Tan45 Methodology Review

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Agenda

- Background
- Initial Results
  - Champlain Hudson Power Express (CHPE) + Offshore Wind (OSW)
- Key Observations
- Next Steps
- Appendix

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Background

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Tan45 Objective and the Changing Grid

- The objective of the Tan45 methodology is to establish an IRM that accounts for the locational differences between upstate and downstate
  - The NYCA system has historically not been locationally "balanced" with major load centers located downstate and significant surplus generation located upstate
  - Constraints on the transmission system between upstate and downstate also impact how MW can be transferred across the NYCA system
  - The location of supply to serve downstate load centers significantly impacts the IRM
    - Assuming greater reliance on supply located within the downstate region to serve the downstate load centers has historically resulted in downward pressure on the IRM
    - Assuming greater reliance on power transfers from the upstate region to serve the downstate load centers has historically placed upward pressure on the IRM
- Significant changes are expected on the NYCA system that will change the underlying locational differences between upstate and downstate
  - Renewable generation build out across NYCA, especially the offshore wind build out in downstate, will change the current dynamic of load and surplus generation
  - Transmission infrastructure improvements will also alleviate/lessen some of the known constraints and change patterns of flow across the NYCA system

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Recap of Progress

- The Tan45 methodology of establishing the installed reserve margin (IRM) is being reviewed to assess its operation under various future scenarios
- The proposed testing plan outlines several of the future scenario cases being evaluated (see slide 16 for a summary of the proposed test cases)
  - These future scenarios include adding expected future transmission projects and supply mix changes to the 2024-2025 IRM study Final Base Case (FBC)
  - The future transmission projects proposed for consideration include implementing Champlain Hudson Power Express (CHPE), Long Island Public Policy Transmission Need (LI PPTN), and Clean Path New York (CPNY) in the model
  - The future supply mix changes proposed for consideration include adding 9,000 MW each of in-front-of-the-meter (FTM) solar, land-based wind (LBW) and off-shore wind (OSW) to the model
- Following the review of initial results for several of the test cases at the 5/1/2024 ICS meeting, additional test cases were requested beyond the original test case summary to analyze the Tan45 process under various system conditions combined with CHPE
  - Slide 16 provides the recommended updates to the initial testing plan

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Initial Results

CHPE + OSW

CHPE + OSW Case Setup

- **Starting with the 2024-2025 IRM technical study base case (23.1% IRM), CHPE and varying quantities of OSW resources were added to the model**
  - The modeling assumptions for the addition of CHPE (see appendix for details) and zonal ratio of OSW resources (2/3 to Load Zone J and 1/3 to Load Zone K) remain consistent with the assumptions utilized in the cases presented at the 5/1/2024 ICS
- **Two scenarios were tested**
  - CHPE + 3,000 MW OSW (2,000 MW in Load Zone J, 1,000 MW in Load Zone K)
  - CHPE + 6,000 MW OSW (4,000 MW in Load Zone J, 2,000 MW in Load Zone K)
- **Possible timeline:**
  - CHPE is currently expected in-service in 2026
  - Two NYSERDA contracted OSW projects totaling ~1,700 MW of capacity have expected commercial operation dates of 2026 and 2027
  - Long Island Public Policy Transmission Need (LI PPTN) will allow for access of at least 3,000 MW of future offshore wind capability into Load Zone K and is expected in-service by 2030

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CHPE + 3,000 MW OSW Results

Case	IRM	J LCR	K LCR	G-J LCR
Base Case (BC)	23.1%	72.73%	103.21%	84.58%
CHPE + 3,000 MW OSW	28.2%	86.40%	116.01%	94.58%

- The Tan45 process was able to calculate an IRM result that met all Policy No. 5 criteria
- The increase to the IRM and LCRs were expected due to higher derating factors for the OSW resources compared to thermal resources and increased capacity added to Load Zones J and K

