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Independent System Operator

Winter Dynamic LFU

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April 18, 2024, KCC

Agenda

- **Current LFU model**
- **Winter dynamic LFU: planning horizon study year 2 through 10**
  - Does not impact the IRM models
- **MARS Models Testing**
  - Goal to implement in the 2024 RNA Base Case

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Current LFU MARS Model

Load Forecasts: Energy and Peak Demand

- **Energy (MWh) and peak demand (MW), are scaled to match the applicable Gold Book summer and winter forecasts for each Study Year**
- **The Gold Book baseline forecast includes:**
  - Upward adjustments for increased usage of electric vehicles and other electrification, as well as Large Loads forecasts.
  - Downward adjustments for the impacts of energy efficiency trends, behind-the-meter solar PV and other distributed energy resources.
  - The impacts of net electricity consumption of all energy storage units are added to the baseline energy forecast, while the peak-reducing impacts of BtM energy storage units are deducted from the baseline peak forecasts.
- **The planning MARS models use gross load forecasts (with the BtM solar reductions added back) in order to discretely model the BtM solar as 5 years of 8760h MW shapes, randomly picked each replication**

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Load: Load Forecast Uncertainty (LFU)

- LFU is applied hourly, for all hours and load bins
- The LFU gives the MARS program information regarding 7 load levels (3 loads lower and 3 loads higher than the median peak) and their respective probabilities of occurrence
- Certain representative historical shapes are used for each of the 7 load bins, selected based on a comprehensive analysis of 20 years of historical shapes
  - LFU Bins 1 and 2: 2013
  - LFU Bins 3 and 4: 2018
  - LFU Bins 5 to 7: 2017

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Load: Load Forecast Uncertainty (LFU)

- **For each modeled hour and zone, MARS calculates an average loss of load expectation for the capability year for each of the 7 load levels**
  - 2,000 replications are simulated for each of the 7 load bins for each study year (14,000 simulations for one study year) in order to determine the expected NYCA LOLE (event-days/year) for each study year and compare it against the 0.1 event-days/year NYSRC and NPCC criterion
- **MARS uses this information to evaluate a probability weighted-average LOLE for each area**
- **Recognizing the unique LFU nature of individual NYCA zones, the summer LFU model is subdivided into five separate areas:**
  - New York City (Zone J), Long Island (Zone K), Zones H and I, Zones F and G, and the rest of New York State (Zones A-E)
- **The load forecast uncertainty (LFU) model captures the uncertainty in future peak load levels due to the variation in peak-day weather conditions**
  - Preparation of the LFU model is coordinated by the NYISO in collaboration with NY Transmission Owners

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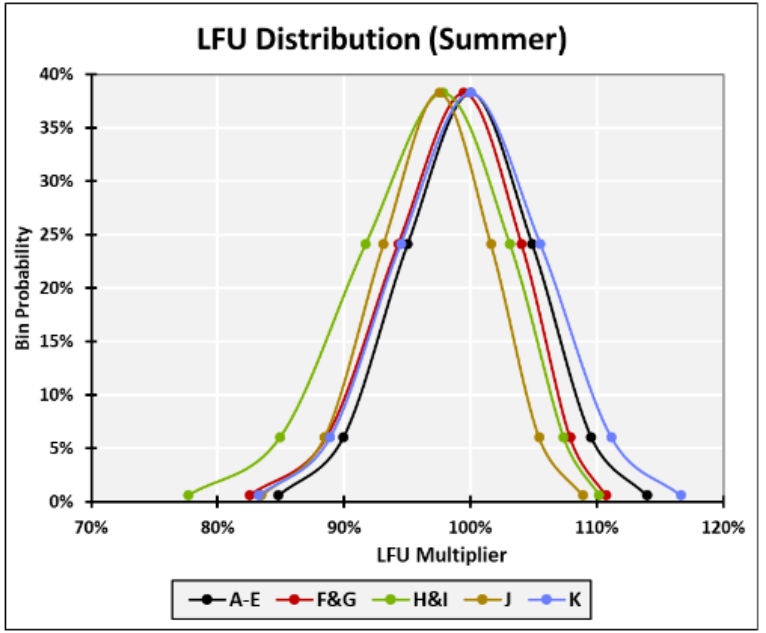
Example: 2023 LFU Distribution by Bin and Zones

Additional LFU info here: May 26, 2023 LFTF: link

			New Recommended LFU Multipliers					
			Summer					Winter
Bin	Bin z	Bin Probability	A-E	F&G	H&I	J	K	NYCA
Bin 1	2.74	0.62%	113.93%	110.69%	110.18%	108.88%	116.62%	110.37%
Bin 2	1.79	6.06%	109.54%	107.86%	107.34%	105.42%	111.14%	106.37%
Bin 3	0.89	24.17%	104.86%	104.04%	103.09%	101.61%	105.52%	102.75%
Bin 4	0.00	38.29%	100.00%	99.46%	97.81%	97.51%	100.00%	99.42%
Bin 5	-0.89	24.17%	95.00%	94.29%	91.70%	93.12%	94.48%	96.29%
Bin 6	-1.79	6.06%	89.91%	88.61%	84.93%	88.45%	88.89%	93.30%
Bin 7	-2.74	0.62%	84.79%	82.53%	77.65%	83.48%	83.27%	90.41%



