New York ISO
Independent System Operator

Expanding Application of Peak Hour Forecasts

Market Design Concept Proposal

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Purpose

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- The purpose of this presentation is to present the Market Design Concept Proposal (MDCP) for the Expanding Application of Peak Hour Forecasts project.

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Background

Date	Working Group	Discussion Points and Links to Materials
February 25, 2021	ICAPWG/MIWG	Kick-off presentation discussing the current process: https://www.nyiso.com/documents/20142/19520392/Expanding%20Application%20of%20Peak%20Hour%20Forecasts%202.25.2021%20ICAPWG%20FINAL.pdf/800c1e4b-6169-7e31-3647-ad417a236221
March 25, 2021	ICAPWG/MIWG	Discuss potential analyses: https://www.nyiso.com/documents/20142/20226859/Expanding%20Application%20of%20Peak%20Hour%20Forecasts%203.25.2021%20ICAPWG%20FINAL.pdf/5334cd44-5d5f-06d8-f12e-bd294bbcbee1
May 4, 2021	ICAPWG/MIWG	Discuss load duration analysis: https://www.nyiso.com/documents/20142/21189817/Expanding%20Application%20of%20Peak%20Hour%20Forecasts%205.4.2021%20ICAPWG.pdf/5a2115b3-cd4d-b977-b3de-6fd3115b13a9
June 3, 2021	ICAPWG/MIWG	Discus process flow and tariff review: https://www.nyiso.com/documents/20142/21942500/Expanding_Application_of_Peak_Hour_Forecasts_6.3.2021_ICAPWG_FINAL.pdf/501b1132-e916-9b67-48b8-8d958bed927d
June 30, 2021	ICAPWG/MIWG	Discuss peak load days and weighting: https://www.nyiso.com/documents/20142/22643498/Expanding_Application_of_Peak_Hour_Forecasts_6.30.2021_FINAL.pdf/8c6b7640-a78e-05fd-b47b-448acfd03c5c

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Background

- Revisions to the ICAP load forecast or Installed Reserve Margin (IRM) processes are not under consideration as part of this project.
- The NYISO and its stakeholders are considering the use of multiple peak load hours in the Transmission Owner (TO) ICAP obligation allocation to LSEs as part of this project.
- Actual load data would be used to identify the peak load hours, as opposed to reconstituted load data.
  - Final Special Case Resource (SCR) load reduction data would not be available in time to be used to identify multiple peak load hours.
  - Actual load data is used today when identifying the peak load hour.

