New York ISO
Independent System Operator

Expanding Application of Peak Hour Forecasts

Ethan D. Avallone

Technical Specialist, Capacity Market Design

ICAPWG/MIWG/LFTF

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Purpose

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- The purpose of this presentation is to:
  - Provide additional detail on the selection of the peak load hour for the ICAP forecast process.
  - Review the load duration curve analysis to identify multiple peak load hours.

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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

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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 will consider providing additional information to the Transmission Owners (TOs) and Load Serving Entities (LSEs) as part of Expanding Application of Peak Hour Forecasts.**
  - First, identifying more peak load hours (*e.g.*, the top 3 peak load hours in the year) is under consideration.
  - Second, whether the load considered for these hours should have additional production added back before identifying peak hours is under consideration.

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Identifying more Peak Load Hours

- **The NYISO could provide peak load hour data for more hours than the single hour that is identified today.**
  - The purpose of this would be to allow the TOs to incorporate this information when they allocate load obligations to the LSEs for the capacity market.
    - Currently, the TOs allocate load obligations based on the single peak load hour identified by the NYISO.
- **Any benefit(s) from providing additional peak load hours would have to be weighed against the feasibility and usefulness of providing this data.**
  - As more peak load hours are considered, the characteristics of a peak load hour can be lost.
  - Additionally, many peak load hours may occur during the same peak load day.

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Reconstituting Load

- **Today, production from ICAP resources that are not visible to the NYISO in Real Time is added back into the peak load hour (i.e., "reconstituted") as part of the NYISO's ICAP load forecast process.**
  - The load could be reconstituted in a similar manner before or after identifying the peak load hours for the TOs.
  - Providing this information to the TOs would not change the NYISO's ICAP load forecast process, which reconstitutes the load *after* the peak load hour is identified.

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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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Multiple Daily Peak Loads in the Current NYISO ICAP Forecast Process

- **The NYISO's ICAP forecast process already uses multiple peak load hours. However, the NYISO design criterion is based on the single highest load hour.**
  - The ICAP forecast regression process for weather normalization uses daily peak loads for each weekday in June, July, and August from recent years.
  - The TOs may use multiple hours of high peak loads to allocate ICAP obligations to LSEs without interfering with the NYISO's ICAP market forecast process.
  - The NYISO would continue to use the single highest load hour to develop the ICAP market forecast under this scenario.

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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

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Load Duration Curve Analysis

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 reconstituted with the estimated Special Case Resource (SCR) response during the hour (if applicable).
- **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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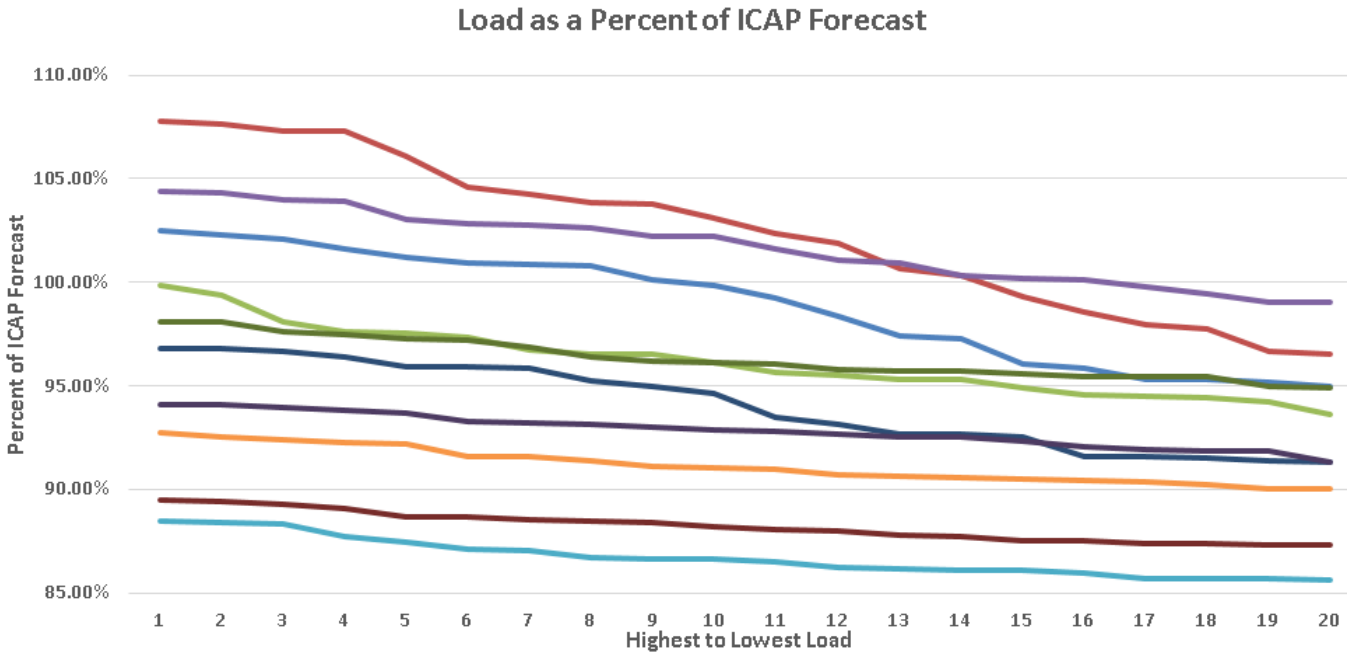
Decline from Peak – Load as a Percent of ICAP Forecast

