New York ISO
Independent System Operator

2023-2042 System & Resource Outlook Update

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Long Term Assessments

Electric System Planning Working Group (ESPWG)

Thursday, November 2, 2023

Agenda

- Scope & Schedule Review
- Assumptions Matrices
- Preliminary Base Case Results
- Contract Case Update
- Policy Case Update
- Next Steps
- Outlook Data Catalog

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Scope & Schedule Review

System & Resource Outlook Scope

Model Development

- Benchmark
- Assumptions
- Reference Cases
- Sensitivities

Congestion Assessment

- Historic & Future Transmission Congestion
- Congestion Relief Analysis

Analyses

- Resources to Meet Policy Objectives
- Renewable Pockets & Energy Deliverability
- Renewable Generation Profiles
- Future Resource Attributes

Report, Appendix, Data Catalog, & Fact Sheet

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Preliminary Targeted Study Schedule

	Month	July					August				September			
	Week	1	2	3	4	5	1	2	3	4	1	2	3	4
2023 Q3	Benchmarking	X	X	X										
	Assumptions Development	X	X	X	X	X	X	X	X	X	X	X	X	X
	CapEx Model Development	X	X	X	X	X	X	X	X	X	X	X	X	X
	Production Cost Model Development	X	X	X	X	X	X	X	X	X	X	X	X	X
	CapEx Results													
	Production Cost Results													
	Analyses													
	Report													

	Month	October					November				December			
	Week	1	2	3	4	5	1	2	3	4	1	2	3	4
2023 Q4	Benchmarking													
	Assumptions Development	X	X	X	X	X	X	X	X	X				
	CapEx Model Development	X	X	X	X	X	X	X	X	X				
	Production Cost Model Development	X	X	X	X	X	X	X	X	X	X	X	X	X
	CapEx Results										X	X	X	X
	Production Cost Results													
	Analyses													
	Report													

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Assumptions Matrices

Assumptions Matrices

- Also posted with this ESPWG meeting material are the following documents:
  - Production Cost Assumptions Matrix – (11/02/2023)
  - Capacity Expansion Assumptions Matrix – (11/02/2023)
- Base Case assumptions locked down: 10/15/2023
- Contract Case assumptions locked down: 10/30/2023
- Policy Case assumptions lock down date (revised): 11/15/2023

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Preliminary Base Case Results

Base Case Results Drivers

- Base Case results primarily driven by load forecast assumptions for four-pool system
- Neighboring pool forecasts extended to align with study period. Linear growth model used to extend forecasts through 2042
- Compared to previous study cycles, load demand in New York and in neighboring pools over the study period (2023-2042) increases significantly

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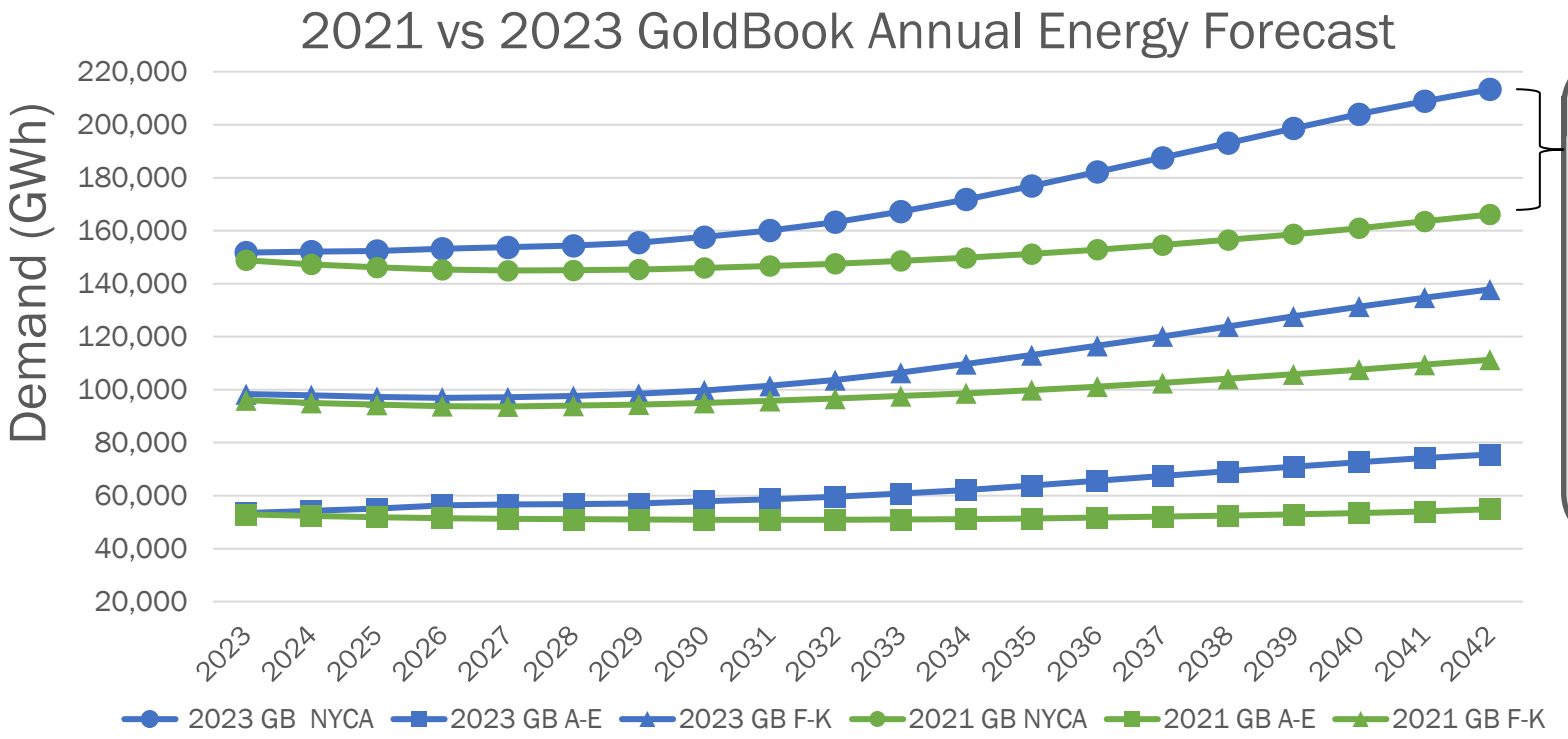
Baseline Load Forecast Comparison



Higher overall Energy Demand (47 TWh higher by 2042) primarily driven by building electrification and EV charging loads

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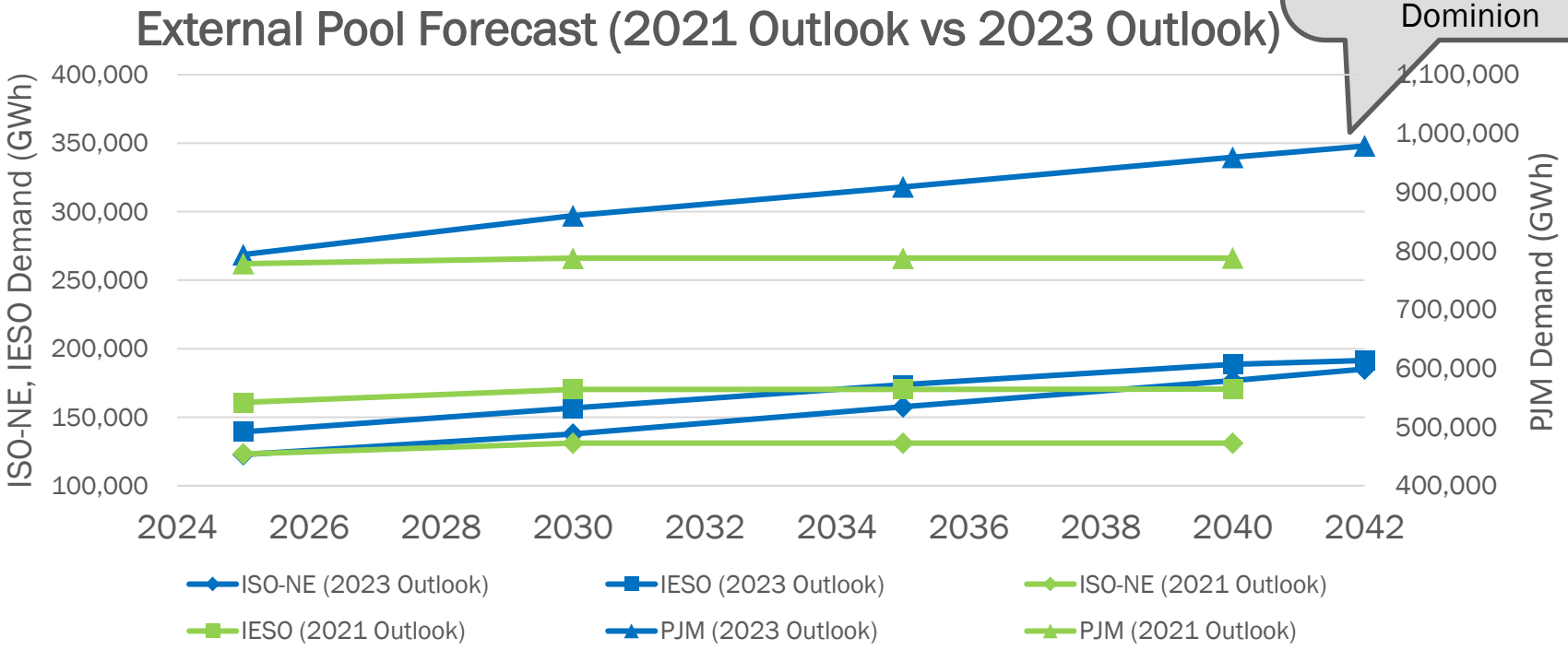
External Forecasts Comparison