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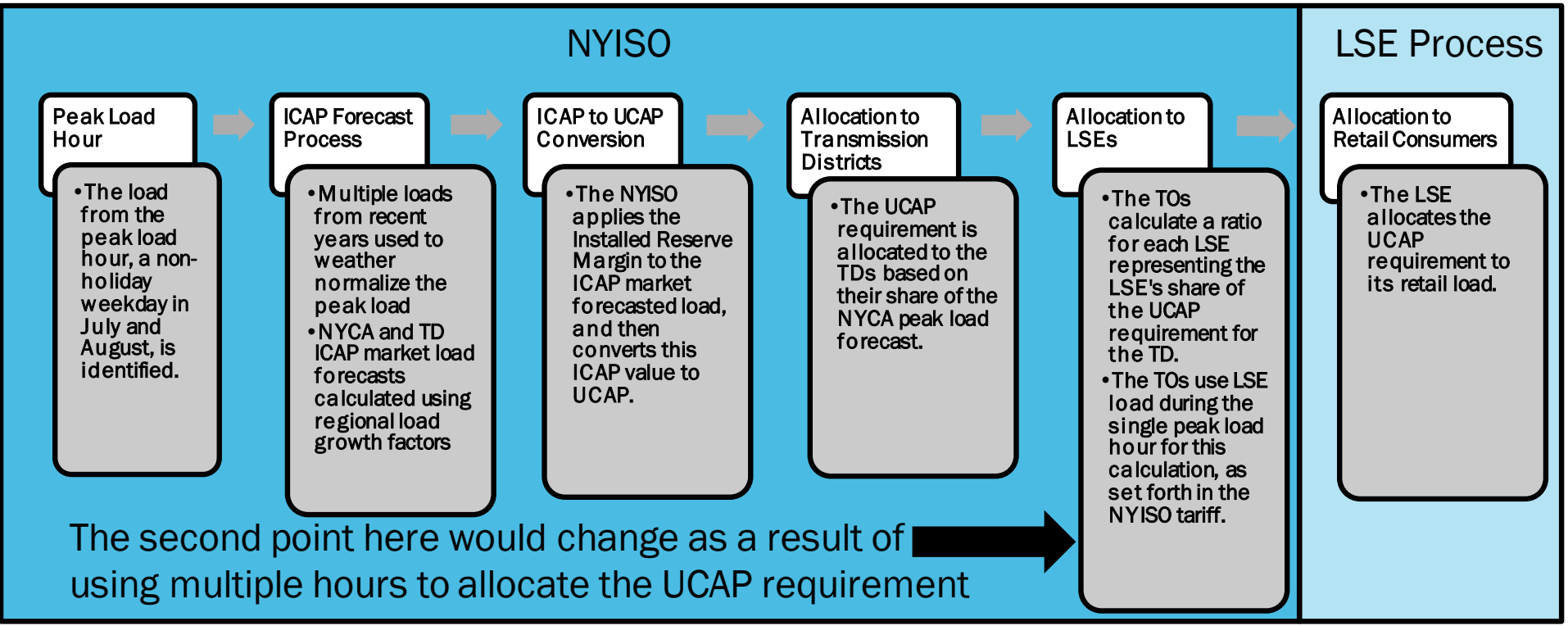
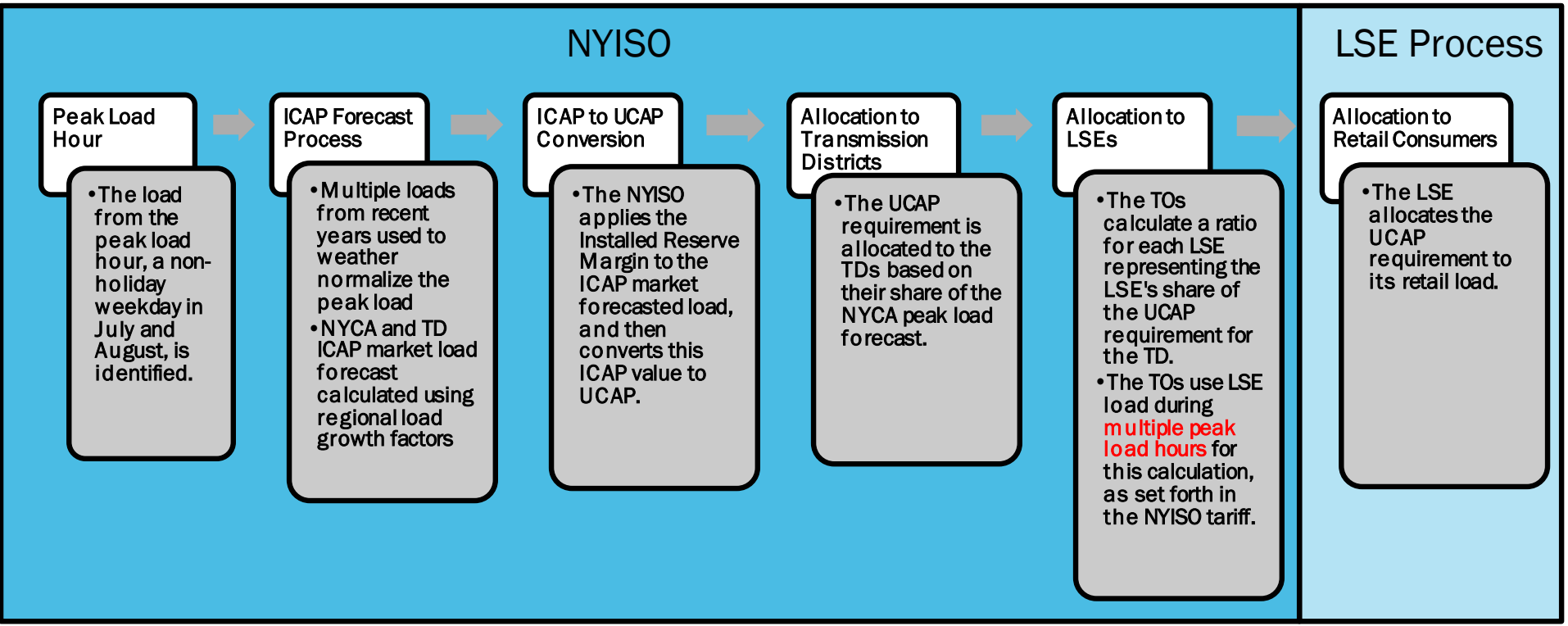
Current Process Flow



Proposed Process Flow



Multiple Daily Peak Loads in the Current NYISO ICAP Forecast Process

- The previous slides show the current and proposed process flow for the establishment and allocation of ICAP market requirements.
- The NYISO's ICAP forecast process already uses multiple peak load hours.
  - The ICAP forecast regression process for weather normalization uses daily peak loads for each weekday in June, July, and August from recent years.
- The NYISO design criterion is based on the single highest load hour.
  - The NYISO's ICAP market forecast process will be unaffected by the identification of multiple hours of peak loads in order for the TOs to allocate ICAP obligations to the LSEs.

