New York ISO
Independent System Operator

# EOP Review Whitepaper

## - *Preliminary Recommendations*

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ICS Meeting #279

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# Background and Agenda

- During the past two ICS meetings, the NYISO concluded that the current emergency assistance (EA) assumptions for the IRM study are optimistic and recommended to implement additional topology limits to constraint EA in the IRM simulation
  - The NYISO also recommended not to advance EA prior to EOPs in the IRM model under this EOP whitepaper
- The NYISO conducted analysis to support the development of these additional topology limits and propose a set of initial recommendations to be considered for the IRM study assumptions
- This presentation covers:
  - Data sources and processing for the analysis
  - Analysis to support initial recommendations for summer season
  - Analysis to support initial recommendations for winter season
  - Impact of the initial recommendation
  - Next Steps

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# Data Sources and Processing

# Historical Data for Extra Reserves

- **The NYISO pulled the hourly extra reserve data from the external areas for 2021-April 2023**
  - For IESO and ISONE, hourly surplus reserves, the reserves beyond the reserve requirements, is available directly
    - For IESO, the data is further adjusted to account for impacts from Demand Response program, based on the reported hourly program impact during the peak load days
  - For PJM, the NYISO received the hourly latent reserves data for the mid-Atlantic region within PJM footprint and calculated the hourly surplus reserves by subtracting the mid-Atlantic region's 30-minute reserve requirements
    - The 30-minute reserve requirements for mid-Atlantic region is proportional to the PJM total reserves requirements based on the region's share of the system forecast peak load
  - For HQ, such data is not available. Based on the IRM study assumption, surplus from HQ is assumed to be 280 MW which is the maximum EA that can be transferred across the interface
    - In the IRM model, transfer capability between NYCA and HQ has been reduced by the amount of firm transactions to 280 MW
- **Aligning the hourly extra reserves data with the NYCA hourly load provides the available extra reserves in external areas at corresponding NYCA load levels**
  - Data is separated by seasons

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# NPCC Seasonal Operating Margins

- **The NPCC seasonal assessment provides operating margins for the upcoming season for 3 out of 4 NYCA's neighboring areas**
  - The assessment is conducted with three forecast levels, 50/50 forecast, 90/10 forecast and above 90/10 forecast
    - Operating margins at above 90/10 forecast are only available for the past 2 years
  - PJM is not included in the NPCC seasonal assessments
- **The NYISO collected the past 5-year's operating margins for both summer and winter seasons for Ontario, New England and Quebec and reviewed the historical averages and trends**

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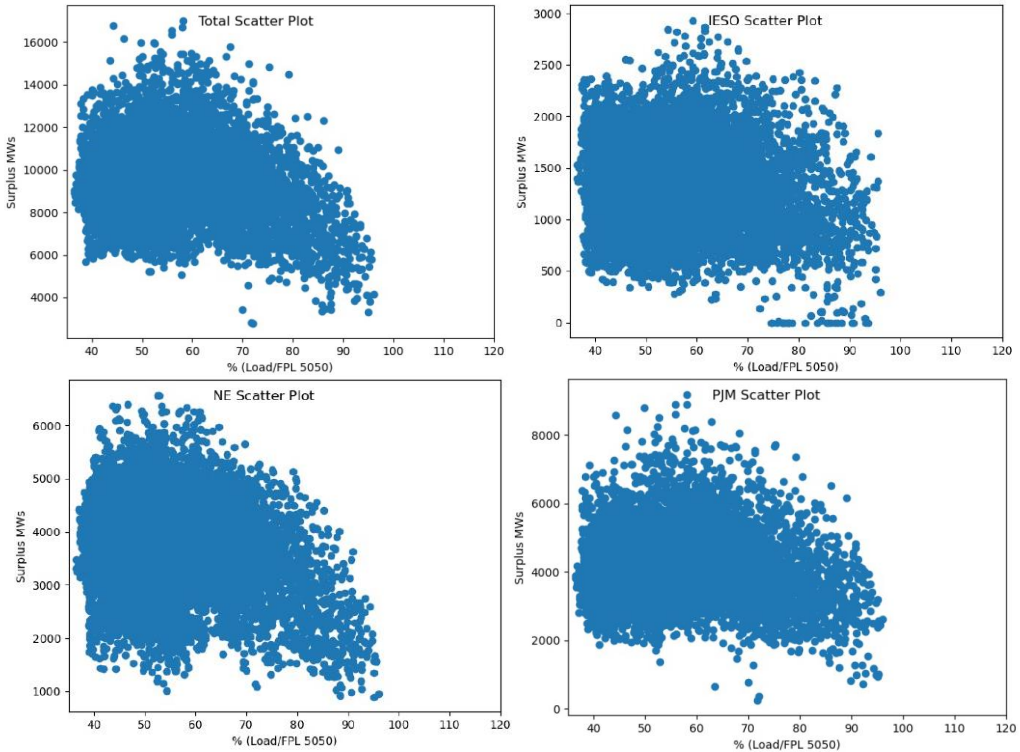
# Analysis for Summer Season Recommendations