Significant Increase in PJM load forecast mostly due to increased data center loads in Dominion



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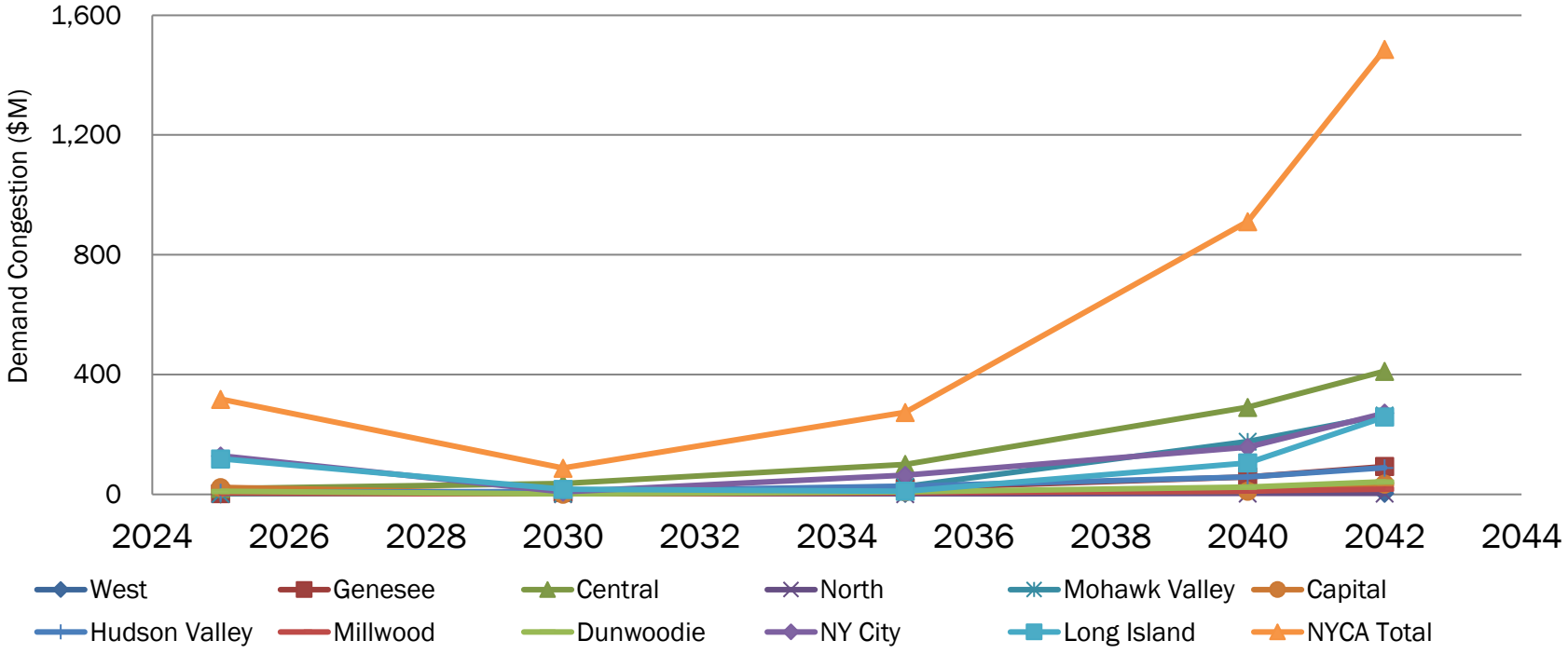
Zonal Demand Congestion (nominal $M)



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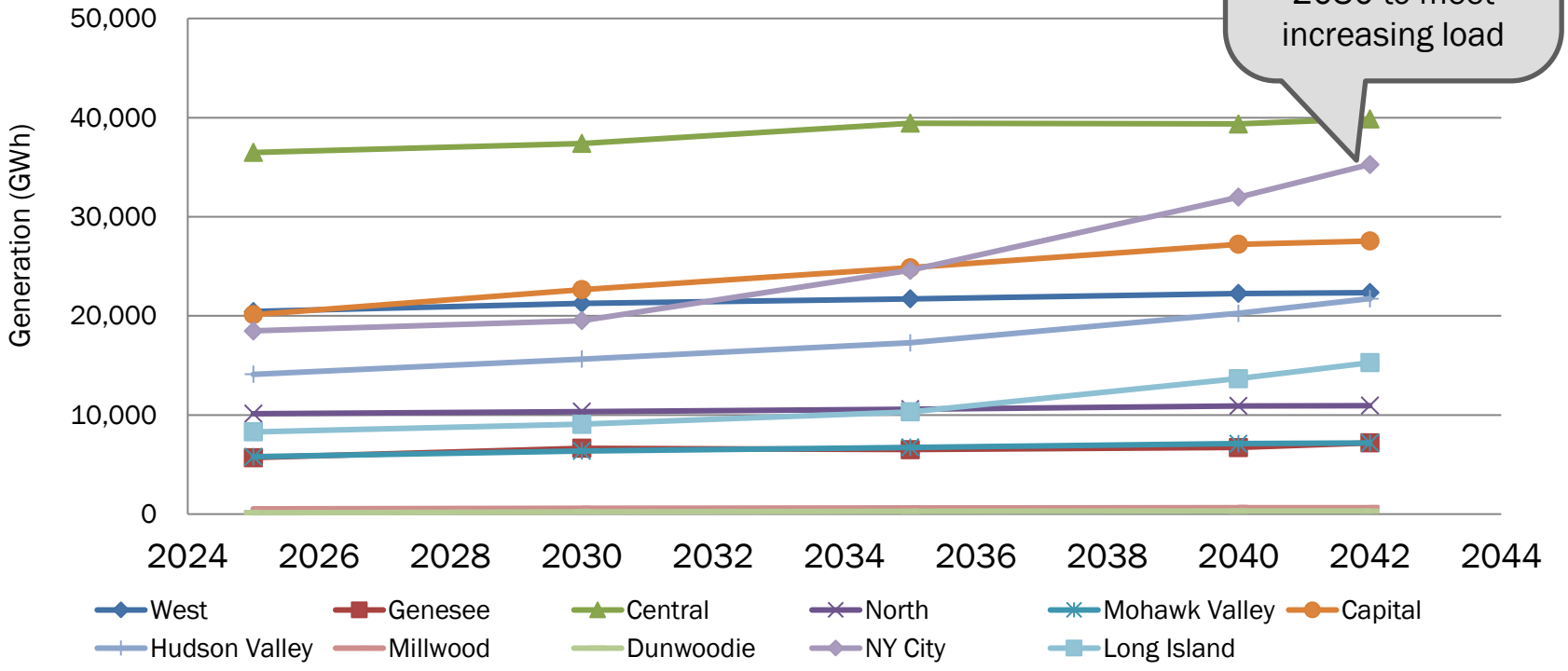
Zonal NYCA Generation (GWh)