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Background

- **The single peak load hour discussed in MST 5.10 and 5.11 is currently used by the Transmission Owners (TOs) to allocate ICAP obligations to the Load Serving Entities (LSEs).**
  - Revised tariff language will be necessary for the TOs to allocate ICAP obligations to the LSEs using multiple peak load hours.
- **The NYISO and its stakeholders should consider the following:**
  - Number of peak load hours, or peak load days, used for the allocation.
  - Weighting of the peak load hours used by the TOs to construct a single ratio for the allocation to the LSEs.
- **Load will continue to be attributed to LSEs based on actual meter data in accordance with TO procedures.**

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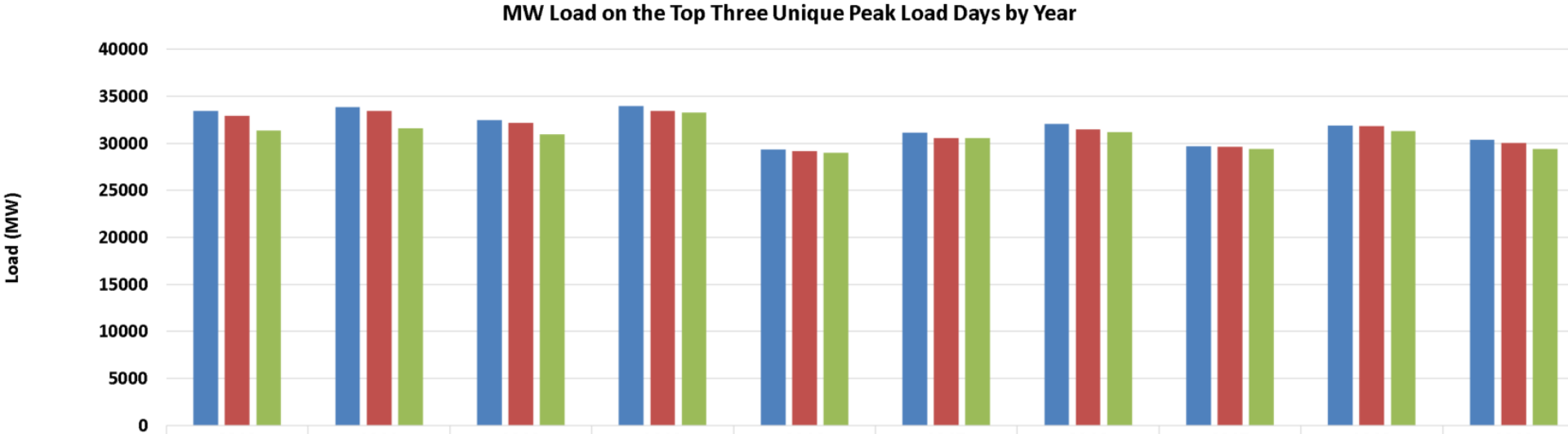
Load MW on Peak Days

Historical Peak Load Days

- The chart below shows NYCA coincident peak load MW from the top three peak load days on non-holiday weekdays in July and August for each year.
  - The MW load is shown for each year and peak load day below the x-axis.
- The load in a given year is similar for each of the top three peak load days.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Peak Load Day 1	33452.3	33865.6	32438.7	33955.8	29330.7	31138.4	32076.0	29699.4	31860.9	30383.4
Peak Load Day 2	32922.5	33454.2	32192.2	33450.6	29196.8	30574.8	31477.0	29622.3	31824.5	30068.4
Peak Load Day 3	31362.7	31623.7	30989.3	33253.6	28988.8	30543.3	31187.0	29422.7	31292.8	29381.1

Weighting of the Peak Load Hours

Weighting of the Peak Load Days

- A methodology using loss of load probability values from the IRM study to weight the top three peak load days has been proposed for consideration by the NYISO and stakeholders, as described in Appendix V.
- The NYISO has concerns with this approach, as the IRM study is based on high load scenarios that may not match the top three peak load MW values that are ultimately observed. There could be a 1,000 MW or 5,000 MW difference in the top three peak load days, and the proposed methodology would not recognize this difference.
  - If there is broad stakeholder consensus that a weighting of the top three peak load days used in the ICAP allocation to LSEs is desirable, then the NYISO will work with stakeholders within the next phase of this market design to develop a more appropriate methodology.

