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Independent System Operator

BTM Solar Modeling – LFU Impact Assessment

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Agenda

- Background
- Supplemental Impact Assessment
- Next Steps
- Appendix

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Background

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Background

- **With the expectation of increasing behind-the-meter (BTM) solar penetration over time, it is important to monitor its impact on the system**
  - Therefore, the ICS expressed interest to explore ways to model BTM solar explicitly in the installed reserve margin (IRM) study
- **During the ICS meeting on 1/30/2024, the NYISO presented potential methodologies and preliminary impact assessments of modeling BTM solar explicitly in the IRM database (see Appendix for additional information)**
  - On the load side, BTM solar is modeled with the 2013, 2017, and 2018 gross load shapes adjusted to the gross peak load forecast (IRM peak load forecast + BTM solar peak load delta by zone)
  - Two different resource side approaches were explored for modeling BTM solar units
    - **Option 1:** Modeling BTM solar units using the past 5 years of hourly profiles and letting GE MARS randomly select the profile during the simulation (~3.2% IRM increase based on the preliminary assessment results)
    - **Option 2:** Modeling BTM solar units using the hourly profiles that are aligned with the load shapes for each Load Forecast Uncertainty (LFU) bin (~1.8% IRM increase based on the preliminary assessment results)
- **The ICS expressed interest in assessing the potential impacts of different ways to apply LFU multipliers on the BTM solar modeling options**
  - Assessment 1: Isolated impact assessment of the two BTM solar modeling options with no LFU multipliers applied
  - Assessment 2: Updated impact assessment of modeling option 2 with and without LFU multipliers applied to the BTM solar modeled as a resource

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Supplemental Impact Assessment

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BTM Solar Modeling Impact Assessment 1 – No LFU Sensitivity

		IRM	J LCR	K LCR	G-J LCR
With LFUs	2024-2025 FBC	23.10%	72.73%	103.21%	84.58%
	Option 1: Random Selection	26.32% (▲3.22)	73.82% (▲1.09)	106.15% (▲2.94)	85.38% (▲0.80)
	Option 2: Aligning Solar	24.93% (▲1.83)	73.25% (▲0.52)	104.96% (▲1.75)	84.96% (▲0.38)
No LFUs	2024-2025 FBC	13.97%	71.14%	98.24%	83.41%
	Option 1: Random Selection	16.47% (▲2.50)	71.89% (▲0.75)	100.96% (▲2.72)	83.97% (▲0.56)
	Option 2: Aligning Solar	15.93% (▲1.96)	71.26% (▲0.12)	99.43% (▲1.19)	83.50% (▲0.09)

- **With modeling option 1, removing the application of LFU multipliers reduces the previously observed impact on IRM by ~0.7%**
  - The difference is attributed to the current set of LFU multipliers, which were developed for the net load shapes (i.e., load shapes that reflect the embedded impact of BTM solar)
    - With modeling option 1, the LFU multipliers are not applied to the resource side modeling of BTM solar
- **With modeling option 2 removing the application of LFU multipliers has a limited impact on previously observed impact on the IRM (change of ~0.1% to the previously observed impact)**
  - This is because the LFU multiplies are applied to the solar production shapes (i.e., resource side modeling of BTM solar) under modeling option 2
  - Implies that, for modeling option 2, the LFU multipliers do not appear to be a primary driver of the observed impact on the IRM

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BTM Solar Modeling Impact Assessment 2 – No LFU in BTM Solar Generation

- **For modeling option 2, the preliminary impact assessment presented at the 1/30/2024 ICS meeting included the application of LFU multipliers to the resource side modeling of BTM solar**
  - A supplemental impact assessment was conducted removing the application of LFU multipliers from the resource side modeling of BTM solar under modeling option 2

		IRM	J LCR	K LCR	G-J LCR
2024-2025 FBC		23.10%	72.73%	103.21%	84.58%
Option 2: Aligning Solar	Solar Production with LFU	24.93% (▲1.83)	73.25% (▲0.52)	104.96% (▲1.75)	84.96% (▲0.38)
	Solar Production without LFU	25.42% (▲2.32)	73.29% (▲0.56)	105.08% (▲1.87)	84.99% (▲0.41)
	Delta with vs. without LFU	▲0.49	▲0.04	▲0.12	▲0.03

- **With modeling option 2, removing the application of LFU multipliers from the resource side modeling of BTM solar further increases the previously observed impact on the IRM by ~0.5%**
  - Without LFU multipliers applied to the resource side modeling, BTM solar production is underrepresented compared to the underlying gross load shapes that includes the application of LFU multipliers