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Winter Dynamic LFU

For Reliability Planning Study Years 2 to 10

Dynamic Winter LFU Considerations

- The composition of winter peak loads over the next decade is expected to change significantly as the saturation of electric vehicles and heating electrification technologies (such as heat pumps) increase
- Winter LFU multipliers for the first winter of the study period (winter 2024-25) match those calculated using recent winter load and weather data
- Over the remainder of the study period, dynamic winter LFU multipliers are calculated, reflecting the increasing share and load behavior of EV charging load, heating electrification, and large load projects

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Dynamic Winter LFU Considerations, *cont.*

- Large load projects have generally constant load levels regardless of the temperature level
- EV charging load is higher on colder days due to reduced battery efficiency and EV range in cold temperatures
- On a cold winter peak day, electric heating impacts are significantly higher than on a typical winter peak day
- The dynamic winter LFU multipliers increase over the study horizon, reflecting the increasing winter weather sensitivity due to additional EV charging and electric heating load, but mitigated to some extent due to the increase in large loads (especially in early years)

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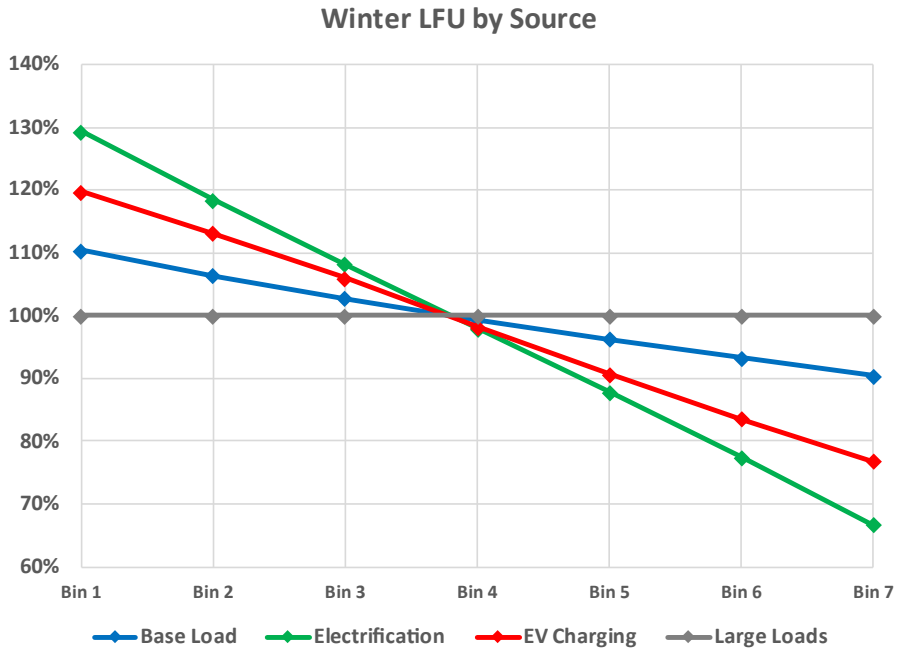
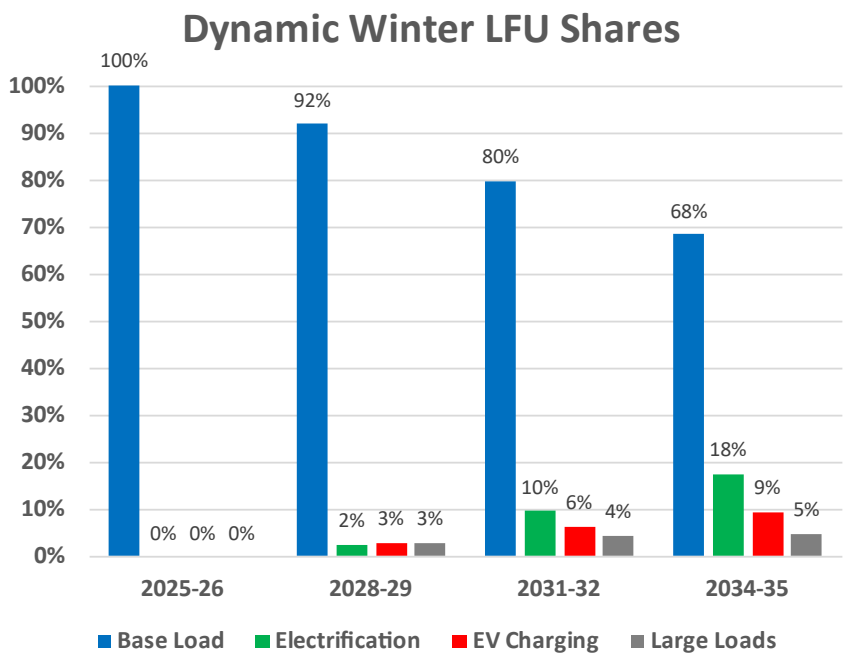
Dynamic Winter LFU Components