- In years where the peak load is closest to 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.



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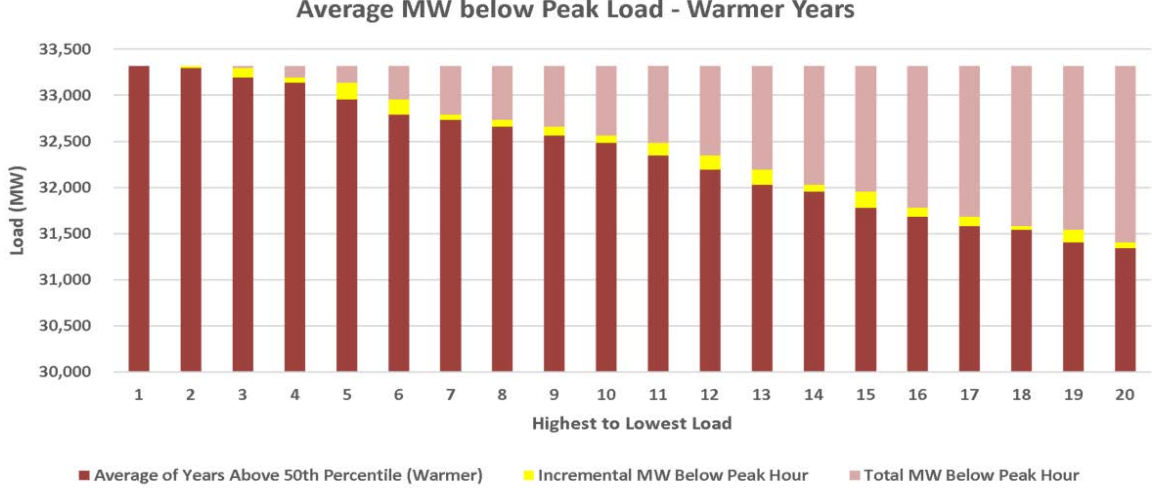
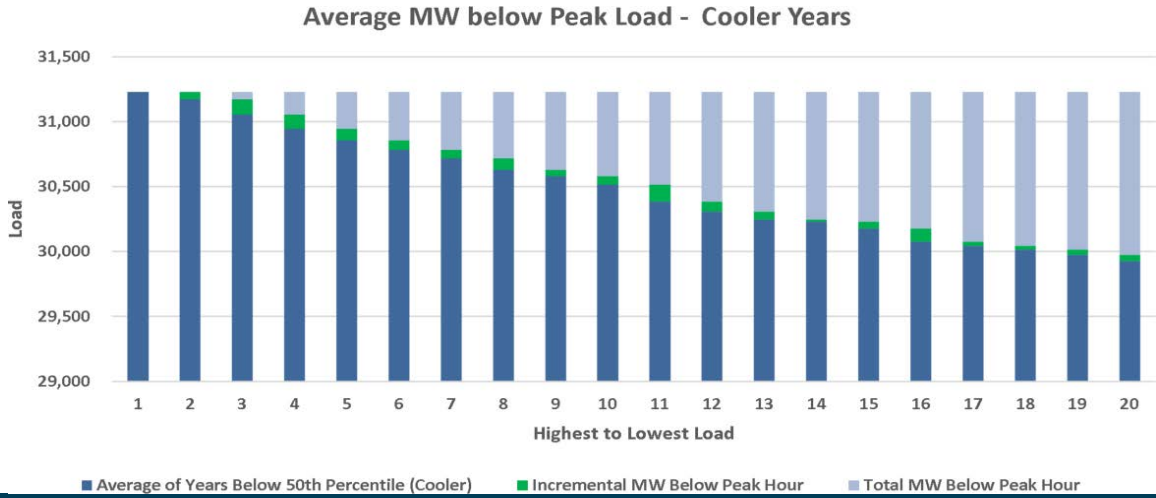
Decline from Peak – MW