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Weighting of the Peak Load Days

- **One of the goals of the Expanding Application of Peak Hour Forecasts project is to reduce volatility in the ICAP allocation to LSEs when using a single peak load hour.**
  - Weighting the top peak load days would mean that volatility could still skew the allocation to hours with a higher weight.
- **It is therefore more appropriate to use an equal weighting of the identified peak load hours to allocate ICAP obligations to the LSEs.**

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NYISO Recommendation

NYISO Recommendation

- **The NYISO proposes to use the NYCA coincident peak load from the highest load hour on each of the top three unique peak load days, with the identification of these peak load days to include only non-holiday weekdays in July and August, consistent with design conditions.**
  - As previously discussed, up to three unique peak load days are historically present in the top 5 peak load hours (see Appendix III).
  - This approach is intended to balance concerns that the incentive to reduce load during peak hours will be reduced with the desire to have that incentive apply to more peak load days.
- **Actual load data would be used to identify the peak load hours, as opposed to reconstituted load data.**
- **The top three peak load days used in the allocation would be equally weighted.**
  - If there is broad stakeholder consensus that a weighting of the top three peak load days used in the ICAP allocation to LSEs is desirable, then the NYISO will work with stakeholders within the next phase of this market design to develop a more appropriate methodology.

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Next Steps

Next Steps

- This presentation meets the NYISO's Market Design Concept Proposal commitment for 2021.
- Expanding Application of Peak Hour Forecasts is currently included as a project candidate for the 2022 project prioritization process.
- If prioritized, the NYISO would work toward a goal of Market Design Complete (MDC) in 2022.
  - An MDC milestone will require the NYISO and its stakeholders to collaborate to finalize the market design and corresponding draft tariff language revisions.
    - These tariff revisions are anticipated to include detail on the number of peak load days utilized, as well as the calculation for the LSE ICAP obligation allocation.

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Appendix I: Peak Hour Forecast Process

Peak Load Date and Hour

- **Each September, NYISO identifies the NYCA peak load date and hour for the current capability year (for example, this September 2021, the NYISO will provide this information for the 2021 Capability Year).**
  - The locality non-coincident peak load dates and hours are also identified.
  - The TOs report meter data for these peak load hours to the NYISO.
    - The data is submitted to the NYISO in multiple data files, and compiled by the NYISO in a single file.
  - TO load data is then compared to NYISO Decision Support System (DSS) data, to ensure that the actual loads match within a 1% tolerance.

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Net Load vs. Gross Load

- **The peak hour load received from the TOs is net of certain production.**
  - Demand reductions during the peak load hour from all Special Case Resources (SCRs), which are Demand Response (DR) resources participating in the Capacity Market, are added back into the peak hour load.
    - The TOs choose whether their own load reduction programs that do not overlap with SCRs should be added back into the load.
  - Specific municipal generating units that participate in the NYISO Capacity Market are also added back into the load.
  - There is currently no adjustment to add back generation from resources not participating in the wholesale markets.
    - For example, there is no adjustment to the load for rooftop solar outside of the wholesale markets.

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Weather Normalized Load

- **The TOs and the NYISO each weather normalize the peak load hour data.**
  - Models are developed by the NYISO and reviewed by the LFTF to weather normalize the data. Examples from 2020 include:
    - Single year model for the current year
    - Pool model including the current year and selected previous years.
  - The TO weather normalized load data is accepted if either:
    - The TO and NYISO adjusted loads are within 25% of each other, OR
    - The TO and NYISO weather normalized loads are within 1% of each other

Example Data*	NYISO	TO
Peak Hour Load	32,000	32,100
Weather Normalized Load	33,000	33,250
Adjusted Load	1,000	1,150

Must be within 25%

Must be within 1%

- **The ratio of coincident to non-coincident peak load is calculated in order to weather-adjust the peak load for each locality.**
- **A regional load growth factor is applied to the weather adjusted load, and this becomes the forecasted peak load**

*Data in this table is for example purposes only

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ICAP Forecast

- **The forecasted peak load is communicated to the ICAP marketplace.**
- **The forecasted peak load is assigned to each TO.**
  - Each TO then assigns the forecasted peak load MW to each LSE.
- **These assigned peak load values are converted to ICAP MW, and then to UCAP values.**
  - These UCAP values become purchase requirements for each LSE.

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Appendix II: NYISO Selection of the Peak Load Hour

NYISO Selection of the Peak Load Hour

- **Last year, the NYISO pursued revisions to the peak load forecast process.**
  - FERC accepted the NYISO's filing on September 18, 2020.
- **As a result of these revisions, the peak load hour may only occur on a non-holiday weekday in July and August**
  - If the peak load day occurs outside of this time frame, then the next highest load is selected until arriving upon a peak load that occurred during a non-holiday peak day in July and August.

*For additional information, please see the presentation at the following link:
https://www.nyiso.com/documents/20142/13050797/04%20NYCA%20Peak%20Load%20Forecast%20Min%20Unforced%20Capacity%20Requirements%20for%20LSEs.pdf/8fe8d2f2-f4aa-f7a4-cd5c-71d66d225c51

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Weather Normalization and Regional Load Growth Factors (RLGFs)

- **The NYISO and the TOs conduct a regression using load and other data from weekdays in June, July, and August.**
  - The resulting regression formula is then used to adjust the coincident peak load for each Transmission District up or down to arrive at the expected peak load under normal weather conditions (i.e., Adjusted Actual Load).
- **The TOs provide Regional Load Growth Factors (RLGFs), which are then evaluated by the NYISO.**
  - The RLGFs are used to forecast the peak load for next year from the Adjusted Actual Load.