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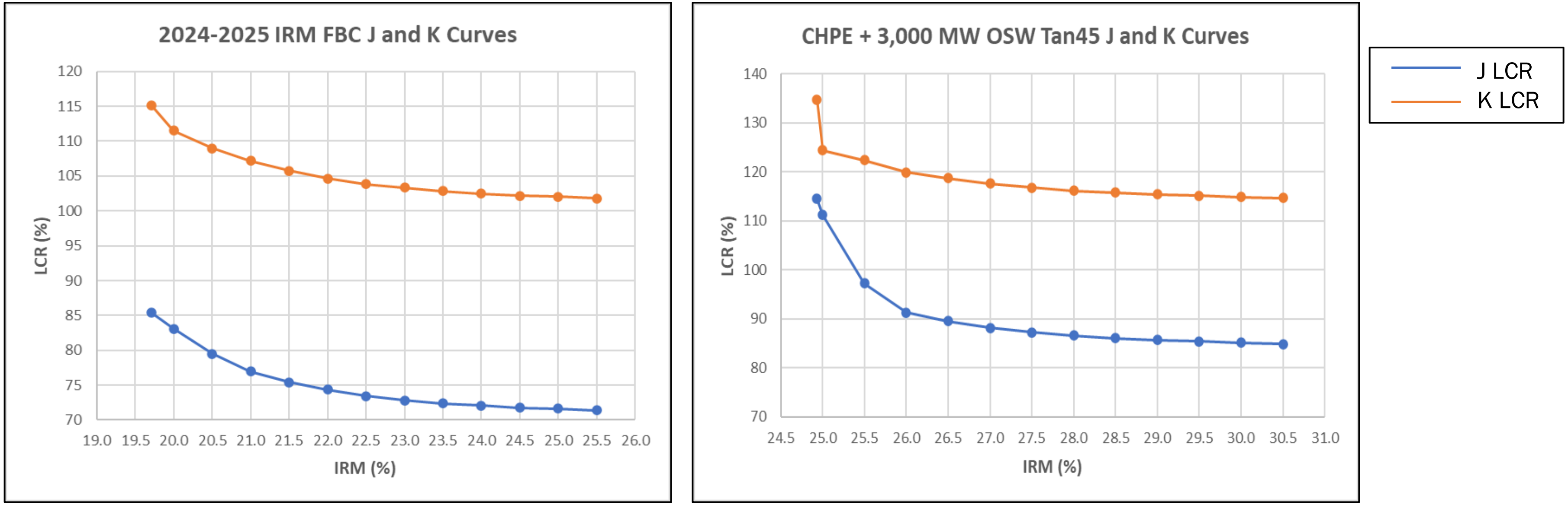
CHPE + 3,000 MW OSW Curve Comparison



- The curves are much steeper for the first few Tan45 points and then start to flatten out more compared to 2024-2025 IRM FBC curves
- Appears to be driven by the large addition of capacity into downstate resulting in a shift to the historical locational differences present on the system

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CHPE + 6,000 MW OSW Results

Case	IRM	J LCR	K LCR	G-J LCR
Base Case (BC)	23.1%	72.73%	103.21%	84.58%
CHPE + 3,000 MW OSW	33.8%	99.04%	132.57%	103.82%

- The Tan45 process was able to calculate an IRM result that met all Policy No. 5 criteria
- The increase to the IRM and LCRs were expected due to higher derating factors for the OSW resources compared to thermal resources and increased capacity added to Load Zones J and K