- 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.

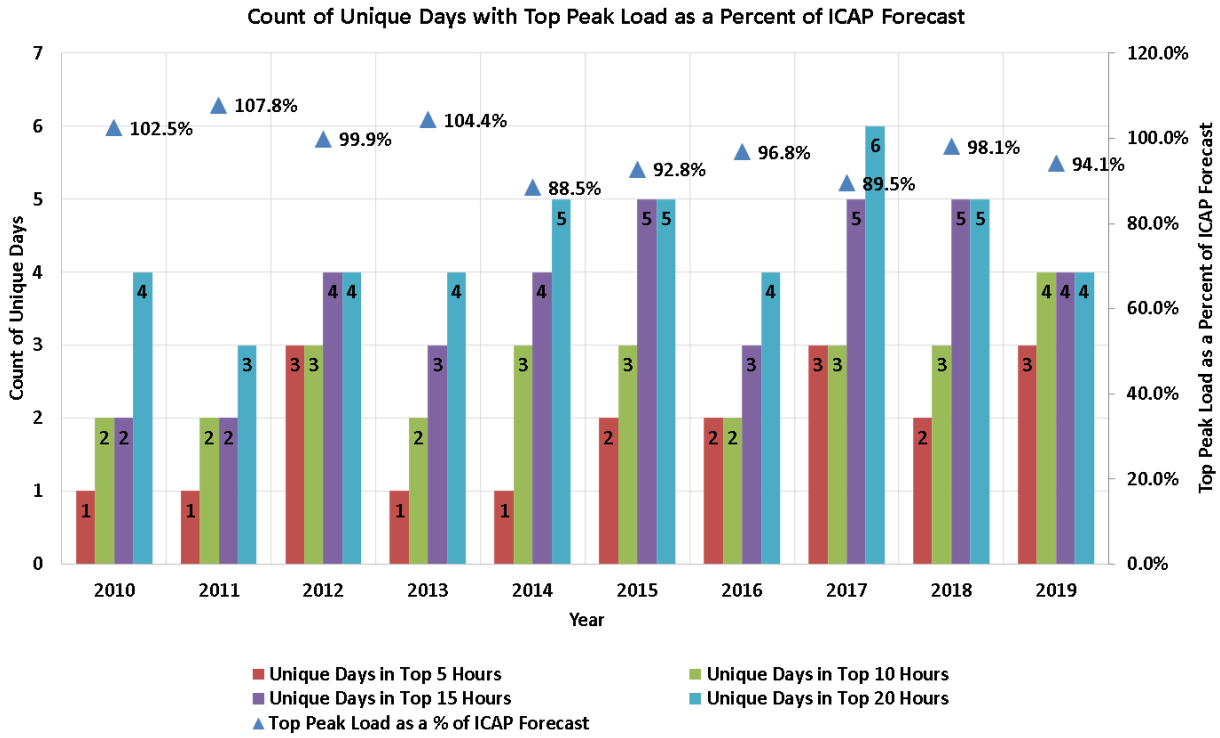




*Please see appendix for additional information on warmer and cooler years.

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 (see appendix).



