Alternative Load Shape Adjustment Method

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Agenda

- Background
- Overview of the Alternative Method
- Impact Assessment
- Next Steps

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Background

Background

- During the ICS meeting on 2/27/2024, ICS indicated that a comprehensive improvement of the load modeling should be developed before proceeding with efforts to explicitly model the Behind-the-Meter (BTM) solar as a supply resource
- During the ICS meeting on 4/3/2024, the NYISO presented the load shapes comparison analysis and demonstrated that the current Installed Reserve Margin (IRM) load shape adjustment procedure does not necessarily overrepresent high load hours compared to the actual load observed in operations
  - Although the current load shape adjustment method does not show immediate issues, the NYISO acknowledges that exploration of potential enhancements is warranted
    - Changes in the future load profiles are expected due to heating electrification and electric vehicle demand
- As a potential alternative method, the NYISO suggested adjusting load shapes to align the seasonal peak forecasts with the energy forecast distributed at monthly and zonal level
  - Aligns with the methodology used in the NYISO's Reliability Needs Assessment (RNA)
- ICS expressed interest in further impact assessment and risk analysis of the alternative load shape adjustment method suggested by the NYISO

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Overview of the Alternative Method

Overview of the Adjustment Methods

Current Load Adjustment Method

- **Non-Coincident Peak (NCP) Ratio Scaling**
  - The historical zonal load shapes are scaled by multiplying by the corresponding zonal NCP adjustment ratio
  - The zonal NCP ratio is calculated for each zone and all hours in the zone are multiplied by the same ratio
- **Coincident Peak (CP) Adjustment**
  - The historical New York Control Area (NYCA) peak as the determined CP hour, and adjust the historical zonal load values to match the forecasted CP by zone
  - Adjacent hours are adjusted to smoothen the load shape around the peak
- **G-J Locality Peak Adjustment**
  - The historical G-J Locality peak as the determined G-J peak hour, and adjust the historical zonal load values to match the forecasted G-J Locality peak
- **External Load Adjustment**
  - The external load shapes are adjusted to ensure that the top three summer load days occur at the same time as the NYCA's

Alternative Load Adjustment Method

- **Energy Scaling**
  - The historical zonal load shapes are scaled to match the corresponding zonal energy forecast from the Load & Capacity Data report (Gold Book)
  - The energy forecast for each zone is distributed at the monthly level, based on the most recent 5-year historical monthly energy distribution
- **Seasonal Peak Adjustment**
  - Based on the most recent 5-year historical ranked monthly peak for each zone, the peak demand for each month for each zone is scaled according to the summer and winter peak
  - The ranked method ensures the summer peaks occur in July, and the winter peaks occur in January
  - Hours near the peak hours are adjusted to smoothen the load shape
- **External Load Adjustment**
  - The external load shapes are adjusted to ensure that the top three summer and top three winter load days occur at the same time as the NYCA's

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Energy Adjustment: Alternative Method

- **Monthly Energy Distribution**
  - Energy distribution represents the fraction of annual energy expected in each given month
  - Calculated based on most recent 5 years of historical monthly energy distribution
  - Monthly energy distribution would be updated every year
    - For 2025-2026 IRM study, the energy ratio would be updated to reflect the 2019-2023 data

- **Monthly Energy Adjustment**
  - 2023 Gold Book zonal annual energy forecast is used as the target annual energy requirement

Annual Energy by Zone (GWh)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2024	14,950	10,730	15,300	5,940	7,340	11,650	9,030	2,820	5,590	48,980	19,810	152,140

  - Based on the monthly energy distribution, the zonal target annual energy is distributed at the monthly level
  - Ratio of the target monthly energy to zonal monthly energy of historical (2013, 2017, and 2018) net load shapes determined as follows:

$$r_{(zone,month)} = \frac{target\ energy_{(zone,month)}}{historical\ energy_{(zone,month)}}$$

  - Multiply all hours in the target month of each zone by the respective ratio $r_{(zone,month)}$