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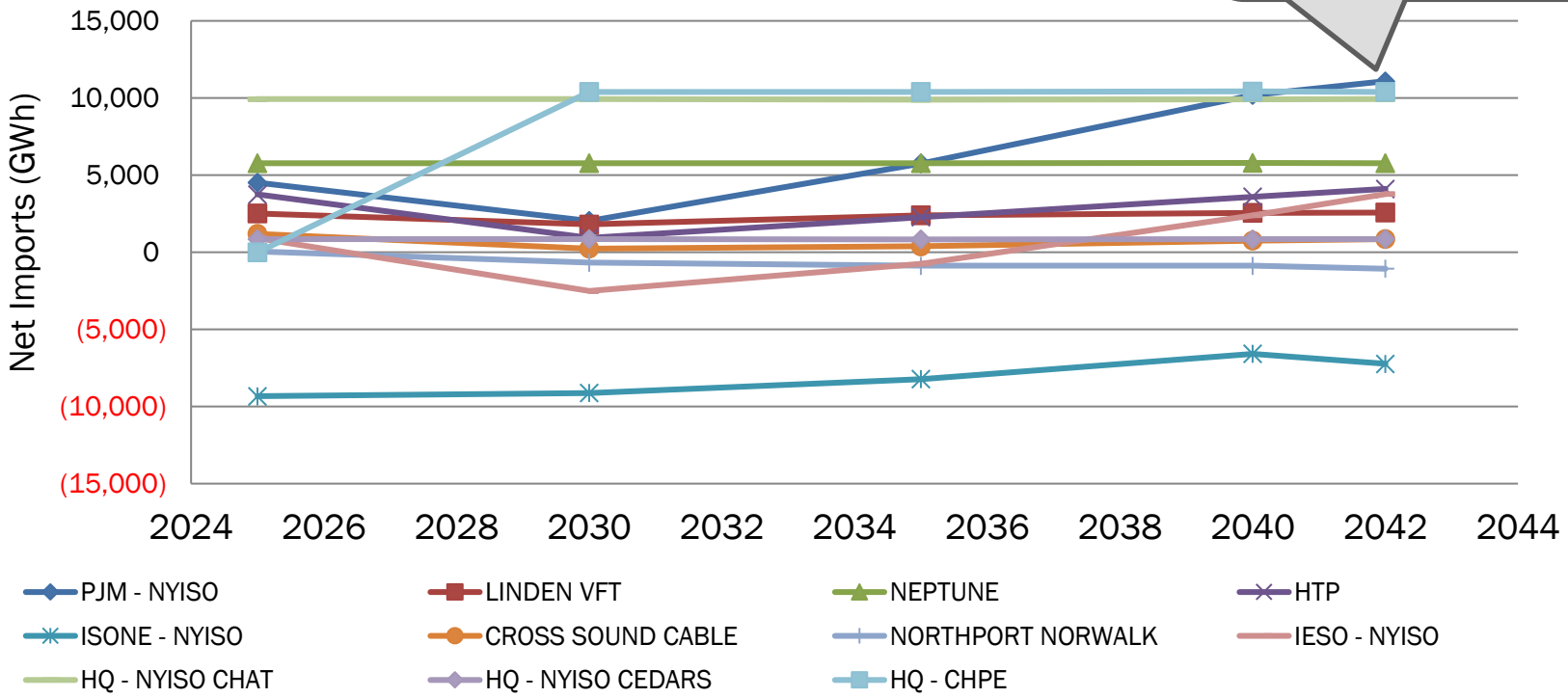
Projected Net Imports (GWh)

Lower PJM Net Imports compared to 2021-2040 Outlook Base Case results due to increased load demand in PJM



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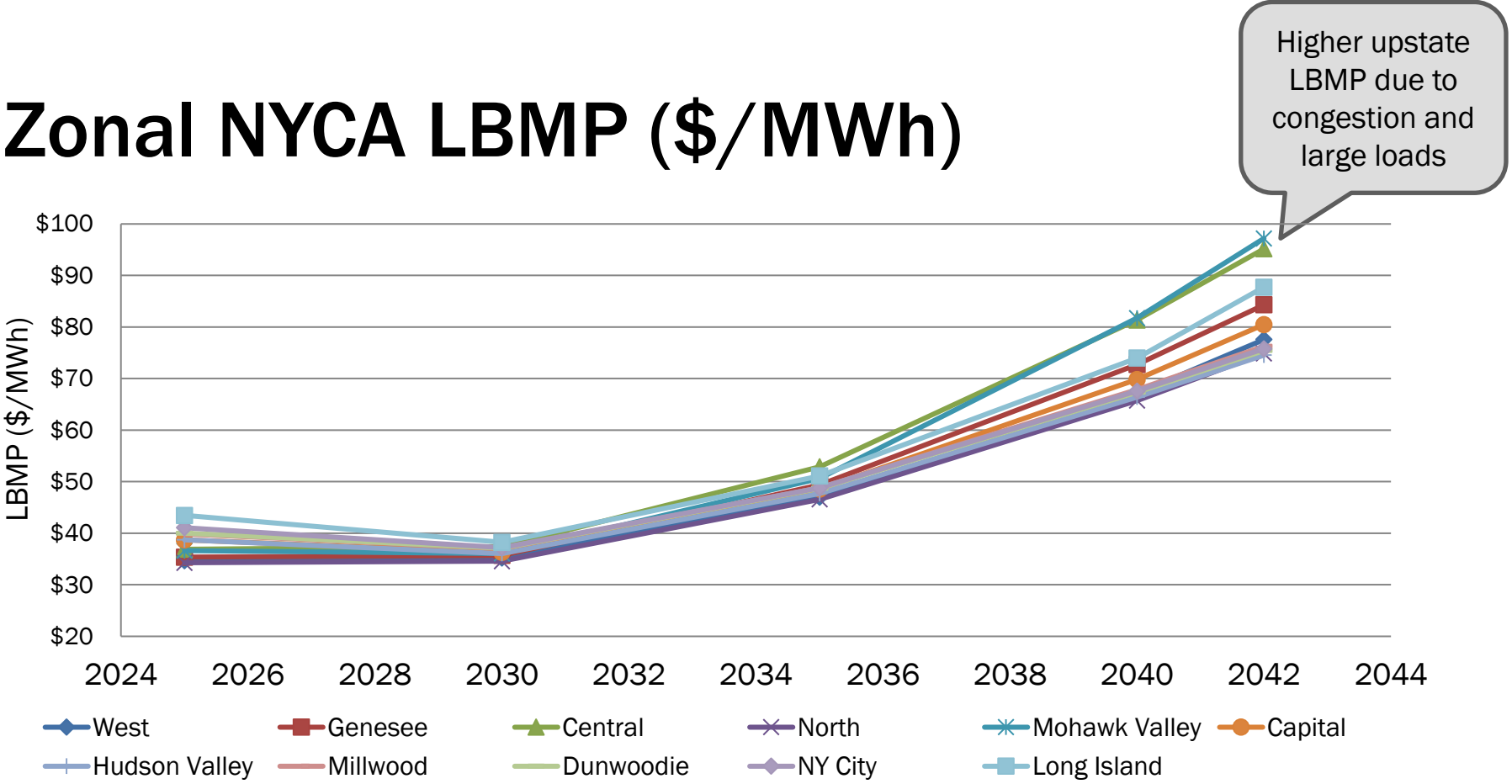
Zonal NYCA LBMP ($/MWh)



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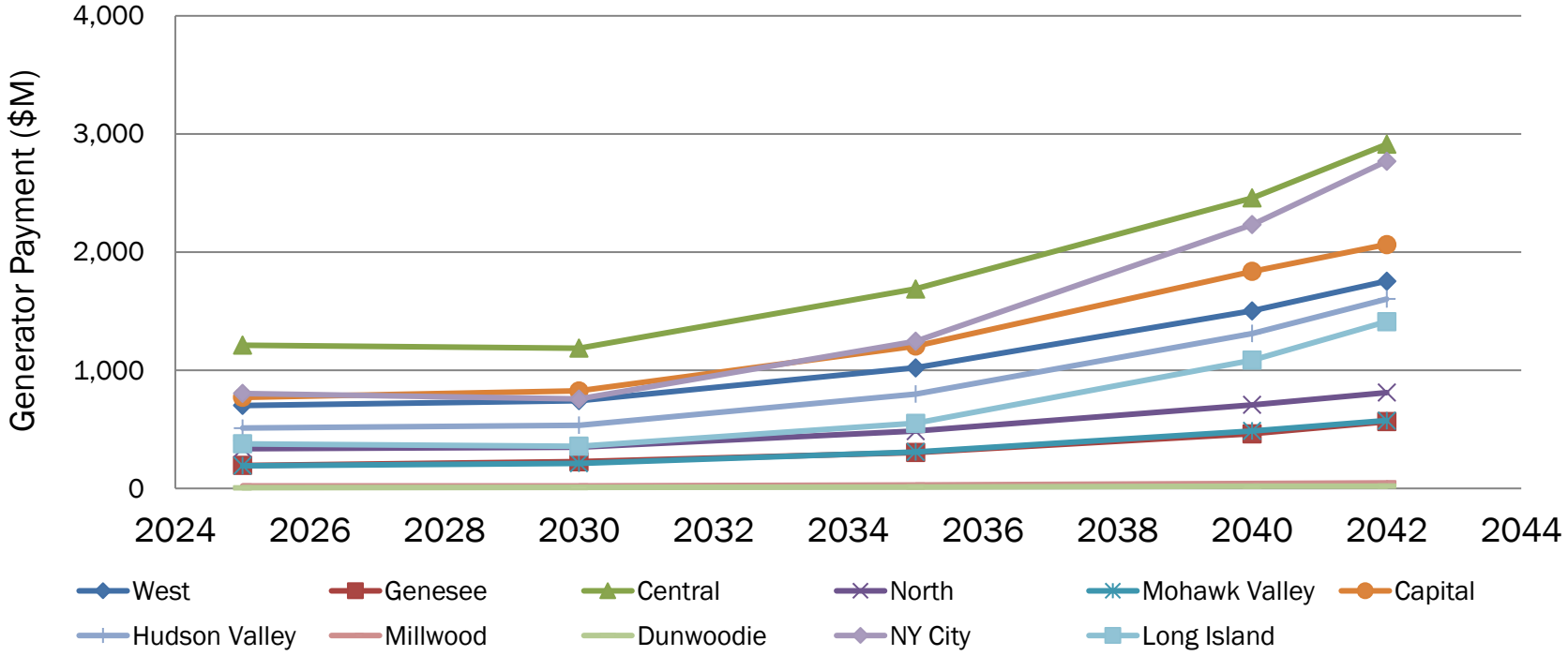
Zonal Generator Payments (nominal $M)