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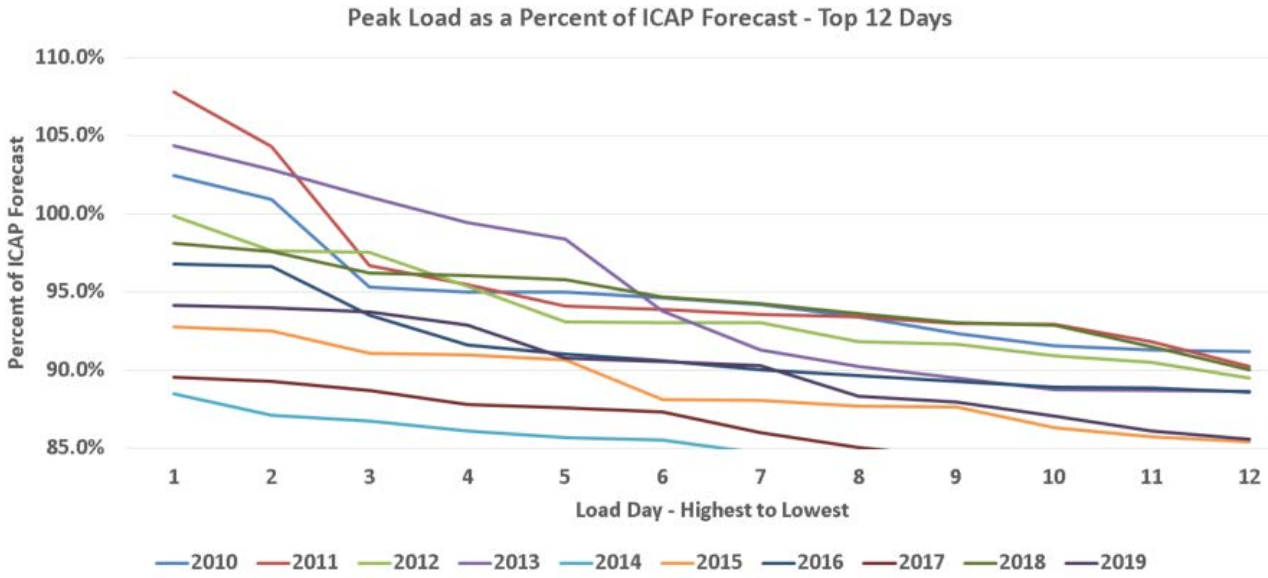
Top Peak Load *Days*

- **The chart below 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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Initial Recommendation

- **The NYISO could provide data for the top 5 peak load hours. The identification of these hours would include only non-holiday weekdays in July and August, consistent with design conditions.**
  - There is a drop in the load as a percent of ICAP forecast after the fifth load hour, as observed in the charts in the previous slides.
  - Additionally, this approach balances 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, as historically up to three unique days are present in the top five load hours.
- **Actual load data could be used to identify the peak load hours, as opposed to reconstituted load data.**
  - Actual load data is used today when identifying the peak load hour.

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Next Steps

Timeline

- **June/ July ICAPWG**
  - Continue stakeholder discussions
- **July BIC**
  - Present MDCP

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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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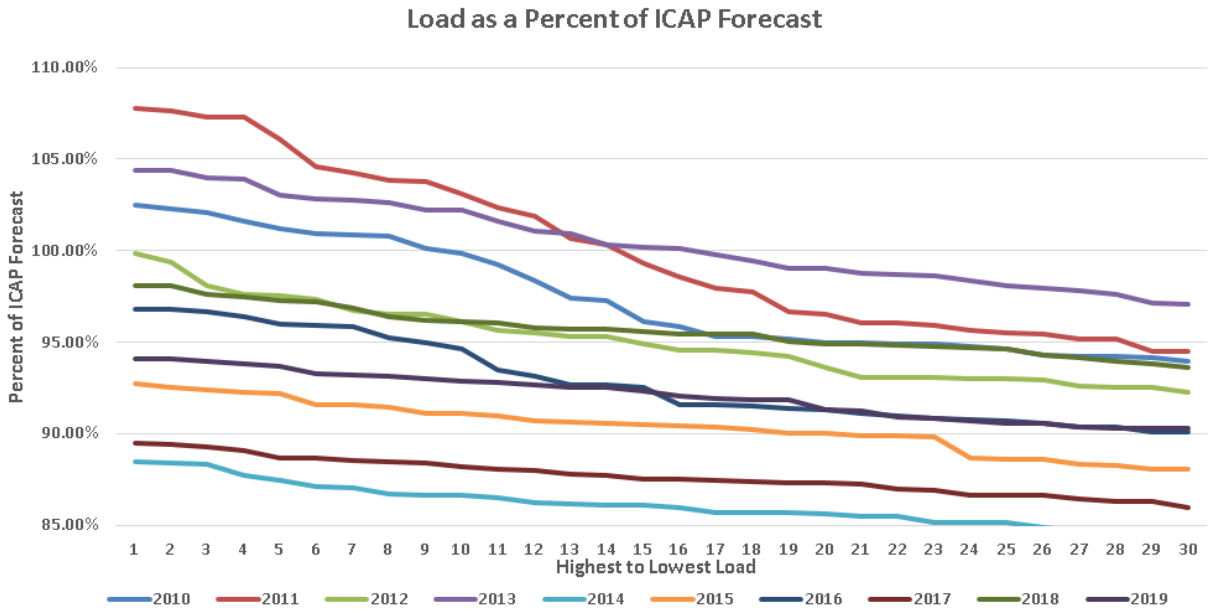
Appendix II: Peak Load Hour Analysis