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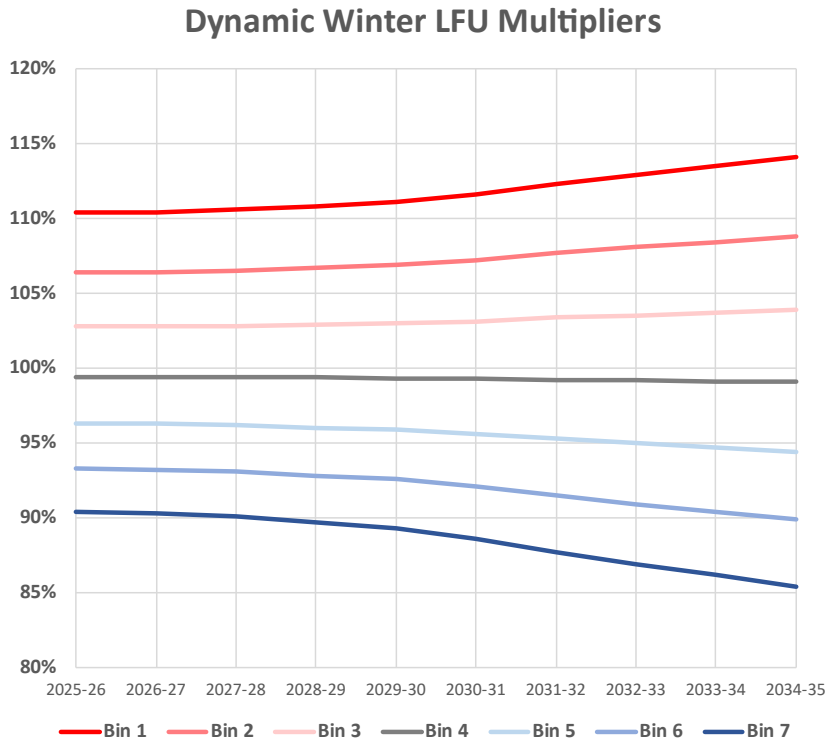
Dynamic Winter LFU Values

Winter Dynamic LFU

Winter	Bin 1	Bin 2	Bin 3	Bin 4	Bin 5	Bin 6	Bin 7	Bin 1 MW*
2024-25	110.4%	106.4%	102.8%	99.4%	96.3%	93.3%	90.4%	26,300
2025-26	110.4%	106.4%	102.8%	99.4%	96.3%	93.3%	90.4%	26,700
2026-27	110.4%	106.4%	102.8%	99.4%	96.3%	93.2%	90.3%	27,300
2027-28	110.6%	106.5%	102.8%	99.4%	96.2%	93.1%	90.1%	27,900
2028-29	110.8%	106.7%	102.9%	99.4%	96.0%	92.8%	89.7%	28,500
2029-30	111.1%	106.9%	103.0%	99.3%	95.9%	92.6%	89.3%	29,300
2030-31	111.6%	107.2%	103.1%	99.3%	95.6%	92.1%	88.6%	30,200
2031-32	112.3%	107.7%	103.4%	99.2%	95.3%	91.5%	87.7%	31,300
2032-33	112.9%	108.1%	103.5%	99.2%	95.0%	90.9%	86.9%	32,600
2033-34	113.5%	108.4%	103.7%	99.1%	94.7%	90.4%	86.2%	34,000
2034-35	114.1%	108.8%	103.9%	99.1%	94.4%	89.9%	85.4%	35,900

**Approximate net (of BTM solar) Bin 1 load level (> 99th percentile), using the 2024 baseline forecast*



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Dynamic Winter LFU Testing Results

Using 2022 RNA Models

Dynamic Winter LFU Testing Results

NYCA LOLE		
Study Year	2022 RNA Base Case LOLE (days/year)	2022 RNA Base Case + Winter Dynamic LFU LOLE (days/year)
2023	0.025	0.025
2024	0.018	0.018
2025	0.024	0.024
2026	0.004	0.004
2027	0.005	0.005
2028	0.004	0.004
2029	0.005	0.005
2030	0.006	0.006
2031	0.010	0.011
2032	0.022	0.027

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Winter Dynamic LFU: Testing Observations

- **Key findings on the 2022 RNA models (Base Cases):**
  - **No significant impact** on NYCA LOLE
  - There were very few winter events in the 2022 RNA 10-year planning model horizon. Summer events are still the main driver of LOLE in this model.
- **Note: it is expected that the impact is higher for a model closer to criterion**

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Questions?

Roles of the NYISO

- **Reliable operation of the bulk electricity grid**
  - Managing the flow of power on 11,000 circuit-miles of transmission lines from hundreds of generating units
- **Administration of open and competitive wholesale electricity markets**
  - Bringing together buyers and sellers of energy and related products and services
- **Planning for New York's energy future**
  - Assessing needs over a 10-year horizon and evaluating projects proposed to meet those needs
- **Advancing the technological infrastructure of the electric system**
  - Developing and deploying information technology and tools to make the grid smarter

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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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