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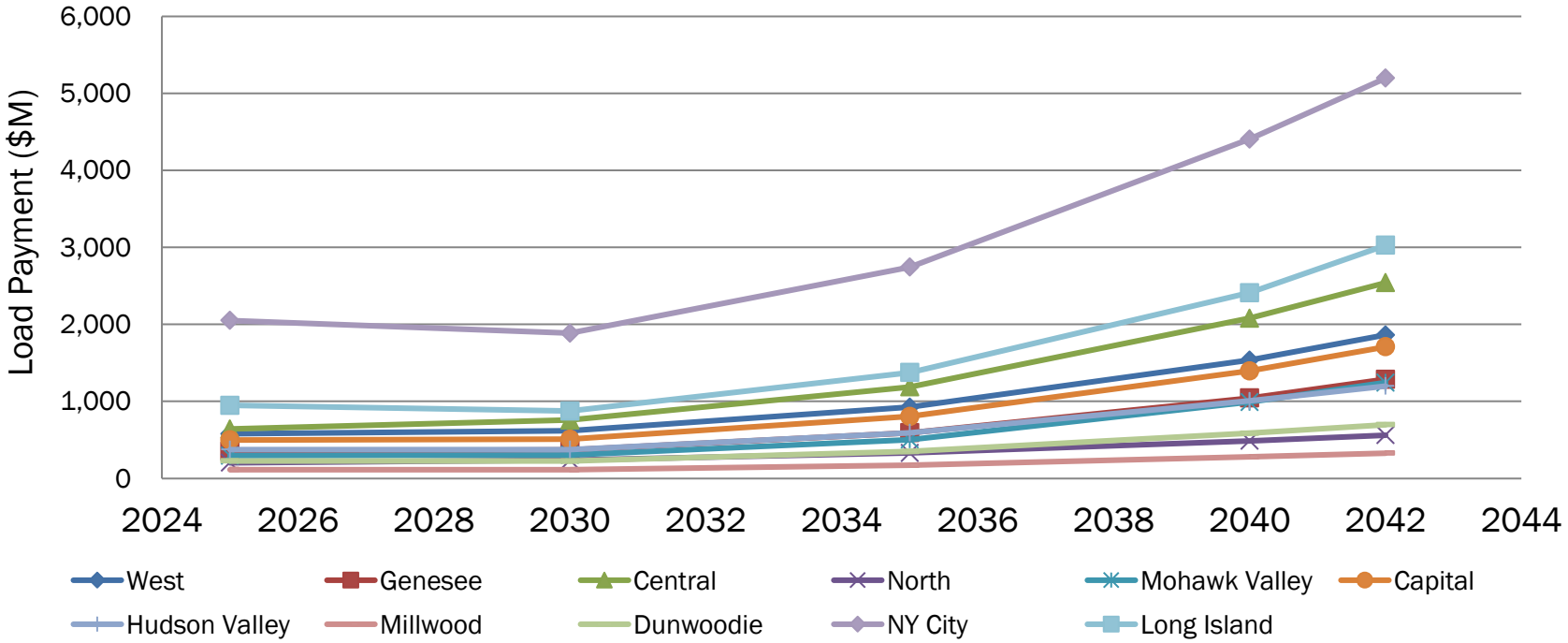
Zonal Load Payments (nominal $M)



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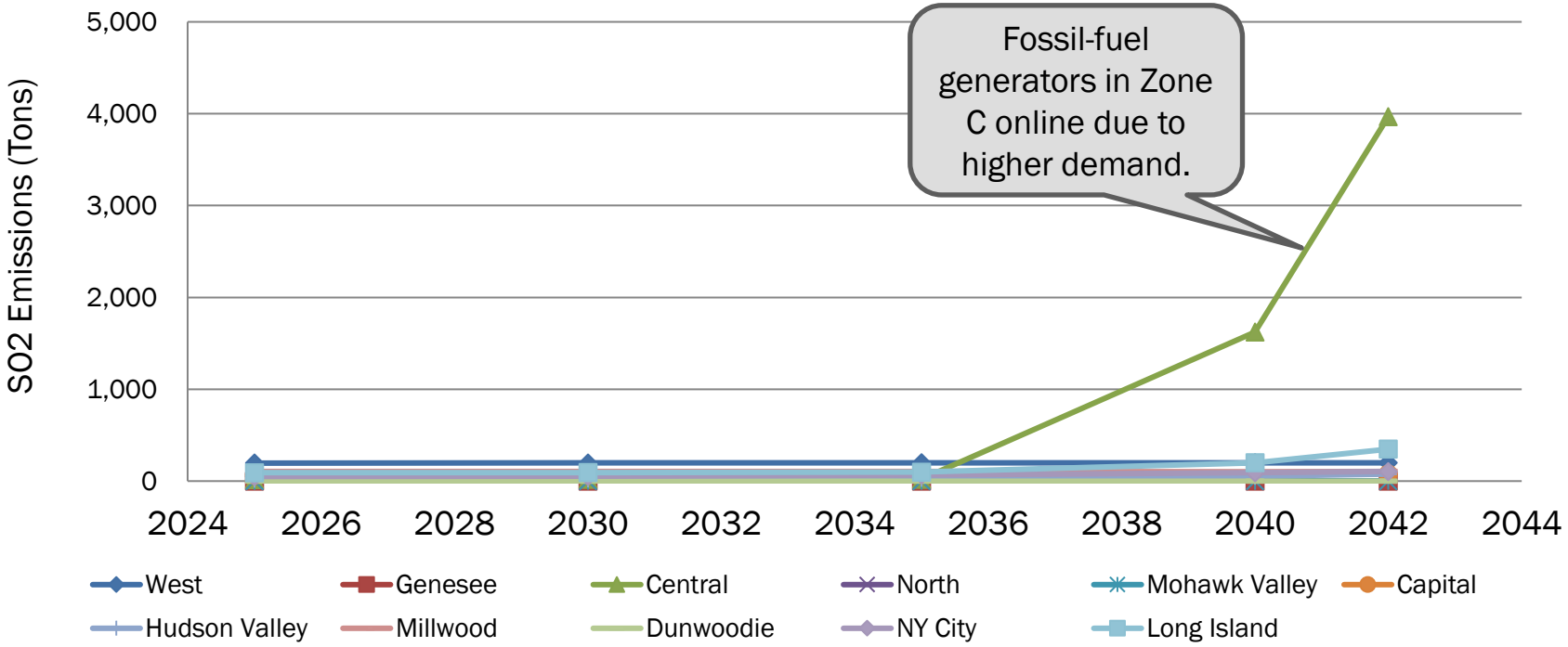
Zonal SO_2 Emissions (Tons)