# Extra Reserves @ NYCA Peak Load (summer)

- **Extra reserves are plotted against the % of NYCA load**
  - X-axis is the % of NYCA Forecast Peak Load (FPL) under 50/50 weather condition
  - Y-axis is the amount of extra reserves based on the historical data
- **Beyond ~95% of the 50/50 FPL, no historical data is available**

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# Regression Analysis and LFU Bins

- **Regression analysis between extra reserves and the NYCA load was performed to identify the relationship between potential support and the NYCA load level**
  - NYISO arrived at the Basic $X^2$ Regression between extra reserves and NYCA load levels
  - Other regressions were explored but did not yield better relationship between extra reserves and NYCA load
- **The NYISO extended the regression model beyond the PLF 50/50 level based on the LFU structured in the IRM model**
  - Using the LFU multipliers for the 2023-2024 IRM study, the forecast level as % of NYCA coincident peak is calculated for each LFU bins as follows, based on the weighting of coincident peak for each of the forecast regions:

| Zone | A | B | C | D | E | F | G | H | I | J | K | NYCA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Coincident Peak (MW) | 2701.0 | 2190.1 | 2783.3 | 692.0 | 1428.0 | 2412.0 | 2137.0 | 620.0 | 1397.0 | 11083.0 | 5008.1 | 32451.5 |

| Bin | A-E | F&G | H&I | J | K | NYCA Weighted Average LFU Multiplier |
|---|---|---|---|---|---|---|
| Bin 1 | 113.93% | 110.69% | 110.18% | 108.88% | 116.62% | **112%** |
| Bin 2 | 109.54% | 107.86% | 107.34% | 105.42% | 111.14% | **108%** |
| Bin 3 | 104.86% | 104.04% | 103.09% | 101.61% | 105.52% | **104%** |
| Bin 4 | 100.00% | 99.46% | 97.81% | 97.51% | 100.00% | **99%** |
| Bin 5 | 95.00% | 94.29% | 91.70% | 93.12% | 94.48% | **94%** |
| Bin 6 | 89.91% | 88.61% | 84.93% | 88.45% | 88.89% | **89%** |
| Bin 7 | 84.79% | 82.53% | 77.65% | 83.48% | 83.27% | **83%** |