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UCAP Allocation to Transmission Owners

- The NYISO ICAP forecast is a forecast of the peak load for the following year, generated using the weather normalized coincident peak load day (numerous load/weather days are considered in the weather normalization process).
  - The forecasted peak load may occur on any day of the following year.
- This forecasted load is converted to UCAP and assigned to the TOs in each Transmission District (TD) using the following formula and example:[1]

$$\text{TD Minimum UCAP Requirement} = NYCA\ Minimum\ UCAP\ Requirement * \frac{TD\ Forecasted\ Coincident\ Peak\ Load}{Sum\ of\ Forecasted\ Coincident\ Peak\ Loads\ for\ all\ TDs}$$

TD Forecasted Coincident Peak Load (Con Edison, 2021)	12,816.7
Sum of Forecasted Coincident Peak Loads for all TDs (2021)	32,333.1
NYCA Minimum UCAP Requirement (2021)	35,603.5

$$\text{TD Minimum UCAP Requirement} = 35{,}603.5 * \frac{12{,}816.7}{32{,}333.1}$$

$$\text{TD Minimum UCAP Requirement} = 14{,}113.1$$

[1] For illustrative purposes only. Data sources includes NYISO AMS and the following presentation:
https://www.nyiso.com/documents/20142/17660272/2021_ICAP_V5a.pdf/bcce19c1-2af1-558a-c9b7-c0ea0c3acd8d

Appendix III: Load Duration Curve Analysis – Actual Load (Not Reconstituted)

Load Duration Curve Analysis Data

- **The NYISO conducted a load duration curve analysis using previous hourly load data from 2010 to 2019.**
  - This load data was not reconstituted with the estimated Special Case Resource (SCR) response.
- **For each hour, the NYISO calculated the hourly load as a percentage of the ICAP load forecast for the applicable year.**

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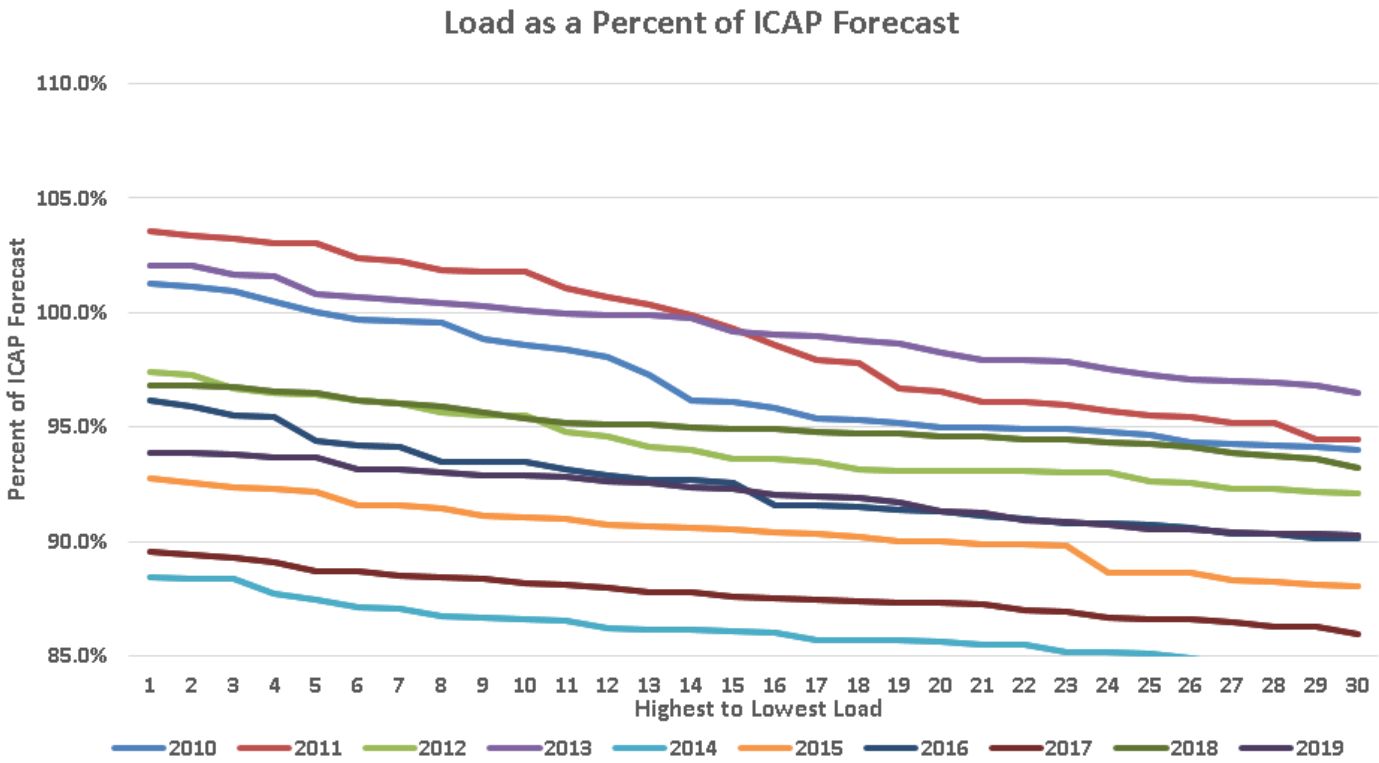
Decline from Peak – Load as a Percent of ICAP Forecast