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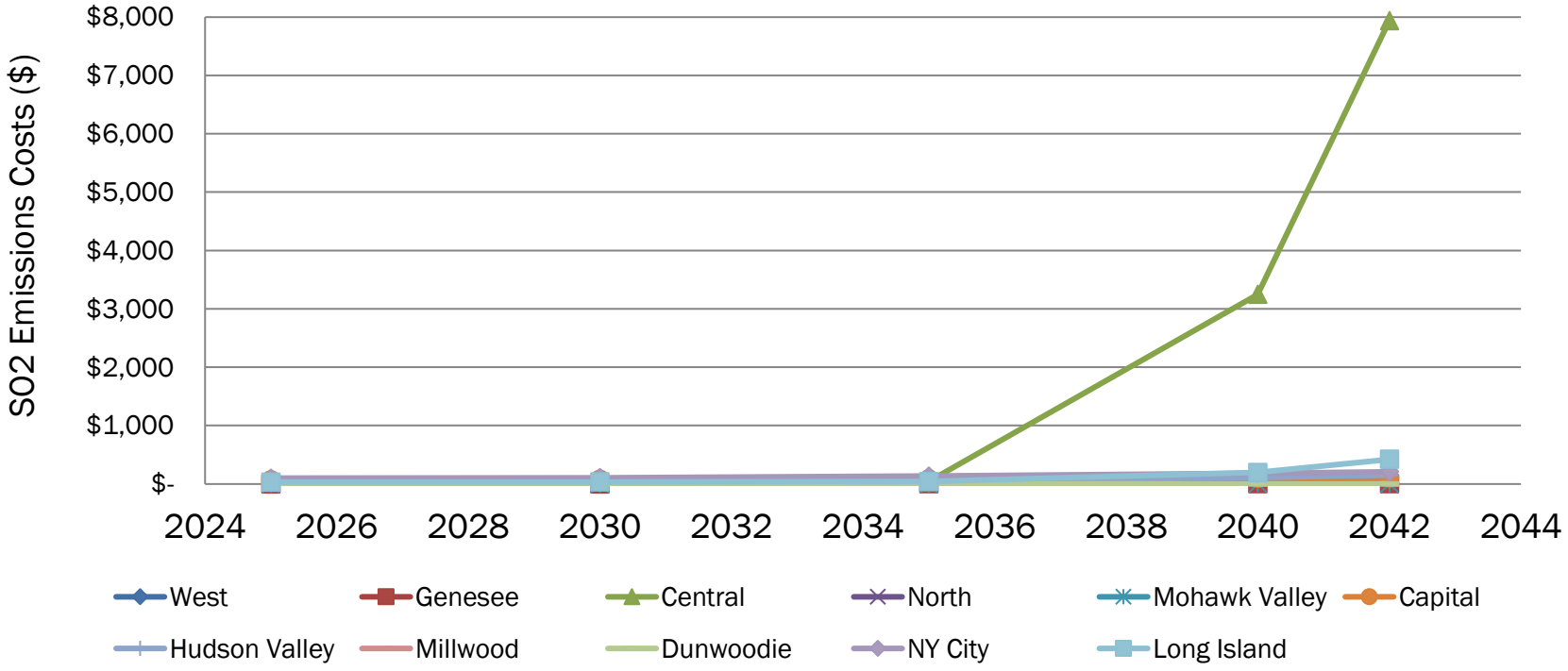
Zonal SO_2 Emissions Costs (nominal $)



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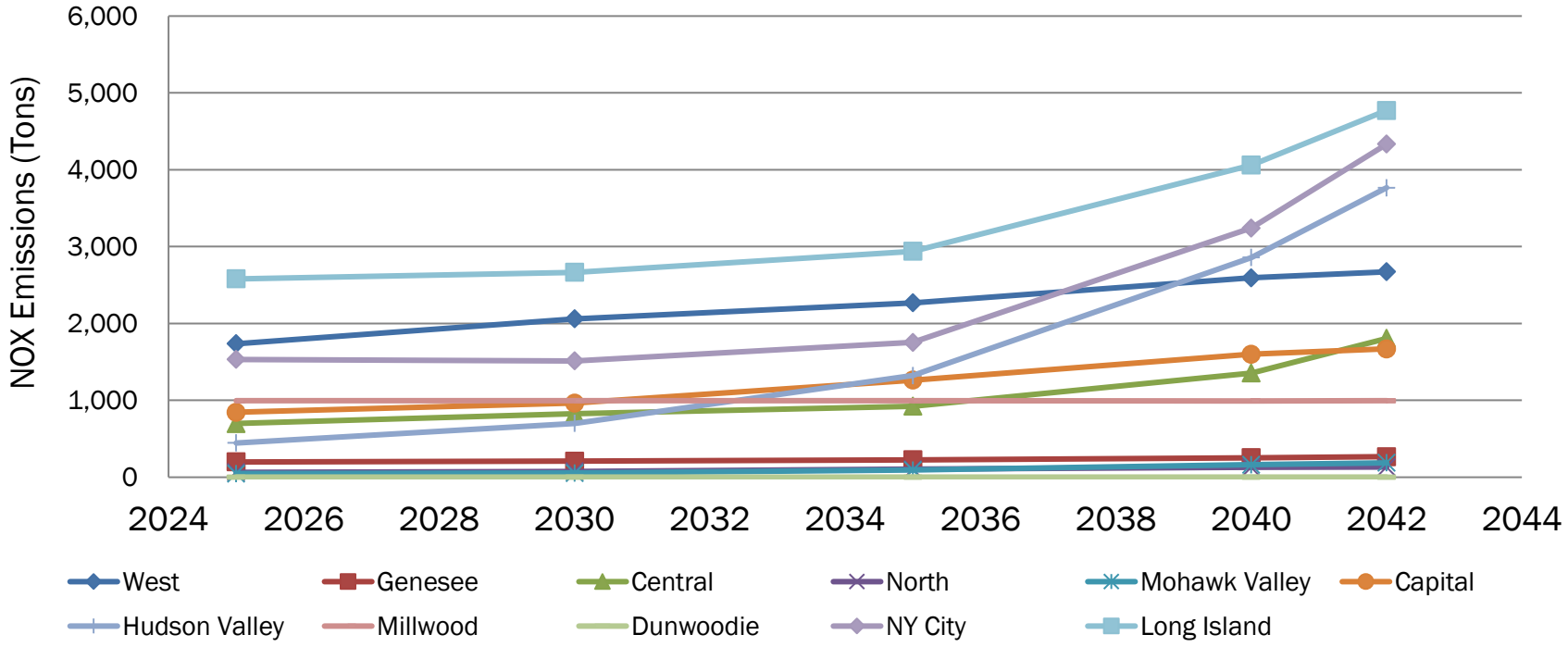
Zonal NO_X Emissions (Tons)



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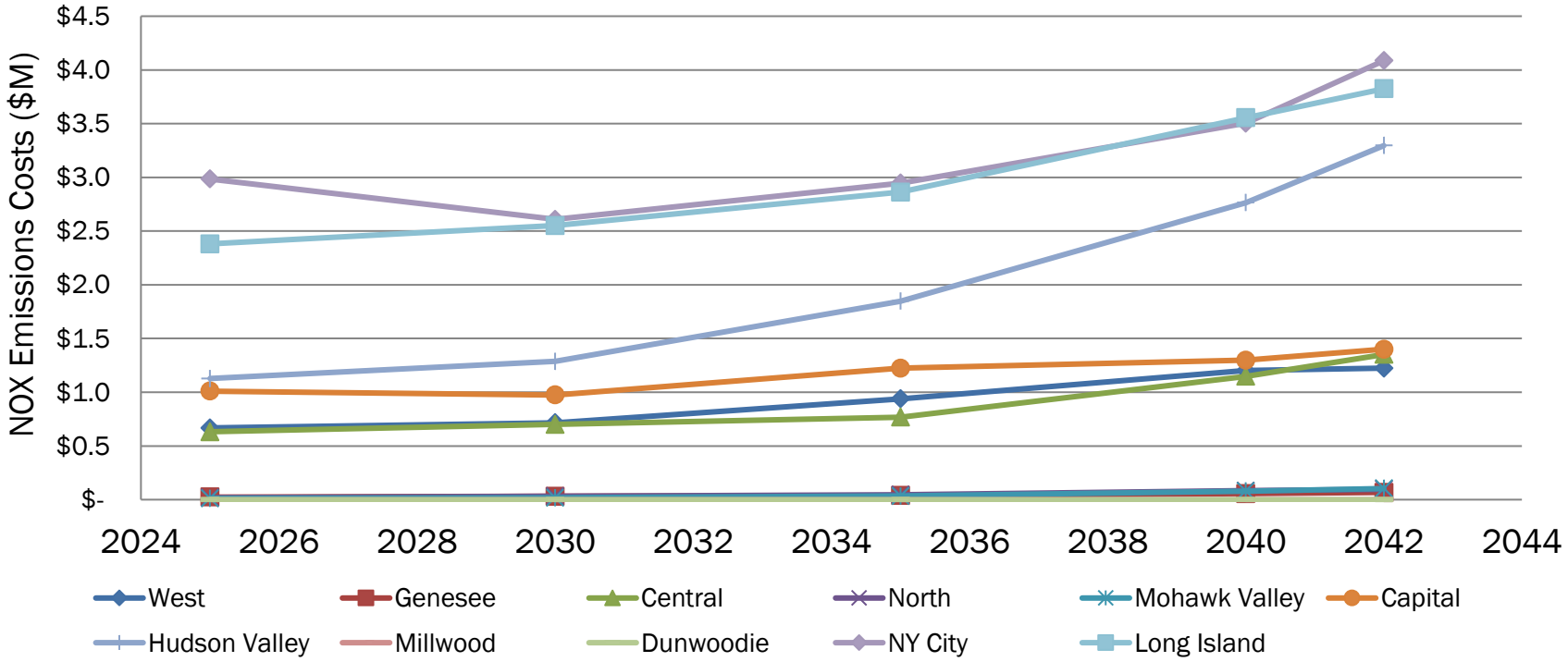
Zonal NO_X Emissions Costs (nominal $M)



