New York ISO
Independent System Operator

Economic Planning Process

2023-2042 System & Resource Outlook

Sarah Carkner

Senior Engineer, Long Term Assessments

Electric System Planning Working Group (ESPWG)

Thursday, September 21, 2023

Agenda

- Scope & Schedule Review
- Preliminary Assumptions Matrices
- Reference Case Assumptions Update
- Next Steps
- Questions, Comments, & Feedback
- 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

2023 Q3	Month	July					August				September			
	Week	1	2	3	4	5	1	2	3	4	1	2	3	4
	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													

2023 Q4	Month	October					November				December			
	Week	1	2	3	4	5	1	2	3	4	1	2	3	4
	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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Preliminary Assumptions Matrices

Preliminary Assumptions Matrices

- **Also posted with this ESPWG meeting material are the following documents:**
  - Production Cost Assumptions Matrix – Preliminary Draft (9/21/2023)
  - Capacity Expansion Assumptions Matrix – Preliminary Draft (9/21/2023)
- **Base Case assumptions lock down date: 10/15/2023**

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Base Case Assumptions

Base Case Assumptions Update

- Addressing Reliability Need identified in 2023 Q2 STAR
- Fuel price forecast based on EIA's 2023 Annual Energy Outlook
- Load forecast from 2023 NYISO Gold Book Baseline forecast
- Emission allowance price forecasts
- Additional details on assumptions can be found in the assumption's matrix posted along with these meeting materials

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Addressing Reliability Need Identified in 2023 Q2 STAR

- The 2023 Q2 STAR study identified a short-term reliability process need ("Need") beginning in summer 2025 in New York City
- The Need is primarily driven by a combination of forecasted increases in peak demand and the assumed unavailability of generation in New York City affected by the DEC's Peaker Rule
- The transmission security margin deficiency of 446 MW for New York City (Zone J) will be addressed by placing generic generation with parameters identical to the new entrant peaking plant technology from the 2021-2025 Demand Curve Reset Study

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Natural Gas Price Forecast

- Natural Gas Price forecast based on methodology as presented on June 25, 2019 ESPWG meeting
- Fuel forecast based on EIA's 2023 Annual Energy Outlook forecast of national delivered price
- NYCA divided into 4 gas regions (Zones A-E, F-I, J and K) proxied by blend/weighted average of hub prices
- Adjoining Control Areas represented as gas regions based on specific hubs
  - ISO-NE North: Algonquin CG / ISO-NE South: Iroquois Z2
  - PJM East: Transco Z6 Non-NY / PJM West: Columbia/TCO
  - IESO: Dawn

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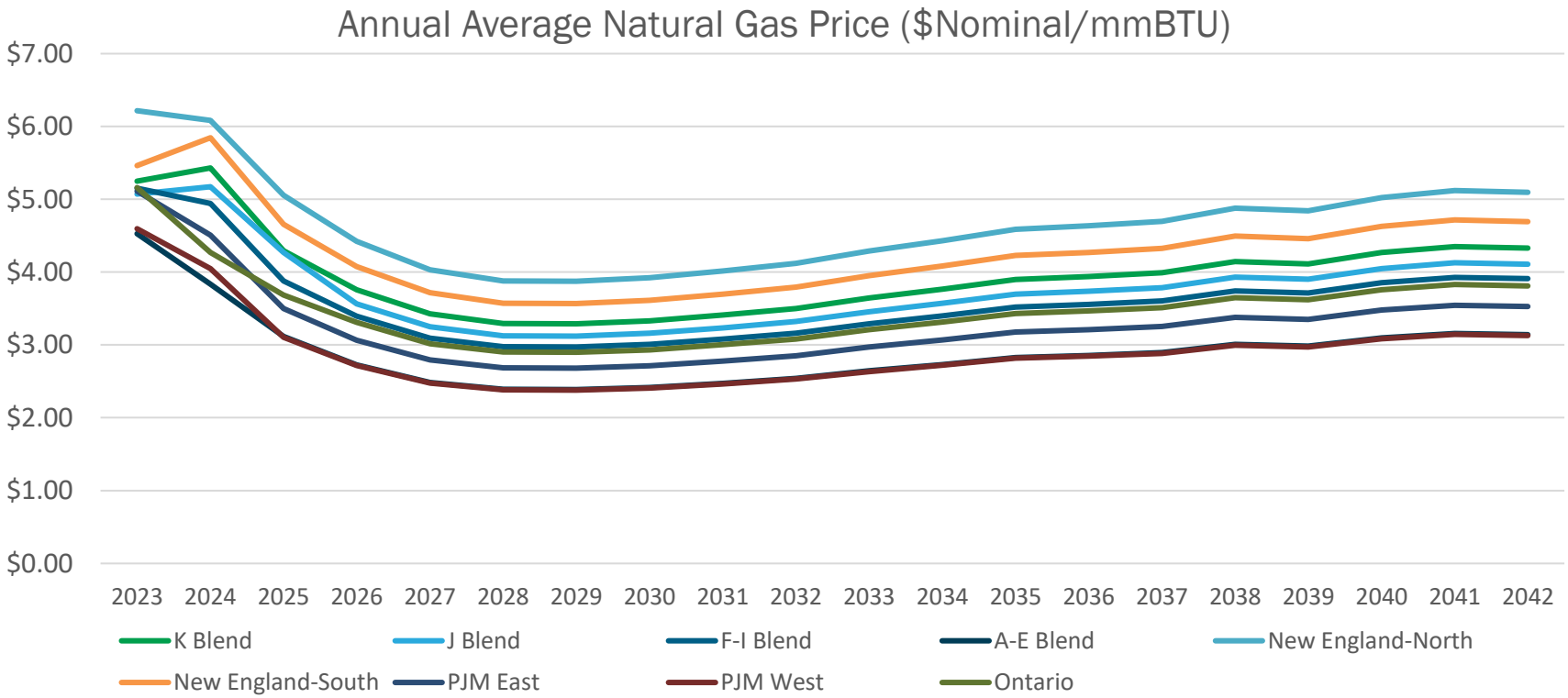
Natural Gas Price Forecasts