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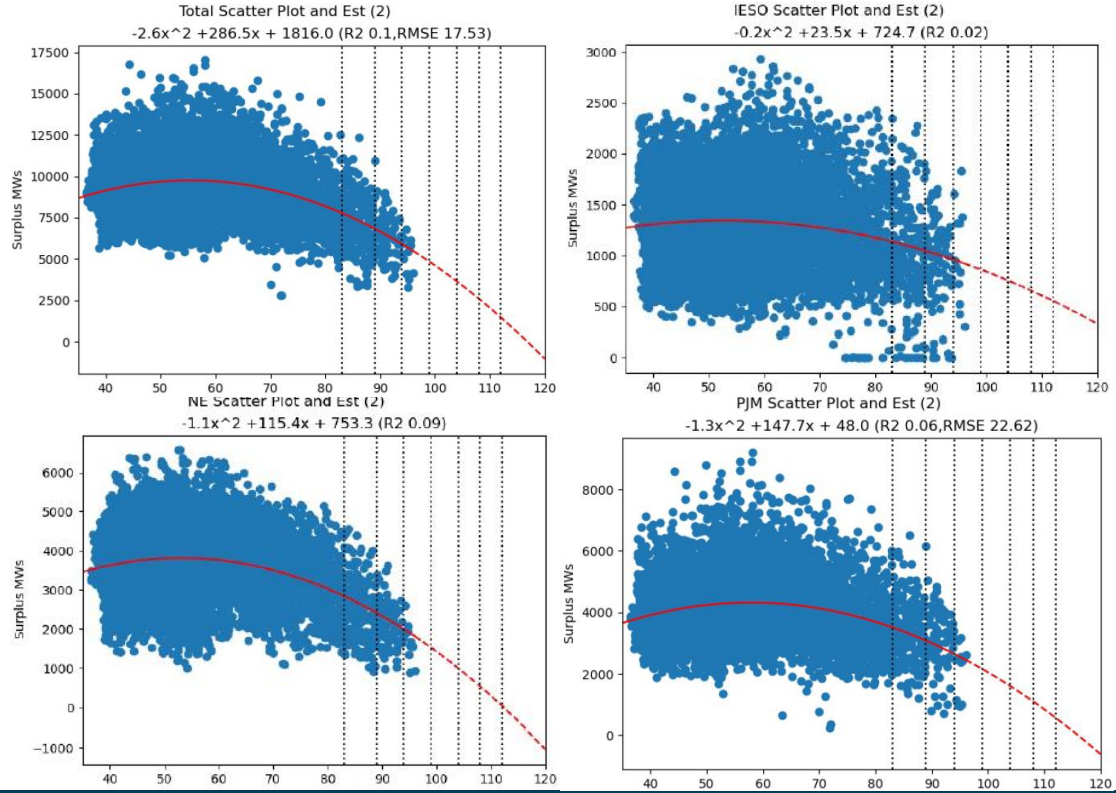
# Extra Reserves @ NYCA Peak Load (summer) *with regression*




Basic $X^2$ Regression line with existing data

Extension of Basic $X^2$ Regression line beyond existing data

Load Levels corresponding to each LFU bins

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# Additional Topology Limits

- Using the LFU bin load levels and the regression analysis on the extra reserves from the external areas, the NYISO arrived at the following topology limits for summer to constraint EA from external areas

| Additional Topology Limits for EA (Summer) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Area | Bin 1 | Bin 2 | Bin 3 | Bin 4 | Bin 5 | Bin 6 | Bin 7 |
| IESO | 550 MW | 660 MW | 750 MW | 860 MW | No additional limits (1950 MW) | | |
| ISONE | 50 MW | 540 MW | 1,000 MW | 1,530 MW | No additional limits (1804 MW) | | |
| PJM | 580 MW | 1,110 MW | No additional limits (1412 MW) | | | | |
| HQ | No additional limits (280 MW) | | | | | | |
| Total | 1,470 MW | 2,600 MW | No additional limits (3500 MW) | | | | |

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# NPCC Summer Operating Margins