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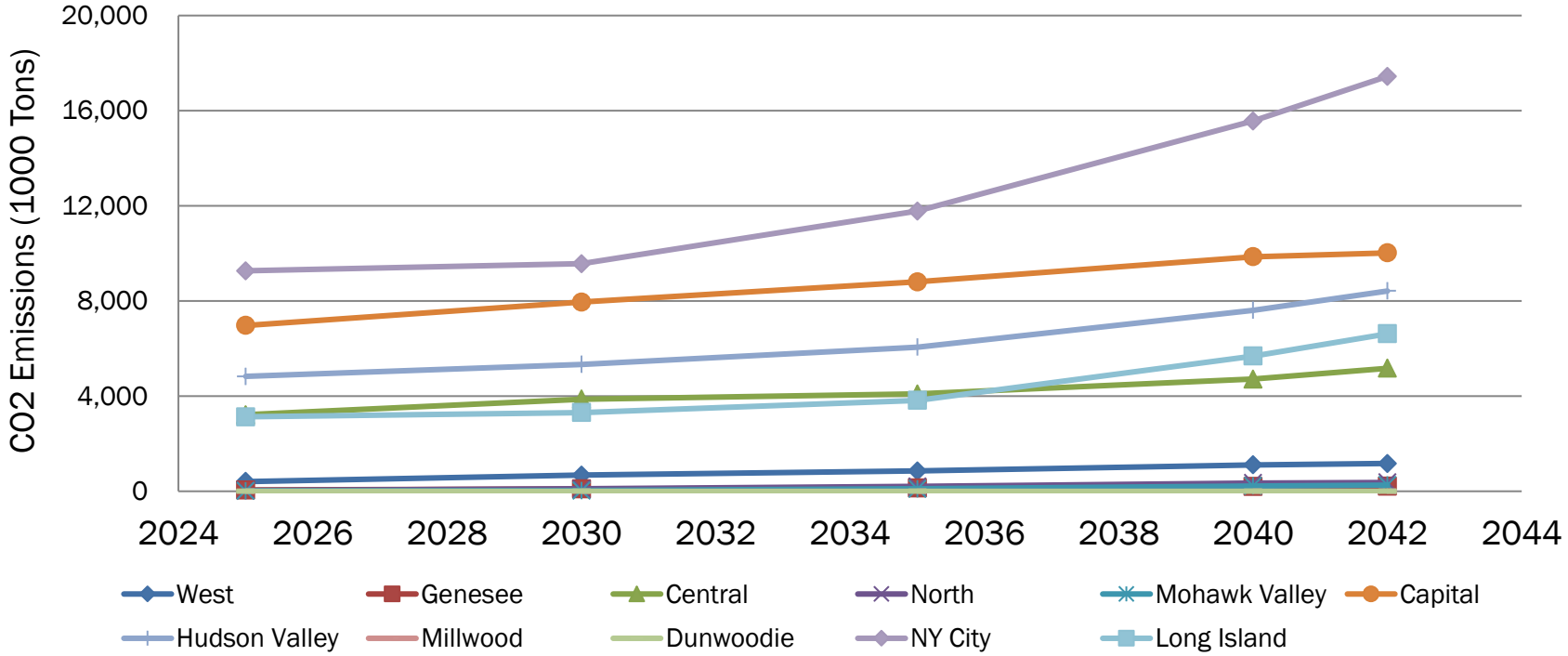
Zonal CO_2 Emissions (1000 Tons)



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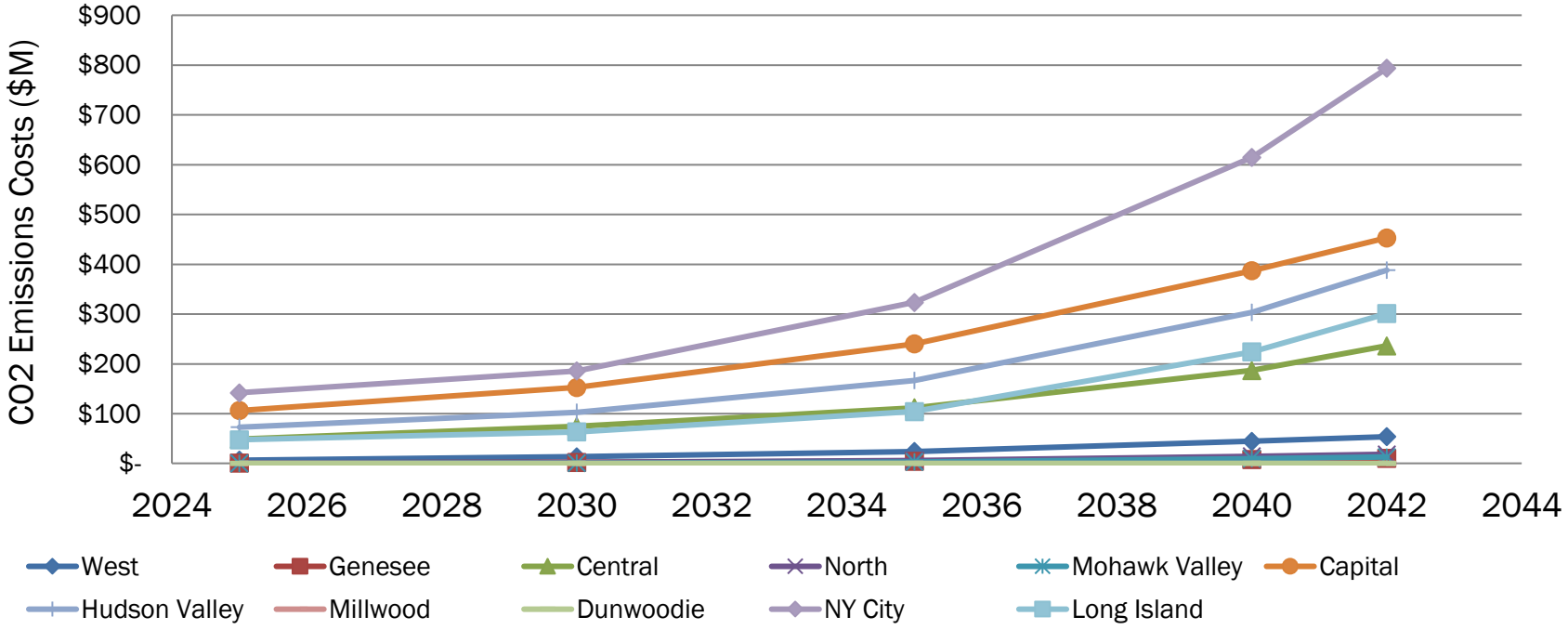
Zonal CO_2 Emissions Costs (nominal $M)