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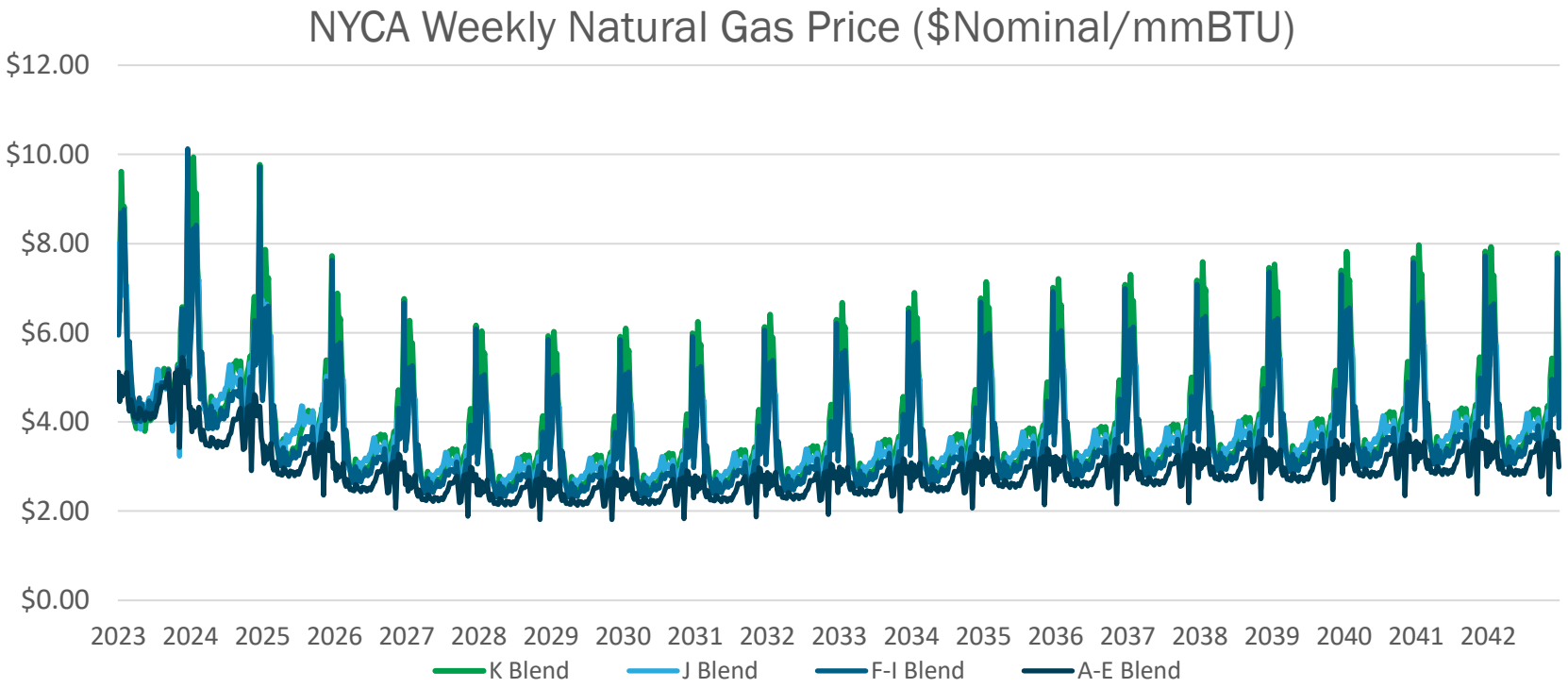
Natural Gas Price Forecasts



