5 - Comparison of MW NPCC Summer Peak Loads for 2021 and 2025

Conclusion

On a region-wide basis, the 2025 shape appears to be similarly stressful to the 2021, although there is indication that the actual NPCC-wide coincident peak is higher for the top days for the 2025 shape (shown in **Figure 5**). The number of days above 95% and 90% of the peak load for the 2025 shape is lower when compared to the 2021 load shape (shown in **Table 1**). To assess the reliability impacts of each load shape on an interconnected system, it's crucial to consider the number of days when the load was at its annual peak or near peak, as these are the days when a loss of load event is most likely to occur. The CP-8 Working Group compared the results of the 2026 NPCC Summer assessment for both the 2021 and 2025 hourly load shape assumptions, finding a difference in the results. As can be seen in **Figure 4** and **Table 1**, almost all of the top 31 days for the 2021 load shape when normalized to the respective 2026 seasonal peak load is higher compared to the 2025 load shape.

Recommendation

For the reasons concluded above, the CP-8 WG recommends simulating the forthcoming 2026 NPCC Summer Multi-Area Probabilistic Reliability Assessment with both the 2021 and 2025 load shapes, to understand which is the most conservative option. Study results demonstrate that the 2021 load shape yields a slightly higher loss of load and increased estimated usage of operating procedures (EOP). Consequently, the CP-8 WG recommends retaining the 2021 load shape as the standard basis for summer profiles in upcoming 2026 Reliability Assessments.

Appendix A. Weather Data

The weather data below consists of the averages of each region in ºF.

Table 1. Average temperatures in 2021 for top 10 days

2021							
Top Day		**Québec**	**Maritimes**	**New England**	**New York**	**Ontario**	**PJM**
1	8/27/2026	67.0	74.0	79.7	79.7	69.5	80.1
2	6/29/2026	75.8	74.3	84.6	83.0	68.3	82.1
3	8/12/2026	78.1	74.6	81.2	81.1	69.0	81.2
4	8/25/2026	77.5	80.0	79.3	79.5	78.7	79.9
5	8/26/2026	79.1	79.9	81.2	81.6	75.2	79.7
6	6/30/2026	71.0	70.5	82.0	81.6	69.0	80.1
7	8/13/2026	78.7	79.8	81.3	82.1	74.4	80.3
8	8/14/2026	72.7	77.3	79.7	78.0	74.1	77.1
9	7/1/2026	65.4	71.1	73.8	73.8	75.5	74.4
10	8/28/2026	62.5	67.6	68.0	72.4	66.6	79.2

Table 2. Average temperatures in 2025 for top 10 days

2025							
Top Day		**Québec**	**Maritimes**	**New England**	**New York**	**Ontario**	**PJM**
1	6/23/2026	83.1	62.7	81.8	83.5	85.0	86.1
2	7/28/2026	79.6	64.4	77.6	79.9	80.2	81.7
3	6/22/2026	76.5	57.9	78.3	78.8	82.7	82.9
4	7/15/2026	78.6	66.7	78.5	77.4	77.9	78.9
5	7/27/2026	75.9	65.1	70.1	75.6	79.3	79.6
6	7/29/2026	79.1	63.9	82.5	81.4	78.9	83.1
7	6/24/2026	85.0	66.3	86.8	84.8	84.1	86.7
8	7/14/2026	78.0	63.7	74.1	76.4	76.9	78.2
9	8/10/2026	82.2	65.8	74.4	75.9	81.0	76.8
10	8/11/2026	83.4	67.1	78.3	77.1	81.0	77.8