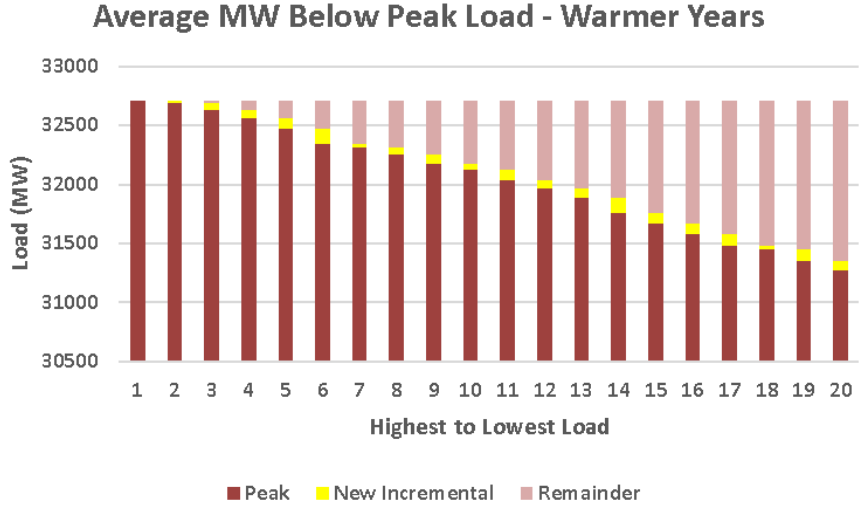
- **In years where the peak load is higher than the ICAP forecast (2010, 2011, 2013), the top peak load hours show a decline around the 5th hour.**
  - These years fall below 100% by roughly the 15th hour.

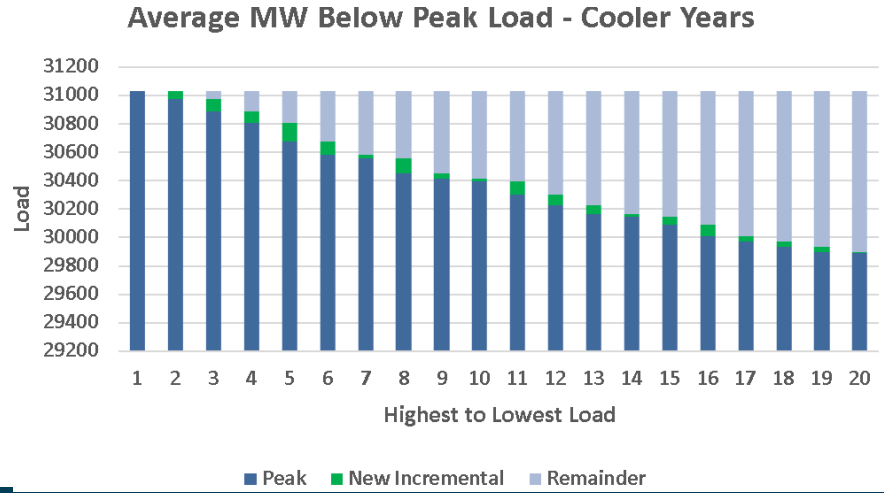


Decline from Peak – MW

- The charts at right show the decline in the average MW when stepping from the first highest load hour to the 20th highest load hour for warmer and cooler years.*
  - Again, a relatively steep decline is present around the 5th hour.