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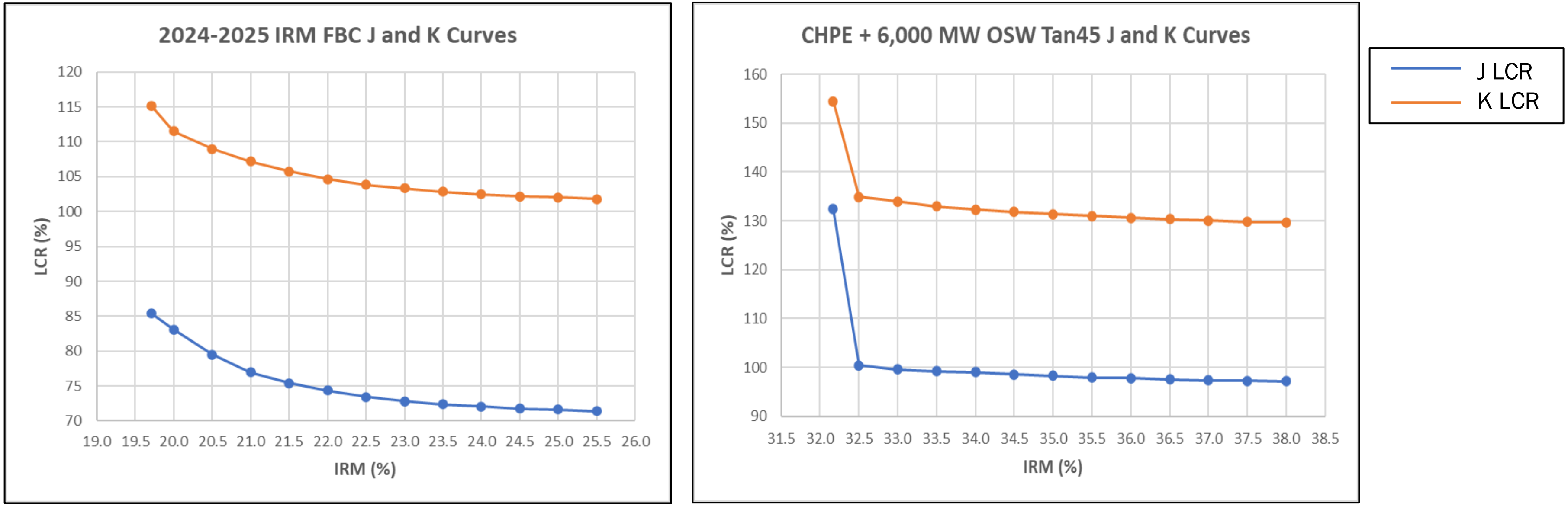
CHPE + 6,000 MW OSW Curve Comparison



- The curves are even steeper than the previous case (see Slide 10) highlighting that the issue of flattening of the Load Zone J and K curves is exacerbated as more capacity is added to Load Zones J and K
- The large drop from the low point to the first Tan45 point was present in the OSW test case (TC-G3) results reviewed at the 5/1/2024 ICS meeting and appears to be due to capacity being less valuable to system LOLE in Load Zones J and K than upstate

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Key Observations - CHPE + OSW Cases

1. The historically observed dynamics of load and surplus generation change as more capacity is installed within Load Zones J and K
   - Such change is amplified with improved transfer between upstate and downstate from transmission reinforcements
2. Removing capacity from zones west of the Central East interface per the Tan45 procedure does not necessarily produce the low point IRM
3. While both the cases were able to calculate an IRM result using the Tan45 methodology, there are significant structural changes to the Load Zone J and K curves
   - Volatility between discrete IRM/locational capacity requirement combinations
   - Significant flattening of the Load Zone J and K curves beyond the IRM "low point"

Additional analysis will occur during this whitepaper to better understand potential concerns regarding use of the Tan45 methodology under these types of system conditions

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Next Steps

Next Steps

- The NYISO will continue developing the remaining future scenario cases outlined in the testing plan and anticipates providing additional results at the 6/26/2024 ICS meeting
  - The LI PPTN and CPNY test case (TC-T2 and TC-T3) assumptions are currently being assessed to ensure meaningful results are presented
- The results will continue to be evaluated to better determine when issues could potentially start to arise
- Identify test cases which may no longer be necessary for the Whitepaper effort