- **The table below summarized the summer operating margins from 2019 to 2023**
  - Operating margins for Ontario and New England are negative at 90/10 forecast or above
  - Quebec has relatively high operating margins at all forecast levels

| Area | Ontario | | | New England* | | | Quebec | | |
|---|---|---|---|---|---|---|---|---|---|
| Forecast | 50/50 | 90/10 | > 90/10 | 50/50 | 90/10 | > 90/10 | 50/50 | 90/10 | > 90/10 |
| 2019 | 2887 | 514 | | 3125 | 1236 | | 9429 | 8899 | |
| 2020 | 1558 | -803 | | 2920 | 962 | | 7922 | 7413 | |
| 2021 | 1468 | -250 | | 1900 | -1 | | 7125 | 6675 | |
| 2022 | 952 | -1715 | -3396 | 918 | -889 | -2541 | 6210 | 5359 | 4537 |
| 2023 | 88 | -2438 | -5058 | 231 | -1584 | -3259 | 7202 | 6161 | 5251 |
| 5-year Average | 1390.6 | -938.4 | -4227.0 | 1818.8 | -55.2 | -2900.0 | 7577.6 | 6901.4 | 4894.0 |

* New England margins are based on capacity obligations. Seasonal capability can have a slight increase on the margins

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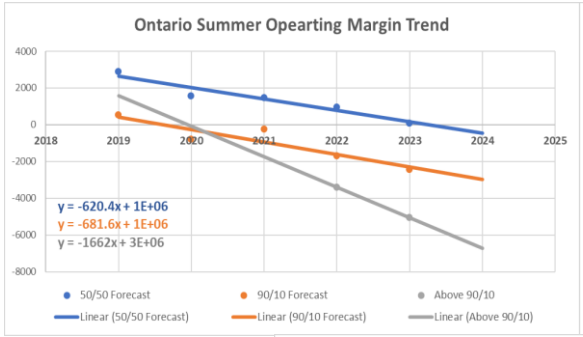
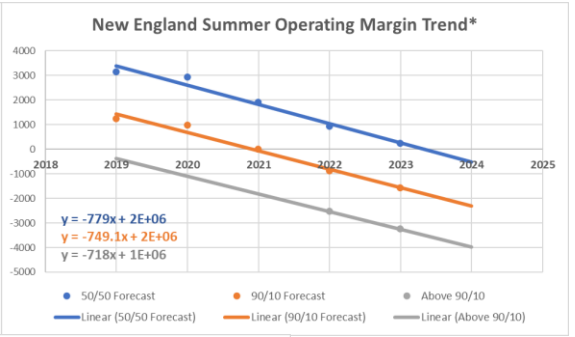
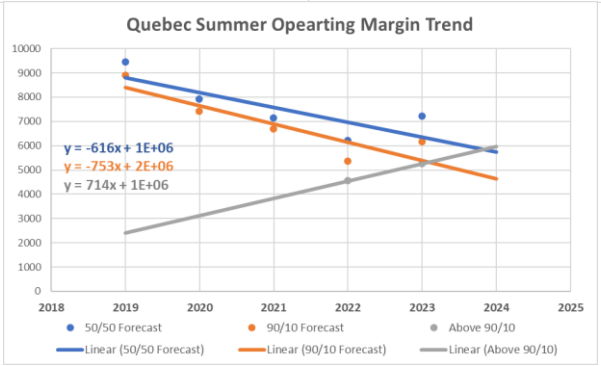
# NPCC Summer Operating Margins Trend

- Liner trend lines have been applied to all the summer operating margins at the three forecast levels
- All areas show downward trends for the summer margins at all forecast levels
  - Except Quebec at the above 90/10 level




* New England margins are based on capacity obligations. Seasonal capability can have a slight increase on the margins

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# Initial Recommendation

- **The NYISO propose to use the outcome from the historical extra reserves analysis for the summer topology limits for the EA modeling:**
  - The analysis covers all of NYCA's neighboring areas and
  - It can be repeated in the future with updated historical extra reserves data
  - It produces moderate decrease on the EA in the IRM model
  - There are a few drawbacks in using the summer operating margins from NPCC
    - PJM is not included in the NPCC seasonal assessment
    - Operating margins above 90/10 forecast only have 2 data points
    - For Ontario and New England, beyond 50/50 forecast, the margins are all negative, leading to extremely conservative assumptions for EA in the IRM for upper LFU bins