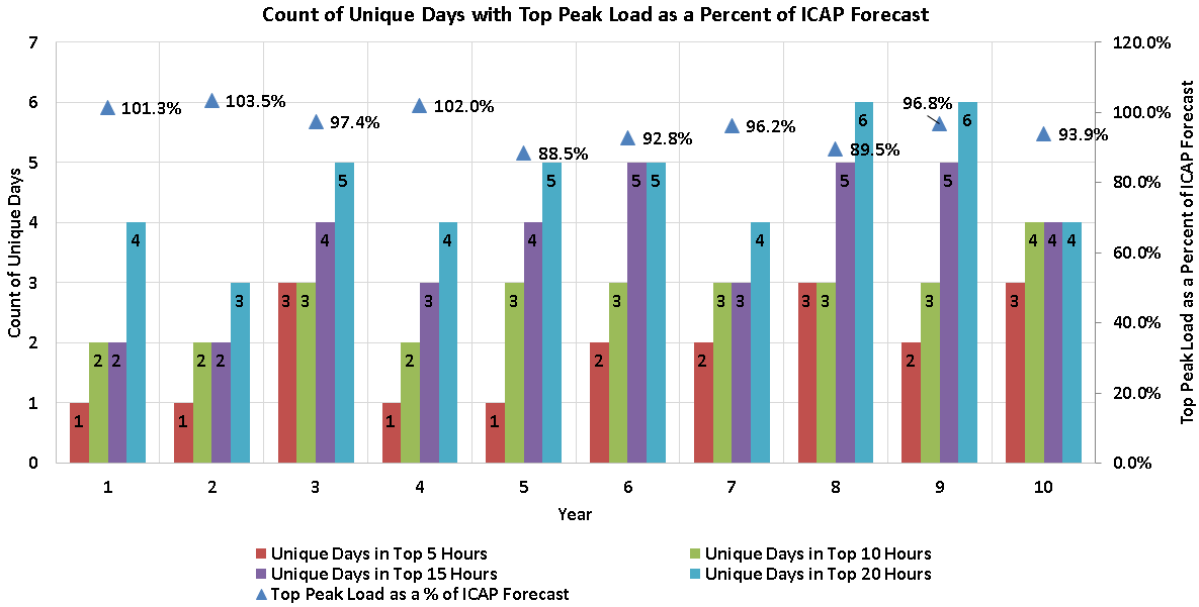
Year	NYCA Peak Day CTHI	Percentile	Above / Below 50th
2010	86.7	88%	A
2011	87.74	95%	A
2012	83.26	37%	B
2013	86.56	87%	A
2014	80.54	6%	B
2015	82.95	32%	B
2016	83.41	39%	B
2017	80.38	5%	B
2018	84.59	60%	A
2019	84.96	66%	A





Days in the Top Load Hours

- **The secondary axis shows the top peak load as a percent of ICAP forecast for each analysis year.**
  - The primary axis shows a count of unique days over the top 20 peak load date hours by year.
- **There are at most three unique days in the top five load hours, four unique days in the top 10, five unique days in the top 15, and six unique days in the top 20.**
  - Additionally, the vast majority of peak load hours occur during weekdays.



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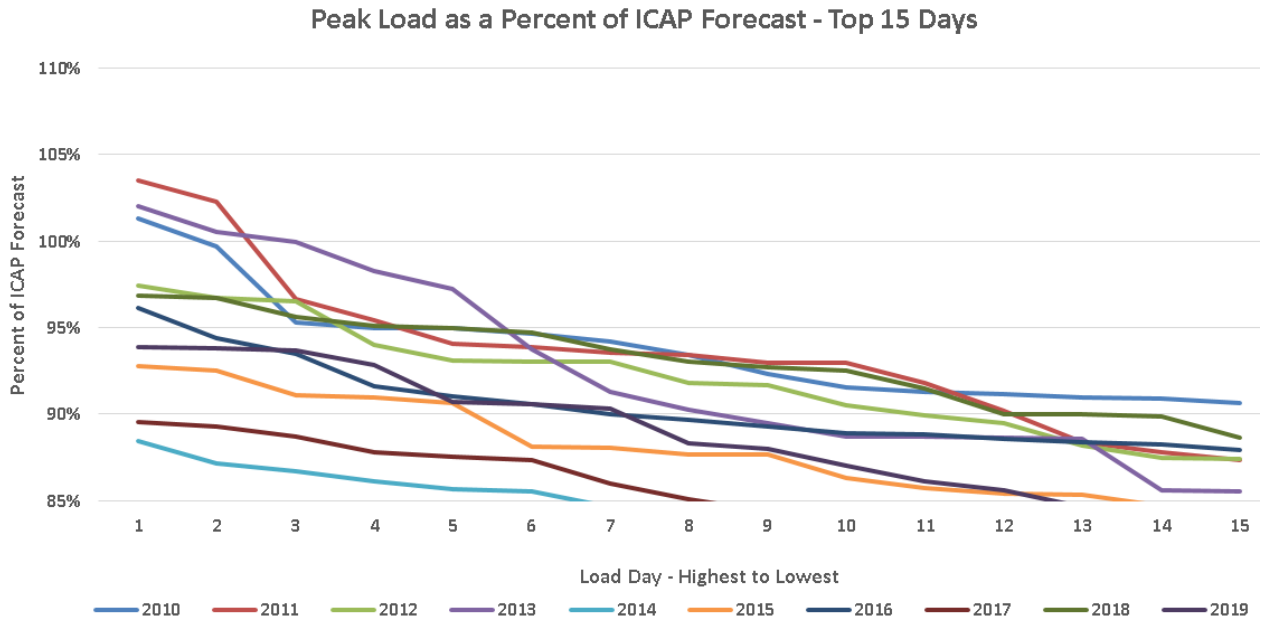
Top Peak Load *Days*