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Test Case Name	System Scenario	Description	Presented At:
BC	Base Case	2024 – 2025 IRM Final Base Case (23.1% IRM)	
TC-T1	Future Transmission Projects	Base Case + CHPE	5/1/2024 ICS
TC-T2		Base Case + LI PPTN	
TC-T3		Base Case + CPNY	
TC-T4		Base Case + CHPE, LI PPTN, and CPNY	
TC-G1	Increased Renewable Generation Resources	Base Case + 9,000 MW FTM Solar	5/1/2024 ICS
TC-G2		Base Case + 9,000 MW LBW	5/1/2024 ICS
TC-G3		Base Case + 9,000 MW OSW	5/1/2024 ICS
TC-G4		Base Case + 27,000 MW FTM Solar, LBW, and OSW (9,000 MW of each type)	
TC-TG5	Future Transmission Projects + Increased Renewable Generation Resources	Base Case + CHPE, LI PPTN, and CPNY + 27,000 MW FTM Solar, LBW, and OSW (9,000 MW of each type)	
S-1	Sensitivities	CHPE + 3,000 MW OSW	6/5/2024 ICS
S-2		CHPE + 6,000 MW OSW	6/5/2024 ICS

- **The two sensitivities presented today were added to the test case summary**
- **The NYISO recommends removing TC-G4 and TC-TG5 to focus on completing TC-T2, TC-T3, and TC-T4, as well as additional sensitivities identified based on the initial results of other test cases**
    - The NYISO is also soliciting ICS input for possible sensitivity additions

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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?

Appendix

Previous Discussions

- 1/30/2024 ICS: Tan45 Methodology Review Whitepaper Scope
  - https://www.nysrc.org/wp-content/uploads/2024/02/Tan45-Methodology-Whitepaper-Scope-01302024-ICS-REVISED27280.pdf
- 2/27/2024 ICS: Tan45 Methodology Review
  - https://www.nysrc.org/wp-content/uploads/2024/02/Tan45-Methodology-Review-02272024-ICS28519.pdf
- 4/3/2024 ICS: Tan45 Methodology Review
  - https://www.nysrc.org/wp-content/uploads/2024/03/Tan45-Methodology-Review-04032024-ICS30726.pdf
- 5/1/2024 ICS: Tan45 Methodology Review
  - https://www.nysrc.org/wp-content/uploads/2024/04/Tan45-Methodology-Review-05012024-ICS30948.pdf

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CHPE Modeling Assumptions

- CHPE modeling assumptions
  - 1,250 MW connection from HQ to Load Zone J backed by a 1,250 MW Unforced Capacity Deliverability Rights (UDR) resource located in a dummy zone modeled within the NYCA system
    - Modeling is similar to other external transmission lines with UDR resources where the transmission line is available to provide emergency assistance in the event of the UDR being on outage
  - The UDR resource was assumed to have an EFORd of 4.54% (NERC class average for hydro resources) and the transmission line was assumed to have an outage rate of 5% (5 Year Average Cable Outage Rate for 2018-22 from 2024-2025 IRM Final Base Case Model Assumptions Matrix = 4.83%)
  - The emergency assistance allowances were not adjusted from the values established in last year's EOP Review Whitepaper Report

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Tan45 Methodology Overview

- Policy No.5-17 appendices A & B discuss the Tan45 methodology (Unified Methodology) of establishing the IRM requirements
- The current process establishes a low point IRM by removing capacity only from capacity rich zones west of the Central-East interface (Load Zones A, C, and D) until the 0.100 LOLE criteria is met
  - The Load Zone J and Load Zone K locational capacity requirements (LCRs) are at their as-found levels
- After the low point is established 12 subsequent points which also meet the 0.100 LOLE criteria are established to produce an IRM-LCR curve
  - The 12 subsequent points increase the IRM from the low point by increments of 0.5% (see example below)
  - As the IRM increases from the low point, capacity is shifted upstate from Load Zones J and K in order to maintain the 0.100 LOLE criteria

Point	Low Point	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12
IRM %	17.20%	17.50%	18.00%	18.50%	19.00%	19.50%	20.00%	20.50%	21.00%	21.50%	22.00%	22.50%	23.00%

- This results in 12 combinations of IRM and LCR values which all meet the 0.100 LOLE criteria
- A regression analysis is then performed on these points to establish an IRM and LCR values at the least volatile point on the curve

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