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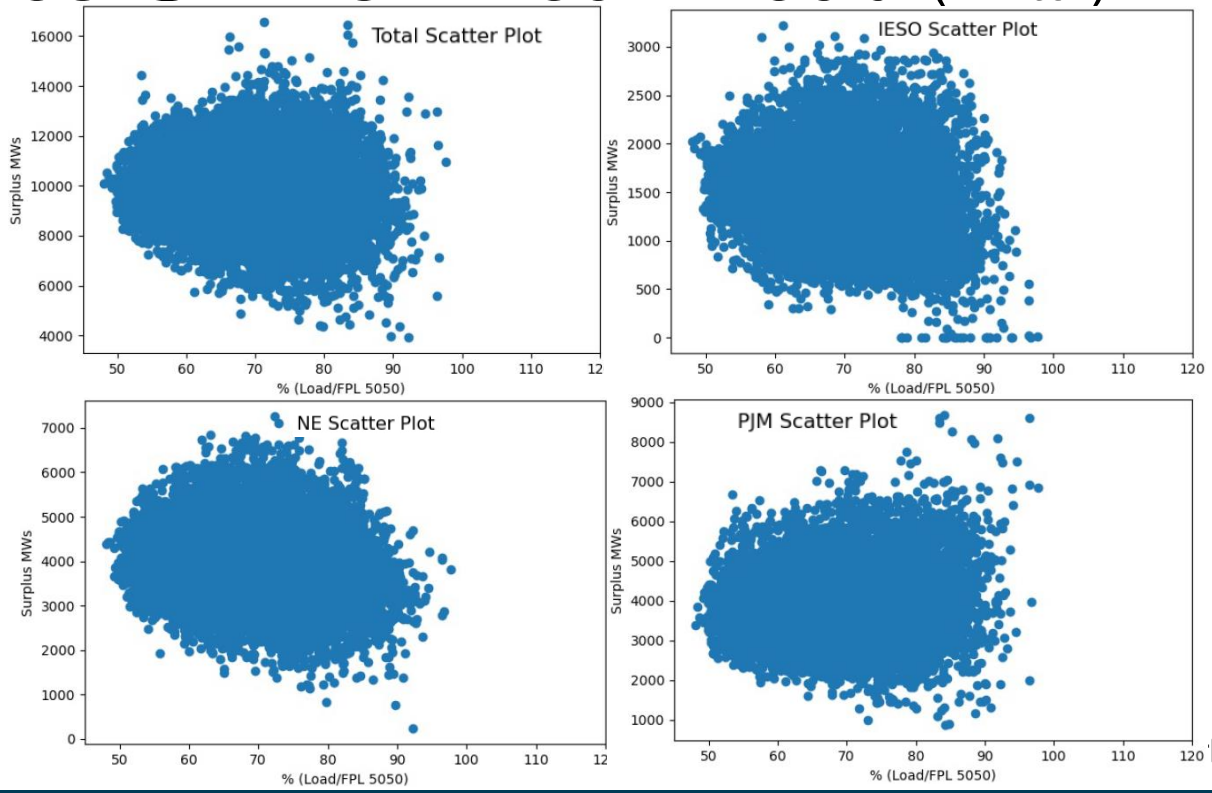
# Analysis for Winter Season Recommendations

# Extra Reserves @ NYCA Peak Load (winter)

- Beyond ~95% of the 50/50 FPL, no historical data is available
- The winter data does not produce meaningful relationship between extra reserves and NYCA load