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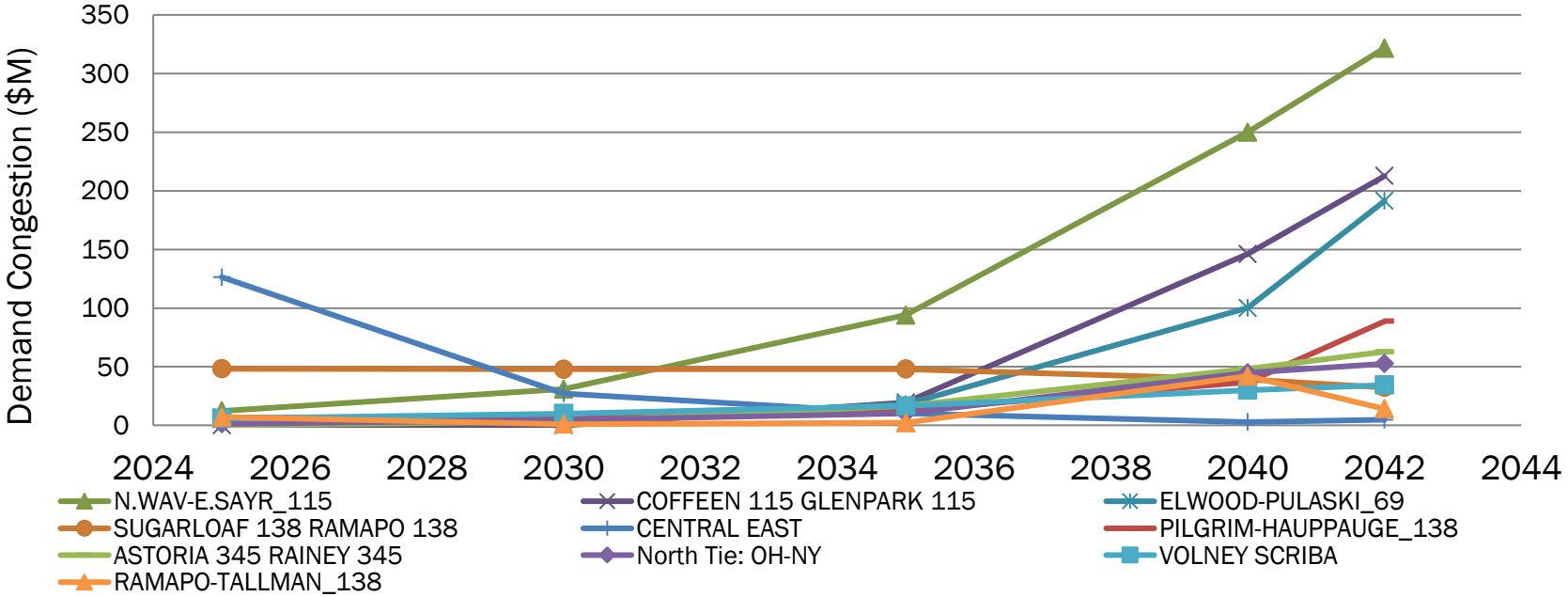
Projected NYCA-Wide Demand Congestion by Constraint (nominal $M)



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Key Takeaways

- Higher overall load forecasts for New York and surrounding regions contribute to higher levels of internal New York generation and lower imports
- Lower kV overloads are more prominent in later years compared to bulk power system congestion
- Higher LBMP prices in upstate zones driven by combination of large loads, local congestion, and higher cost generation dispatched to serve energy

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Contract Case Update

Contract Case Assumptions

- Load, fuel price, and emission allowance price assumptions will be the same as the Base Case forecasts
- Renewable generation resource additions will be based on the current NYSERDA Renewable Energy Certificate (REC) contracts database and announced awards as of 10/30/2023
  - In addition to details presented at 10/24/23 ESPWG, the REC and OREC awards announced on 10/24/2023 will be included in the Contract (and Policy) Case
  - Incremental additions will consider resources already included in the Base Case due to the inclusion rules
- Inclusion of approved Phase 1 and 2 transmission projects approved in February 2023 PSC Order, including the Brooklyn Clean Energy Hub

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Policy Case Update: Capacity Expansion Model Assumptions

Policy Case Assumptions Update

- In consideration of stakeholder feedback, the Policy Case lockdown date has been revised to 11/15/2023
- Capacity expansion model enhancements to be included in the Policy Case for the 2023-2042 Outlook include:
  - Updated marginal ELCC curves (proposal presented at 10/24/23 ESPWG)
  - Time representation methodology (proposal presented at 10/24/23 ESPWG)
  - Addition of external pools
  - Addition of generation supply curves for renewable technologies
- Additional detail on the proposed assumptions for the Policy Case are included in the assumptions matrices posted with today's meeting materials

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Capacity Expansion Model Study Years

- The capacity expansion model will evaluate the 2023-2042 horizon, and results will be reported for model years 2025, 2030, 2035, 2040, and 2042

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Transmission Representation in Capacity Expansion Model

- The capacity expansion model assumes a nodal to zonal reduction of transmission network topology performed by PLEXOS to create a pipe-and-bubble equivalent model, where intra-zonal lines are collapsed
- Transmission upgrades beyond the existing system topology included in the capacity expansion model for the Policy Case are as follows:
  - NYPA Northern New York Priority Transmission Project
  - Champlain Hudson Power Express
  - Clean Path New York
  - Joint Utilities Phase 1 & Phase 2 Projects, including the Brooklyn Clean Energy Hub
  - Long Island OSW Public Policy Project

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Transmission Representation in Capacity Expansion Model: External Pools

- **In addition to the modeling the NYCA system, the capacity expansion model for the 2023-2042 Outlook will include a simplified representation of transmission and generation in the external pools**
  - Each neighboring region will be modeled as a connection in the pipe-and-bubble equivalent model of the system
  - Generation mix will be assumed to change through the study horizon consistent with "policy futures" for neighboring regions and will be aggregated by technology type
    - Assumptions will leverage public information from respective ISO/RTO
- **Load forecasts for external pools will account for "policy futures" for each respective ISO and leverage public information from respective ISO/RTO**

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Generation Supply Curves for Renewable Resources

- **Information from the NYSERDA Large Scale Renewables Supply Curve effort will be leveraged for candidate generators in the capacity expansion model**
  - Maximum resource potential by location will be assumed for applicable candidate generators
  - Generator costs will be assumed accordingly for each Policy Case scenario

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Capacity Reserve Margin Requirements

- Capacity reserve margin requirements will be modeled explicitly in the capacity expansion model in the Policy Case
- For the 2023-2042 Outlook, propose to assume UCAP equivalent of capacity reserve margins as the minimum requirement for capacity in respective locations (NYCA and Localities)
- Propose to adjust minimum requirements for Localities (G-J, J, and K) for years 2030 and beyond to address major topology changes in the NYCA system
  - This method would leverage the TSL floor methodology used in the NYISO's LCR optimization process and account for changes to the parameters accordingly

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Capacity Expansion Enhancements: Time Representation

- Time representation methodology - framework for the time representation in the capacity expansion model
- Details on the methodologies used in the prior study are included in section E.3.1 of 2021-2040 Outlook Appendix E
- For the 2023-2042 Outlook, propose a framework with representative days for each year and preserves chronology within each representative day
  - Representative days will be applied and weighted across each model year to most accurately match the input generation and peak totals for that year
  - This method preserves the chronology, including the state-of-charge (SoC) of energy storage resources, within each day
  - Sources and references for this methodology development are included in the System and Resource Outlook Update slides presented at 10/24/23 ESPWG

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Capacity Expansion Enhancements: Time Representation Proposal

- For the 2023-2042 Outlook, propose to model each year with 13 representative days to represent a year's variety of conditions
- For each model year, base representative days on load, wind (OSW and LBW), and solar values
- Seek to preserve annual energy total, seasonal peaks, and variable performance of renewable resources
- Each year will include the following representative days (totaling 13 per year):
  - Peak summer day (weighted 1x)
  - Peak winter day (weighted 1x)
  - Near peak summer day (weighted 5x)
  - Near peak winter day (weighted 5x)
  - Moderate day (weighted based on clustering)
  - 8 groups to represent each combination of high/low energy, wind, and solar