- **The chart at right shows the top peak load *days* as a percent of the ICAP forecast.**
  - The top few peak load days, instead of peak load hours, could be identified by the NYISO.
- **This chart shows a steep decline around the third peak load day.**



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Appendix IV: NYCA Coincident Peak Load

Coincident and Non-Coincident Peak Load

- **In the majority of the 10 year period shown below, at least one of the NYCA peak load dates matches with each of the Localities, typically within a few hours. Matching dates are shown in bold font below. The table below considers only non-holiday weekdays in July and August.**
  - Allocating ICAP obligations to LSEs based on an equal weighting of the peak load days is expected to incorporate both coincident and non-coincident peak load dates.

Observation (NYCA Peak Load Day)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Top Peak Load as a % of ICAP Forecast	101.3%	103.5%	97.4%	102.0%	88.5%	92.8%	96.2%	89.5%	96.8%	93.9%
1	**Tuesday, July 6 16:00**	**Friday, July 22 15:00**	Tuesday, July 17 16:00	**Friday, July 19 16:00**	Tuesday, July 1 15:00	Wednesday, July 29 16:00	**Thursday, August 11 16:00**	Wednesday, July 19 16:00	**Wednesday, August 29 16:00**	Monday, July 29 16:00
2	Wednesday, July 7 15:00	Thursday, July 21 16:00	**Wednesday, July 18 13:00**	**Thursday, July 18 16:00**	Wednesday, July 2 12:00	**Monday, July 20 15:00**	**Friday, August 12 14:00**	Friday, July 21 15:00	Tuesday, August 28 16:00	Tuesday, July 30 17:00
3	Thursday, July 8 16:00	Tuesday, July 12 16:00	Friday, August 3 15:00	Wednesday, July 17 16:00	**Tuesday, July 8 15:00**	Monday, August 17 16:00	Friday, July 22 16:00	**Thursday, July 20 15:00**	Monday, July 2 15:00	**Wednesday, July 17 17:00**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
G-J Non-Coincident Peak	**Tuesday, July 6 16:00**	**Friday, July 22 15:00**	**Wednesday, July 18 12:00**	**Friday, July 19 16:00**	**Tuesday, July 8 15:00**	**Monday, July 20 16:00**	**Thursday, August 11 16:00**	**Thursday, July 20 15:00**	**Wednesday, August 29 16:00**	**Wednesday, July 17 15:00**
J Non-Coincident Peak	**Tuesday, July 6 16:00**	**Friday, July 22 11:00**	**Wednesday, July 18 14:00**	**Friday, July 19 16:00**	**Tuesday, July 8 15:00**	**Monday, July 20 17:00**	**Thursday, August 11 16:00**	**Thursday, July 20 15:00**	**Wednesday, August 29 16:00**	**Wednesday, July 17 17:00**
K Non-Coincident Peak	**Tuesday, July 6 16:00**	**Friday, July 22 15:00**	**Wednesday, July 18 13:00**	**Thursday, July 18 16:00**	Thursday, July 3 15:00	**Monday, July 20 16:00**	**Friday, August 12 16:00**	**Thursday, July 20 15:00**	**Wednesday, August 29 16:00**	**Wednesday, July 17 16:00**

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Appendix V: Weighting Methodology Analysis

Weighting Methodology Analysis

- **The probability of loss of load derived from the IRM study could be used to weight the top peak load days.**
  - The data at right shows the loss of load probability by day from the 2020 IRM study, sorted from the highest to lowest probability.

Highest (1) to Lowest (10) Day	Loss of Load Probability
1	35.02%
2	15.49%
3	13.30%
4	11.48%
5	6.49%
6	5.91%
7	2.27%
8	2.07%
9	1.79%
10	1.24%

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Weighting Methodology Analysis

- A proportion is calculation for each of the top three peak load days.
- This calculated weight would then be used in the allocation of the ICAP obligation to LSEs using the top three peak load days.

Highest (1) to Lowest (3) Day	Loss of Load Probability by Day	Calculated Weight using Proposed Methodology
1	35.02%	55%
2	15.49%	24%
3	13.30%	21%
Total	63.81%	

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Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system

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