Decline from Peak – Load as a Percent of ICAP Forecast

- **This shows that in years where the peak load is closest to the ICAP forecast (2010, 2011, 2013), the top peak load hours fall below 100% by roughly the 15th hour.**



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Top 20 Peak Load Hours

- The top 20 peak load date hours by year are shown below.

Date and Hour of Top Peak Loads by Year										
Observation	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	7/6/2010 16:00	7/22/2011 15:00	6/21/2012 16:00	7/19/2013 16:00	9/2/2014 14:00	7/29/2015 16:00	8/12/2016 15:00	7/19/2017 16:00	8/29/2018 16:00	7/20/2019 16:00
2	7/6/2010 15:00	7/22/2011 14:00	6/21/2012 17:00	7/19/2013 15:00	9/2/2014 13:00	9/8/2015 16:00	8/12/2016 14:00	7/19/2017 15:00	8/29/2018 15:00	7/20/2019 17:00
3	7/6/2010 14:00	7/22/2011 16:00	6/21/2012 15:00	7/19/2013 14:00	9/2/2014 15:00	9/8/2015 15:00	8/11/2016 16:00	7/21/2017 15:00	8/28/2018 16:00	7/29/2019 16:00
4	7/6/2010 17:00	7/22/2011 13:00	7/18/2012 13:00	7/19/2013 13:00	9/2/2014 12:00	7/29/2015 17:00	8/11/2016 15:00	7/21/2017 16:00	8/29/2018 14:00	7/29/2019 17:00
5	7/6/2010 13:00	7/22/2011 17:00	7/17/2012 16:00	7/19/2013 17:00	9/2/2014 16:00	7/29/2015 15:00	8/11/2016 17:00	7/20/2017 15:00	8/28/2018 17:00	7/21/2019 17:00
6	7/7/2010 15:00	7/22/2011 12:00	7/17/2012 17:00	7/18/2013 16:00	7/1/2014 15:00	9/8/2015 17:00	8/12/2016 16:00	7/21/2017 14:00	8/29/2018 17:00	7/20/2019 15:00
7	7/7/2010 14:00	7/21/2011 16:00	7/18/2012 14:00	7/18/2013 15:00	7/1/2014 14:00	9/8/2015 14:00	8/11/2016 14:00	7/20/2017 13:00	8/28/2018 15:00	7/21/2019 16:00
8	7/7/2010 16:00	7/21/2011 17:00	7/17/2012 15:00	7/18/2013 14:00	7/2/2014 12:00	7/29/2015 14:00	8/12/2016 13:00	7/20/2017 14:00	8/29/2018 13:00	7/20/2019 18:00
9	7/7/2010 13:00	7/21/2011 15:00	6/21/2012 14:00	7/18/2013 17:00	7/1/2014 13:00	7/20/2015 15:00	8/12/2016 17:00	7/19/2017 14:00	7/2/2018 15:00	7/29/2019 15:00
10	7/7/2010 17:00	7/21/2011 14:00	7/18/2012 12:00	7/18/2013 13:00	7/2/2014 13:00	7/20/2015 16:00	8/11/2016 13:00	7/20/2017 12:00	7/2/2018 16:00	7/30/2019 17:00
11	7/6/2010 18:00	7/22/2011 11:00	7/17/2012 14:00	7/19/2013 12:00	7/2/2014 14:00	8/17/2015 16:00	7/22/2016 16:00	7/19/2017 17:00	9/5/2018 16:00	7/30/2019 16:00
12	7/6/2010 12:00	7/21/2011 13:00	7/17/2012 18:00	7/17/2013 16:00	7/1/2014 16:00	7/20/2015 14:00	7/22/2016 17:00	7/21/2017 13:00	8/6/2018 16:00	7/21/2019 18:00
13	7/7/2010 18:00	7/21/2011 18:00	6/20/2012 16:00	7/17/2013 15:00	7/2/2014 15:00	7/28/2015 16:00	7/22/2016 15:00	6/13/2017 15:00	7/2/2018 14:00	7/20/2019 14:00
14	7/7/2010 12:00	7/22/2011 18:00	6/21/2012 13:00	7/17/2013 17:00	9/2/2014 11:00	8/17/2015 17:00	8/12/2016 12:00	6/13/2017 14:00	8/28/2018 14:00	7/30/2019 14:00
15	7/6/2010 11:00	7/22/2011 10:00	6/20/2012 17:00	7/17/2013 14:00	7/8/2014 15:00	8/17/2015 15:00	8/11/2016 18:00	6/12/2017 16:00	9/5/2018 17:00	7/21/2019 15:00
16	7/6/2010 19:00	7/21/2011 12:00	6/21/2012 18:00	7/19/2013 11:00	7/8/2014 14:00	7/29/2015 18:00	8/13/2016 14:00	6/13/2017 16:00	8/6/2018 17:00	7/30/2019 15:00
17	7/7/2010 11:00	7/21/2011 19:00	7/18/2012 15:00	7/18/2013 12:00	7/2/2014 11:00	7/20/2015 17:00	8/11/2016 12:00	7/20/2017 16:00	8/28/2018 18:00	7/29/2019 18:00
18	9/2/2010 15:00	7/22/2011 19:00	6/20/2012 15:00	7/15/2013 16:00	7/23/2014 14:00	7/28/2015 17:00	8/13/2016 15:00	6/12/2017 15:00	7/2/2018 17:00	7/30/2019 13:00
19	9/2/2010 16:00	7/12/2011 16:00	7/17/2012 13:00	7/15/2013 17:00	7/23/2014 15:00	7/20/2015 13:00	8/12/2016 18:00	6/13/2017 13:00	9/5/2018 15:00	7/29/2019 14:00
20	9/1/2010 16:00	7/21/2011 20:00	7/18/2012 11:00	7/17/2013 13:00	7/8/2014 13:00	7/29/2015 13:00	7/22/2016 14:00	8/22/2017 14:00	8/6/2018 15:00	7/20/2019 13:00