# NPCC Winter Operating Margins

- **The table below summarized the winter operating margins from 2018 to 2022**
  - Significant operating margins are available across all areas at 50/50 and 90/10 forecast levels
  - Only Quebec and New England shows negative margins for 90/10 forecast and above

| Area | Ontario | | | New England* | | | Quebec | | |
|---|---|---|---|---|---|---|---|---|---|
| Forecast | 50/50 | 90/10 | > 90/10 | 50/50 | 90/10 | > 90/10 | 50/50 | 90/10 | > 90/10 |
| 2018-19 | 2543 | 1616 | | 2437 | 1270 | | 3226 | 940 | |
| 2019-20 | 1559 | 386 | | 2477 | 1313 | | 2720 | 562 | |
| 2020-21 | 3070 | 1364 | | 2560 | 1076 | | 1861 | 844 | |
| 2021-22 | 1646 | 1012 | 621 | 2704 | 1109 | -436 | 1603 | 2054 | -1048 |
| 2022-23 | 2504 | 2167 | 1842 | 1207 | -281 | -1746 | 1902 | 2214 | -749 |
| 5-year Average | 2264.4 | 1309 | 1231.5 | 2277 | 897.4 | -1091 | 2262.4 | 1322.8 | -898.5 |

* New England margins are based on capacity obligations. Seasonal capability can have a significant increase on the margins

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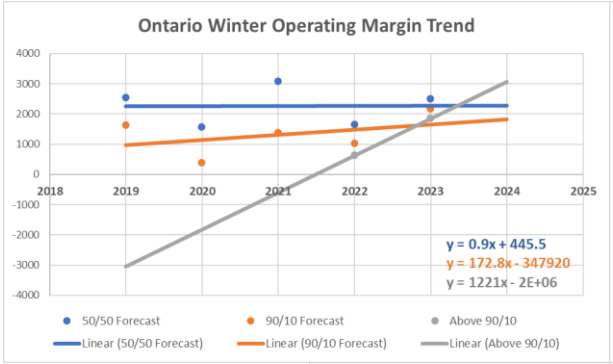
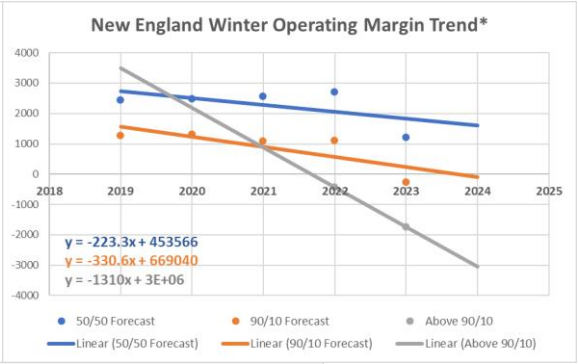
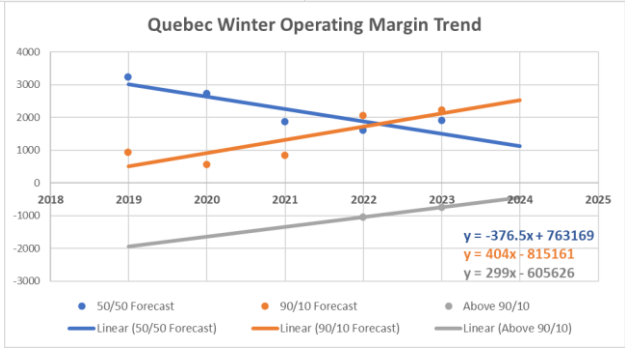
# NPCC Winter Operating Margins Trend

- Liner trend lines have been applied to all the summer operating margins at the three forecast levels
- There is no consistent trends observed across all regions and at all forecast levels

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# Additional Winter Considerations

- **NYISO recognizes the importance of reliability during winter seasons and therefore developed the strategic plan to improve the resource adequacy modeling to properly reflect winter conditions**
  - The areas of focus include EA assumptions, gas constraints, winter forecast and load shape, and topology limits
- **All of our neighbors have also expressed concerns over the winter seasons**
  - Quebec is a winter peaking system; New England is subject to gas pipeline constraints in winter; PJM had recently announced reliability risks concentrated in winter; Ontario is expected to be winter peaking in early 2030s
- **While the NYISO believes that the support from the neighboring areas is highly limited, historical and current modeling data for the Northeast region does not properly reflect the winter conditions and therefore analysis using these data would not reflect the true conditions of winter**
  - For example, the gas constraints in NYCA and ISONE are not captured in the current NPCC database