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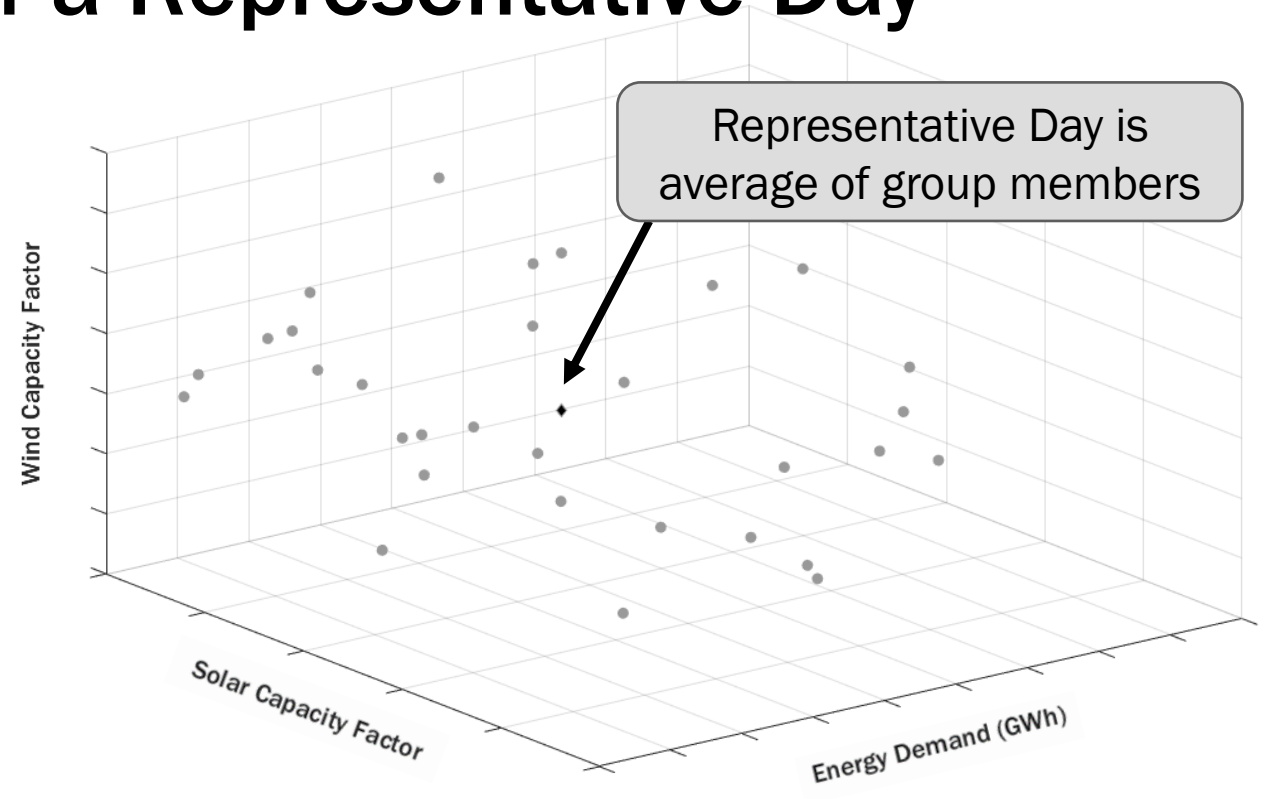
Example of a Representative Day

- Each point is a day, placed on the figure according to its total Energy Demand, Average Solar Capacity Factor, and Average Wind Capacity Factor.
- This example shows a small subset of 32 days. The representative day for this group is the day formed by the hour-by-hour average of all 32 days (as shown in black diamond).



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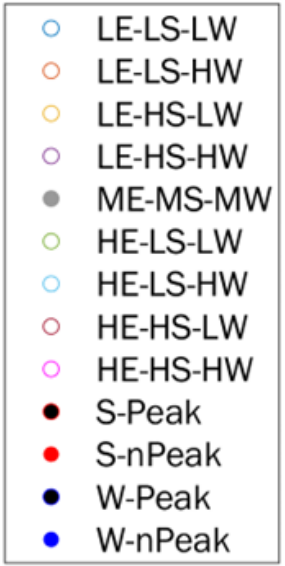
Example of Representative Days (cont.)

- **The 13 representative days per year are designed as follows:**
  - The first 9 groups describe the combinations of energy, wind, and solar performance
    - For example, “LE-LS-HW” means that days in that group have below average (low) energy demand and below average (low) solar capacity factor but above average (high) wind capacity factor. ME-MS-MW is the moderate day of all three qualities.
  - The other 4 groups are the peaks and near-peaks for the summer and winter seasons
- **Each representative day is “weighted” according to the number of days that comprise that group, for a total of 365 day-weights per year**
  - For example, the group of 32 days on the previous slide represents the moderate (ME-MS-MW) day. These days are replaced by the group’s representative day (average of load, wind, and solar shapes), giving it a weight of 32 (out of 365)
- **Each day captures six 4-hour blocks that are solved by the model, totaling 78 blocks per year for all 20 years**
  - This is nearly 5x higher resolution than the 17 timeslices in the previous Outlook



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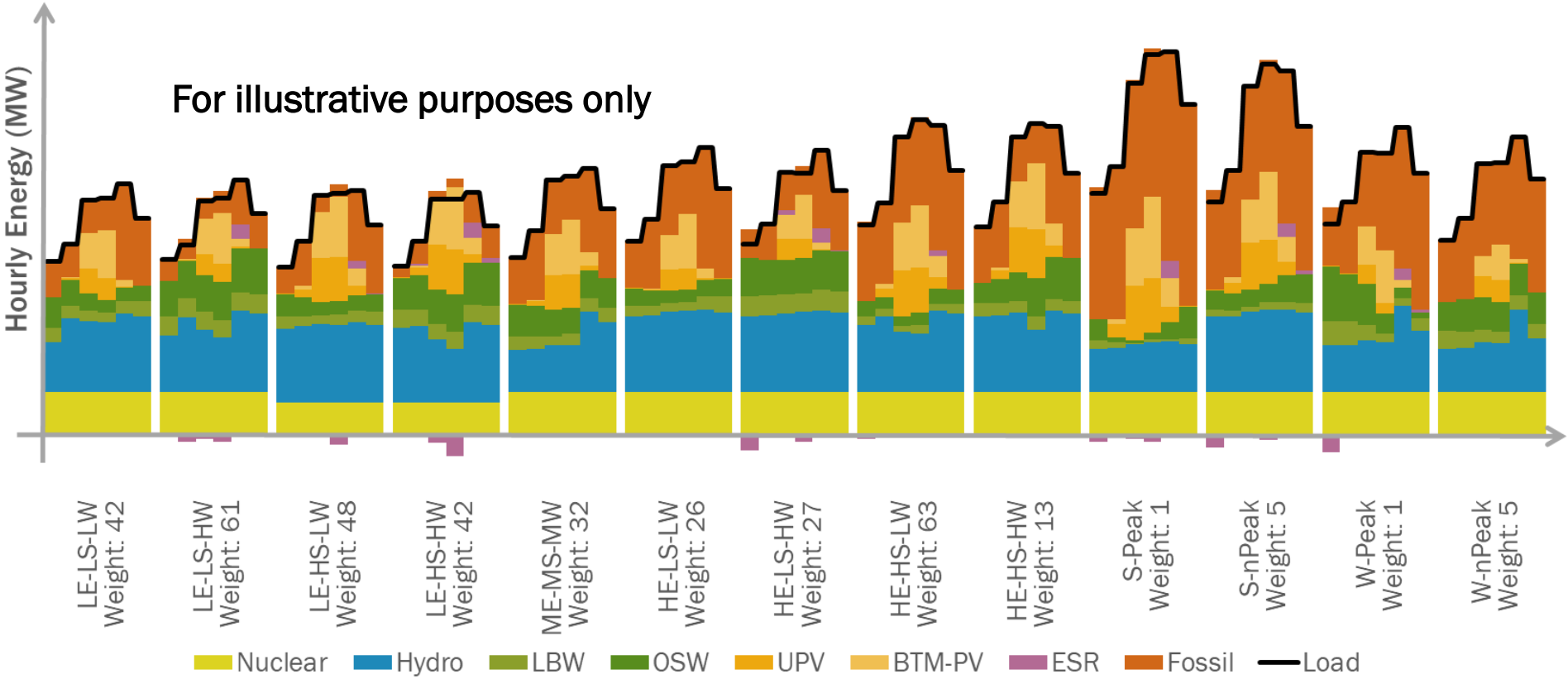
Example Representative Days for One Year



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Next Steps

Next Steps

- Continue model development of production cost and capacity expansion models
- Policy Case assumptions lock down date: 11/15/2023
- Upcoming stakeholder presentations
  - November 21, 2023 ESPWG
  - December 19, 2023 ESPWG

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Questions, Comments, & Feedback?

Email additional feedback to:
SCarkner@nyiso.com
one week prior the next ESPWG

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2023-2042 System & Resource Outlook Data Catalog

Report

Report Placeholder

Study Summary

Summary Placeholder

Stakeholder Presentations

November 18, 2022
- 2021 Outlook Lessons Learned
- NYSERDA Outlook Suggestions

June 16, 2023
- 2023-2042 Outlook Kickoff

July 17, 2023
- 2023-2042 Outlook Benchmark
- 2023-2042 Outlook Update

August 22, 2023
- 2023-2042 Outlook Preliminary Reference Case Assumptions

September 21, 2023
- 2023-2042 Outlook Reference Case Assumptions Update

October 24, 2023
- 2023-2042 Outlook Reference Case Assumptions Update

Report Appendices

Production Cost Model Benchmark Draft

Data Documents

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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