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Day of the Week – Peak Load Hours

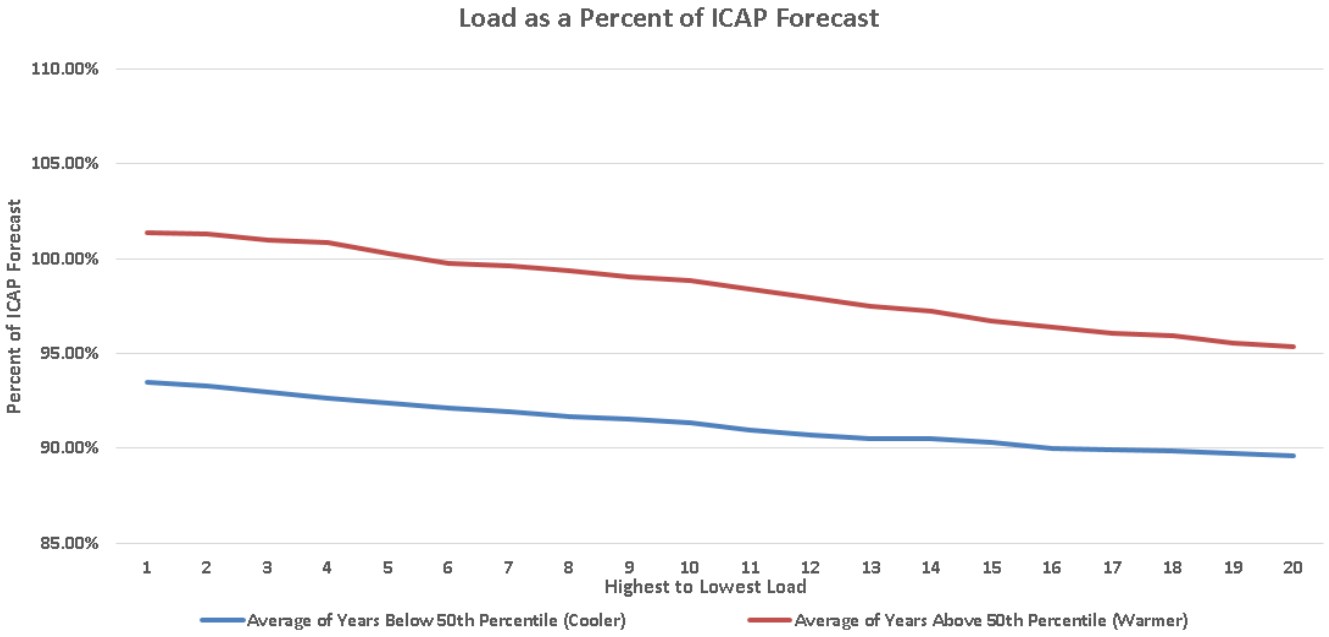
- The table below shows the day of the week upon which each peak load hour fell. Note that peak load hours overwhelmingly fall on weekdays, consistent with design conditions.