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Next Steps

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Observations

- **The supplemental analysis indicates that the application of the current LFU multipliers is not likely a primary driver of the previously observed impacts on the IRM**
- **Changes to the current load modeling procedures are needed to proceed with an explicit modeling of BTM solar as a resource to mitigate the potential for unintended impacts on the IRM**
  - Improvement of the current load shape adjustment procedures is already identified as a priority for 2025 in the Resource Adequacy Modeling Improvement Strategic Plan
  - Development of potential interim solutions could be considered to facilitate proceeding with efforts to explicitly model BTM solar for the 2025-2026 IRM study
    - For example, the NYISO Reliability Needs Assessment (RNA) utilizes a load shape adjustment process that could be further evaluated for potential use in the IRM model on an interim basis
      - The procedures employed in conducting the RNA account for seasonal peaks, as well as annual energy requirements distributed at monthly and zonal levels
    - Manually adding BTM solar production shapes on top of the IRM load shapes could also be considered as a potential interim solution
      - A manual adjustment could potentially be used in conjunction with the RNA's load adjustment method

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Next Steps

- The NYISO will continue to explore the BTM solar modeling methodology and discuss the options and potential impacts with ICS
- The NYISO will continue working with ICS towards a recommendation for the BTM solar modeling methodology to be used in the 2025-2026 IRM study over the next few months
  - The recommendation should also include proper adjustment on the load side

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Appendix

(Slides Presented at the 1/30/2024 ICS Meeting)

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Overview of Alternative Methodologies

- **To model BTM solar explicitly adjustments need to be made on both resource side and load side to properly account for the BTM solar impact in MARS simulations**
  - On the load side, gross load shapes and gross peak load forecast were developed with BTM solar impact backed out from the current inputs
    - For 2024-2025 study, 1,720 MW of BTM solar peak impact is estimated
  - On the resource side, NYISO explored the two approaches to explicitly model BTM solar
- **With BTM solar being modeled explicitly in the MARS model, the calculation for the IRM should remain unchanged**
  - Net demand forecast should continue to be used as the denominator of the IRM calculation
  - The MW of BTM solar would not be counted in the total ICAP in the numerator of the IRM calculation
  - The derating factor of BTM solar would not be included in the IRM zonal derating factors as a part of the shifting methodology

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Treatment on Load Side

- **On the load side, BTM solar would be modeled with the following characteristics:**
  - 2013, 2017 and 2018 gross load shapes (with the estimated BTM solar impact added back)
    - LFU Bin 1 & 2: 2013
    - LFU Bin 3 & 4: 2018
    - LFU Bin 5 – 7: 2017
  - Gross peak load forecast would be developed to be used in load shape adjustment
    - Gross peak load forecast = IRM Coincident, Non-Coincident, and G-J peak
      + BTM solar peak load delta by zone
      - ❖ BTM Solar peak load deltas represent estimated peak load impact of BTM solar penetration

BTM Solar Peak Load Delta (MW)												
Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2024	139	169	280	20	188	235	205	31	35	140	278	1,720

  - Subject to existing LFU multipliers

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Treatment on Resource Side

- **On the resource side, BTM solar would be modeled with the following generic characteristics:**
  - Modeled as Demand Side Management (DSM) units with hourly profiles ("BTM solar units")
  - MW will be aggregated to one BTM solar unit per zone
  - The NYISO's BTM solar data would be utilized to develop the hourly profiles for BTM solar units. Inputs include:
    - BTM solar PV Annual Energy Reduction (Gold Book Baseline Forecast Table I-9b)
    - Representative hourly values of BTM solar by zone (energy normalized)
      - To be multiplied by the Gold Book Table I-9b for hourly production in MW for the projected year
- **The NYISO explored two different approaches for modeling the BTM solar units**
  - Modeling the BTM solar units using the past 5 years of hourly profiles and let MARS randomly select the profile during the simulation
  - Modeling the BTM solar units using the hourly profiles that are aligned with the load shapes for each LFU bins

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Modeling Option 1: Random Selection of Solar Production Shapes

- **BTM solar units would be modeled using the most recent 5 years of historical hourly production shapes**
  - 2018 – 2022 shapes used for the impact assessment presented herein
    For 2025-2026 IRM study, 2019 – 2023 shapes would be used
  - One of the historical shapes is chosen randomly for each replication during the MARS simulations
    - The selection will be consistent with the selection of the other DSM resources

- **Pros**
  - Probabilistic study approach
    - Aligns with NYISO Reliability Needs Assessment (RNA) study modeling method
  - Provides a representation for the variability of solar production
  - Consistent with existing renewable resources' modeling in the IRM study

- **Cons**
  - May result in a less accurate representation of load and weather correlation
    - High load days during summer should correlate to higher solar production
  - May overstate the variability of solar production
  - Selected solar shapes are applied to all LFU bins
    - Consistent with all DSM shape selection

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Modeling Option 2: Aligning BTM Solar Shapes to Load Shapes

- **BTM solar units are modeled using 2013, 2017, and 2018 historical production shapes**
  - Solar shapes are aligned with the load shapes without random selection
    - e.g., the 2013 BTM solar shapes will be applied only the LFU Bin 1 and 2, where the 2013 load shape is applied
- **Solar production shapes are subject to LFU multipliers**

- **Pros**
  - Consistent with the current IRM study modeling construct
    - The current IRM study uses BTM solar embedded in load shapes
  - May provide more accurate representation of load and weather correlation

- **Cons**
  - May be less representative of the variability of solar production
    - Removing the randomness in the Monte-Carlo simulation

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Questions?

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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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