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# Initial Recommendation

- **The NYISO propose to apply the summer topology limits to the winter season for the EA modeling:**
  - Neither of the historical extra reserve analysis nor the NPCC winter operating margins provides reasonable EA assumptions for the IRM study
    - No relationship can be extracted between historical extra reserves and NYCA load
    - The NPCC winter operating margins indicate significant amount of support available during winter season, which has not been the experience during recent years
    - PJM is not included in the NPCC operating margins assessment
  - Continued exploring other methodologies and data sources to support winter EA assumptions is needed
- **The NYISO also propose to consider an extreme assumptions with 0 MW of EA assumptions for winter, as a separate sensitivity case to assess the book-end impact of the EA assumptions**

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# Impact Assessment and Next Steps

# Complete Additional Topology Limits

| Additional Topology Limits for EA | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Summer* | | | | | | | |
| Area | Bin 1 | Bin 2 | Bin 3 | Bin 4 | Bin 5 | Bin 6 | Bin 7 |
| IESO | 550 MW | 660 MW | 750 MW | 860 MW | No additional limits (1950 MW) | | |
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| PJM | 580 MW | 1,110 MW | No additional limits (1412 MW) | | | | |
| HQ | No additional limits (280 MW) | | | | | | |
| Total | 1,470 MW | 2,600 MW | No additional limits (3500 MW) | | | | |
| *Winter* | | | | | | | |
| Area | Bin 1 | Bin 2 | Bin 3 | Bin 4 | Bin 5 | Bin 6 | Bin 7 |
| IESO | 550 MW | 660 MW | 750 MW | 860 MW | No additional limits (2100 MW) | | |
| ISONE | 50 MW | 540 MW | 1,000 MW | 1,530 MW | No additional limits (1804 MW) | | |
| PJM | 580 MW | 1,110 MW | No additional limits (1412 MW) | | | | |
| HQ | No additional limits (858 MW) | | | | | | |
| Total | 1,470 MW | 2,600 MW | No additional limits (3500 MW) | | | | |

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# Impact of the Initial Recommendations

- Implementing the additional topology limits to constrain the EA flow results in ~2% increase in the IRM and ~0.3% decrease on the LCRs

| *Tan45 Results* | *IRM* | *J LCR* | *K LCR* |
|---|---|---|---|
| 2023-2024 IRM FBC | 19.90 | 78.20 | 107.40 |
| 2023-2024 IRM FBC<br>+ Additional Topology Limits for EA | 21.91 | 77.862 | 107.065 |
| *Delta* | *2.01* | *-0.338* | *-0.335* |

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# Process beyond Initial Recommendation

- **For the next two years, repeat the regression analysis with historical extra reserves data for any potential updates to the IRM study assumptions**
  - NYISO proposes to update the IRM assumption if the regression analysis results in ≥ 25 MW change
- **Continue to explore methodologies to develop winter-specific EA assumptions**
- **Leverage regional collaboration and neighboring areas progress with emergency assistance assumptions to review/improve the current methodology beyond 2024**
  - The NYISO participates in the NPCC working group and is supporting the working group effort to improve regional tie-benefits study
  - The NYISO is also in conversation with PJM and ISONE to monitor their progress in revising their adequacy study assumptions for emergency assistance
    - Both jurisdictions have previously communicated the desire to lower the assumptions for external support in the respected resource adequacy study

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# Next Steps

- **If accepted by the ICS, conduct sensitivity case with the proposed initial recommendation at the PBC**
  - Conduct another sensitivity case with proposed initial recommendation + 0 MW EA assumptions for winter
- **If no unintended consequences identified, adopt the recommended EA modeling in the FBC**
- **Finalize the EOP Whitepaper Report for ICS review at 10/4 meeting**
  - Extending final report timeline due to resources being prioritized to complete the IRM study

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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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# Questions?