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Peak Adjustment: Alternative Method

- **Monthly Peak Adjustment Ratios**
  - The monthly peak ratios represent the monthly peak as a fraction of the seasonal peak
  - Based on most recent 5 years of historical monthly peak demand
  - January and July are set at 100% of the respective peak forecast, as they are the expected winter and summer peak months respectively
  - Winter period monthly ratios (January-April and November-December) are represented as a fraction of the winter peak forecast
  - Summer period monthly ratios (May-October) are represented as a fraction of the summer peak forecast
  - The ratios are ranked to preserve the expected distribution of the monthly peaks
    - For example, August is the 2nd highest for the summer period
  - Monthly peak ratios would be updated every year
    - For 2025-2026 IRM study, the energy ratios would be updated to reflect the 2019-2023 data

- **Winter Peak Forecast**
  - 2023 Gold Book non-coincident peak, coincident peak, and G-J Locality winter peak forecasts + Behind-the-Met Net Generation (BTM:NG) resources peak load values are used for the target winter peak values for January

Winter Peak Forecasts (MW)

2024-25	A	B	C	D	E	F	G	H	I	J	K	NYCA	G-J
NCP	2,175.2	1,754.6	2,805.1	910	1,351.8	1,925	1,545	511	896	7,665.2	3,352.9		
CP	2,151.2	1,740.6	2,799.1	891	1,327.8	1,914	1,534	500	886	7,595.2	3,339.9	24,678.8	
G-J Locality							1,531	498	886	7,640.2			10,555.2

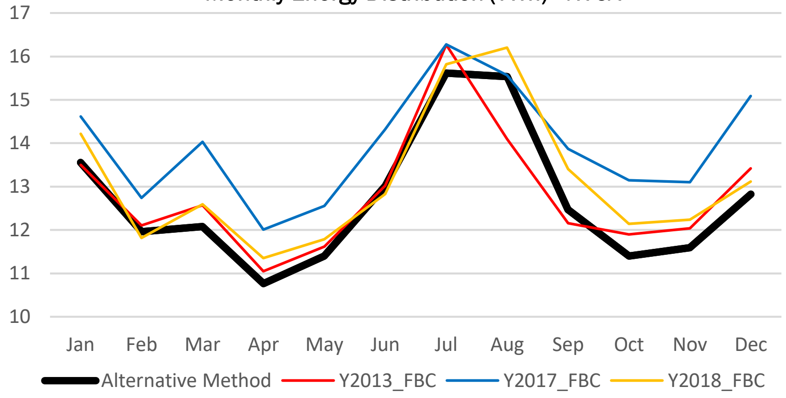
Key Changes

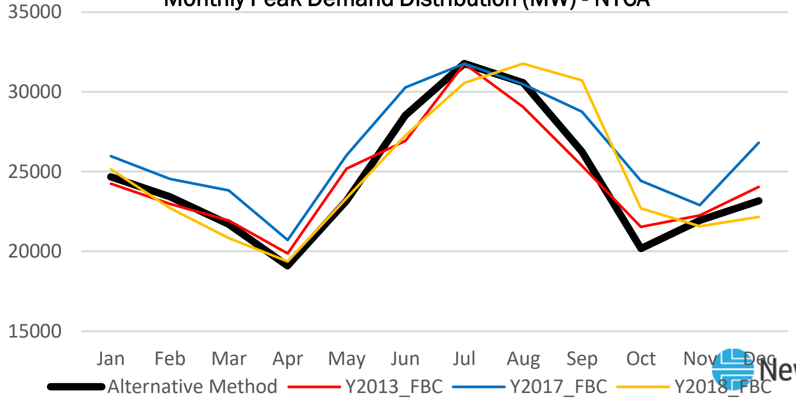
- **For the 2024-2025 IRM study, the alternative load adjustment method would have resulted in a greater decrease to the annual energy requirement for Load Zone J compared to Load Zone K and Load Zones A-F**
  - The current load adjustment method does not capture the zonal energy requirement difference; hence the alternative method would be more representative of the actual load distribution observed in operations
  - Due to the rounding method and the peak load adjustments, small variances in modeled energy were observed between the two methods