Day of Week for each Peak Load Hour										
Observation (Peak Load Hour)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	Tuesday	Friday	Thursday	Friday	Tuesday	Wednesday	Friday	Wednesday	Wednesday	Saturday
2	Tuesday	Friday	Thursday	Friday	Tuesday	Tuesday	Friday	Wednesday	Wednesday	Saturday
3	Tuesday	Friday	Thursday	Friday	Tuesday	Tuesday	Thursday	Friday	Tuesday	Monday
4	Tuesday	Friday	Wednesday	Friday	Tuesday	Wednesday	Thursday	Friday	Wednesday	Monday
5	Tuesday	Friday	Tuesday	Friday	Tuesday	Wednesday	Thursday	Thursday	Tuesday	Sunday
6	Wednesday	Friday	Tuesday	Thursday	Tuesday	Tuesday	Friday	Friday	Wednesday	Saturday
7	Wednesday	Thursday	Wednesday	Thursday	Tuesday	Tuesday	Thursday	Thursday	Tuesday	Sunday
8	Wednesday	Thursday	Tuesday	Thursday	Wednesday	Wednesday	Friday	Thursday	Wednesday	Saturday
9	Wednesday	Thursday	Thursday	Thursday	Tuesday	Monday	Friday	Wednesday	Monday	Monday
10	Wednesday	Thursday	Wednesday	Thursday	Wednesday	Monday	Thursday	Thursday	Monday	Tuesday
11	Tuesday	Friday	Tuesday	Friday	Wednesday	Monday	Friday	Wednesday	Wednesday	Tuesday
12	Tuesday	Thursday	Tuesday	Wednesday	Tuesday	Monday	Friday	Friday	Monday	Sunday
13	Wednesday	Thursday	Wednesday	Wednesday	Wednesday	Tuesday	Friday	Tuesday	Monday	Saturday
14	Wednesday	Friday	Thursday	Wednesday	Tuesday	Monday	Friday	Tuesday	Tuesday	Tuesday
15	Tuesday	Friday	Wednesday	Wednesday	Tuesday	Monday	Thursday	Monday	Wednesday	Sunday
16	Tuesday	Thursday	Thursday	Friday	Tuesday	Wednesday	Saturday	Tuesday	Monday	Tuesday
17	Wednesday	Thursday	Wednesday	Thursday	Wednesday	Monday	Thursday	Thursday	Tuesday	Monday
18	Thursday	Friday	Wednesday	Monday	Wednesday	Tuesday	Saturday	Monday	Monday	Tuesday
19	Thursday	Tuesday	Tuesday	Monday	Wednesday	Monday	Friday	Tuesday	Wednesday	Monday
20	Wednesday	Thursday	Wednesday	Wednesday	Tuesday	Wednesday	Friday	Tuesday	Monday	Saturday

Warmer and Cooler Years

- The years 2010 to 2019 were divided into warmer and cooler years according to whether the NYCA Peak Day CTHI was above or below the 50th percentile. The top peak load hours of warmer years are closer to the ICAP forecast than those of cooler years.

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



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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