Modeled Zonal Annual Energy (TWh)

	Y2013				Y2017				Y2018			
	NYCA	Zone A-F	Zone J	Zone K	NYCA	Zone A-F	Zone J	Zone K	NYCA	Zone A-F	Zone J	Zone K
2024-2025 IRM FBC	153.75	65.49	51.21	19.59	167.3	71.71	55.25	21.04	157.51	65.17	53.92	19.99
Alternative Method	152.24	65.97	48.99	19.83	152.25	65.98	48.99	19.83	152.23	65.97	48.99	19.83
Delta	*-1.51*	*0.48*	*-2.22*	*0.24*	*-15.05*	*-5.73*	*-6.26*	*-1.21*	*-5.28*	*0.80*	*-4.93*	*-0.16*

- **NYCA level monthly energy and peak load values would generally be lowered using the alternative method**





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Impact Assessment

Impact Assessment

- The NYISO conducted a sensitivity analysis (Tan45) of using the alternative load adjustment method on the 2024-2025 IRM Final Base Case (FBC) with a 23.1% IRM

	IRM	J LCR	K LCR	G-J Locality
2024-2025 IRM FBC	23.10%	72.73%	103.21%	84.58%
Alternative Load Adjustment Method	21.70%	72.25%	103.01%	84.22%
Delta	*-1.40%*	*-0.48%*	*-0.20%*	*-0.36%*

- Using the alternative load adjustment method, the IRM would decrease by 1.4%
  - The primary driver of the impact is attributed to the decreased total energy requirement modeled in the study
- The locational capacity requirements would decrease by 0.2-0.5% using the alternative method
  - Using the alternative load adjustment method, the modeled annual energy requirement for Load Zone J would decrease by a greater margin compared to the NYCA's annual energy reduction in Load Forecast Uncertainty (LFU) bins 1-2

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Hourly Risk Analysis

- **The NYISO conducted an hourly risk analysis for the 2024-2025 IRM FBC to better understand the impact of the alternative load adjustment method**
- **The hourly loss of load expectation (LOLE) distribution shows a small change in distribution**
  - The high-risk hours would remain unchanged, but the proportion of expected risk during the high-risk hours was greater using the alternative method
- **Based on the LFU bins 1-4 average hourly load delta, a greater load reduction in modeled load was observed during the evening hours (HB19-HB21) using the alternative method**
  - A smaller reduction in modeled load was observed during the high-risk hours (HB15-HB17), and early morning hours (HB00-HB05)

Hourly LOLE Distribution

	2024-2025 FBC	Alternative Method
HB00	0%	0%
HB01	0%	0%
HB02	0%	0%
HB03	0%	0%
HB04	0%	0%
HB05	0%	0%
HB06	0%	0%
HB07	0%	0%
HB08	0%	0%
HB09	0%	0%
HB10	0%	0%
HB11	1%	1%
HB12	3%	2%
HB13	6%	6%
HB14	7%	6%
HB15	13%	13%
HB16	20%	21%
HB17	21%	23%
HB18	12%	13%
HB19	6%	6%
HB20	7%	6%
HB21	4%	3%
HB22	0%	0%
HB23	0%	0%

Average Hourly Load Delta (MW)

	Bin 1	Bin 2	Bin 3	Bin 4
HB00	-153.1	-148.3	-558.8	-538.8
HB01	-144.2	-139.8	-526.9	-508.2
HB02	-139.4	-135.1	-506.9	-488.9
HB03	-136.7	-132.4	-496.4	-478.8
HB04	-135.8	-131.5	-496.3	-478.7
HB05	-141.2	-136.8	-519.2	-500.8
HB06	-179.2	-173.5	-570.9	-550.5
HB07	-228.7	-221.2	-620.9	-598.4
HB08	-223.7	-216.5	-639.4	-616.1
HB09	-197.5	-191.2	-631.3	-608.3
HB10	-183	-177.2	-624.6	-601.7
HB11	-175	-169.5	-621	-598.3
HB12	-167.9	-162.6	-617.9	-595.3
HB13	-161.6	-156.5	-618	-595.3
HB14	-153.5	-148.7	-619.5	-596.7
HB15	-136.9	-132.7	-612.4	-589.7
HB16	-117.4	-114	-587.3	-565.1
HB17	-115.8	-112.4	-566.5	-544.5
HB18	-205.7	-199.2	-637.8	-612.7
HB19	-286.5	-277	-686.1	-659.2
HB20	-334.5	-323.4	-718.2	-690.5
HB21	-279.4	-270.2	-714.9	-688.2
HB22	-207.1	-200.5	-666.1	-641.8
HB23	-172.5	-167.1	-607.4	-585.6

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Additional Analysis

	2024-2025 FBC	Alternative Method	*Delta*
LOLH (hrs/yr)	0.378	0.345	*-0.033*
EUE (MWh)	224.98	215.84	*-9.14*
Normalized EUE "Simple Method" (ppm)	1.479	1.419	*-0.060*
Normalized EUE "By Bin Method" (ppm)	1.332	1.277	*-0.055*
EOP Calls			
JAN	0.000	0.000	*0.0*
FEB	0.000	0.000	*0.0*
MAR	0.000	0.000	*0.0*
APR	0.000	0.000	*0.0*
MAY	0.002	0.001	*-0.001*
JUN	0.366	0.404	*0.038*
JUL	2.614	3.750	*1.136*
AUG	3.511	2.742	*-0.769*
SEP	1.591	0.054	*-1.537*
OCT	0.001	0.000	*-0.001*
NOV	0.000	0.000	*0.0*
DEC	0.003	0.000	*-0.003*
Total EOP Calls	8.088	6.952	*-1.136*

- **For the 2024-2025 IRM FBC, both the Expected Unserved Energy (EUE) and the total number of Emergency Operating Procedure (EOP) calls decreased using the alternative method**
  - The primary driver is the reduced total energy in the model
- **The EOP calls during June and July increased using the alternative method**
  - The alternative load adjustment method would ensure that the modeled summer peaks occur in July
    - The current load adjustment method preserves the historical peak day/hour, and the 2018 shape's (LFU bin 3-4) peak load occurs in August

Summary

- **The alternative load shape adjustment method would capture seasonal peaks and annual energy distributed at zonal and monthly level**
  - The alternative method appears to be more representative of the actual load distribution observed in operations
  - Based on the 2024-2025 IRM FBC, the alternative method produces a greater reduction in the annual energy requirement for Load Zone J compared to Load Zone K and Load Zones A-F
- **The alternative load shape adjustment method ensures the summer and winter peaks occur in July and January respectively**
  - Consequently, the alternative method would increase the EOP calls in July
  - The external load shapes are adjusted to ensure that the top three summer and top three winter load days occur at the same time as the NYCA's
- **Based on the assessment of the potential impact for the 2024-2025 IRM FBC, use of the alternative load shape adjustment produced decreases to the IRM and locational capacity requirements using the Tan45 methodology**
  - The primary driver of the impact is attributed to the decreased total energy requirement modeled in the study using the alternative method
  - The alternative method also reduced the total number of EOP calls

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Next Steps

Next Steps

- The NYISO will continue to review the alternative load shape adjustment method with inputs from the ICS
- The NYISO proposes to revisit the previously explored explicit modeling of BTM solar in the IRM model to understand the combined impact of the alternative load shape adjustment method with the explicit modeling of BTM solar resource
- The NYISO will provide ongoing updates to the ICS to share progress and solicit feedback

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Questions?

Our Mission & Vision

Mission

Ensure power system reliability and competitive markets for New York in a clean energy future

Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation

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