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Load Forecast

- The NYISO produces load shapes reflecting forecast year energy and peaks (based upon the 2018 weather year), and evolving over time to account for the increasing impacts of BTM solar and electrification
  - The shape shifts from a summer peaking system to a winter peaking system
  - Weather-sensitive, end uses are preserved
- The NYISO derives targets from the Gold Book Baseline Forecast values but with the following components removed (according to table I-1b, c, & d):
  - Large Loads
  - Storage Net Energy Consumption & Peak Reductions
- The NYISO creates a BTM Solar shape separately and adds this to the load forecast to obtain the gross load forecast
- The NYISO explicitly models BTM Solar, Storage, and Large Loads instead of including them in the load forecast for use in the Outlook

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Load Forecast Summary

Baseline Forecast Summary

Year	NYCA Annual Energy (GWh)	NYCA Summer Peak (MW)	NYCA Winter Peak (MW)
2025	153,631	33,219	24,406
2030	158,567	33,290	27,816
2035	179,261	35,546	34,956
2040	207,241	38,025	43,804
2042	216,709	38,969	46,541

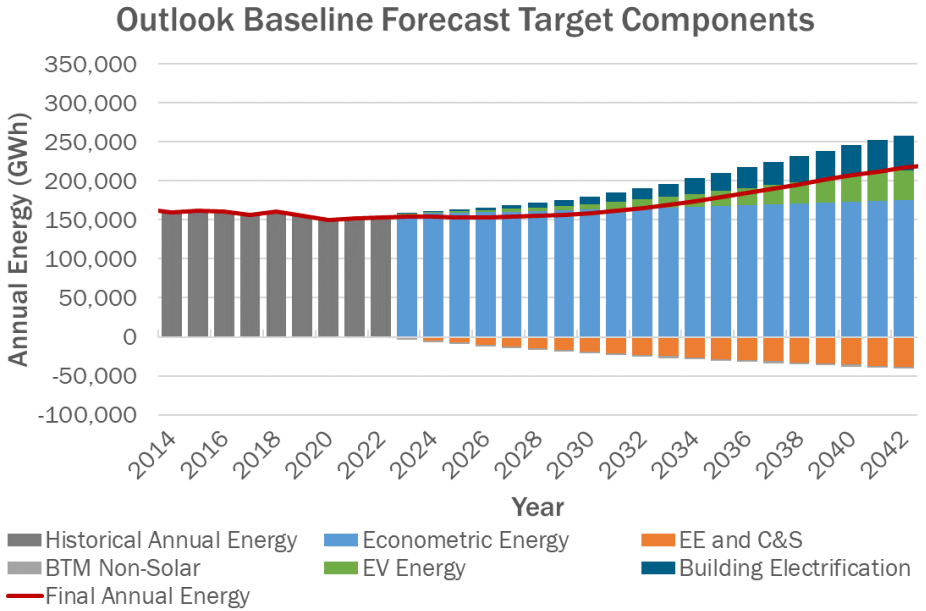

Table is accurate to forecast totals. Figure represents targets only, not forecast totals.

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Large Load Assumptions

- **Large load forecast consistent with 2023 Q3 STAR assumptions, which include:**
  - Q0580 – WNY STAMP
  - Q0776 – Greenidge Load (BTM)
  - Q0849 – Somerset Load
  - Q0580 – Cayuga load
  - Q0979 – North Country Data Center (Load Increase)
  - Q1536 – White Pine Phase 1 (Micron)
  - Q1446 – Massena Green Hydrogen (Air Products and Chemicals)

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CO_2 Emissions Allowance Price Forecast Considerations

- **Regional Greenhouse Gas Initiative (RGGI)** – Assume current program design features extended beyond 2030 while program review is ongoing (Link)
  - Pennsylvania not included in RGGI program as legal proceedings continue
  - Virginia included in RGGI program as legal proceedings continue
- **Massachusetts Global Warming Solution Act (GWSA)** – Single state cap and trade program modeled in addition to RGGI price for affected generators (Link)
- **Ontario Carbon Price** – updated to apply carbon price only to emissions released above the industry-specific benchmark emissions rate (decreased in 2023 from 370 to 310 tCO2e/GWh). Aligns with methodology used by IESO (Link)

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Cross-State Air Pollution Rule Allowance Price Forecast Considerations

- Annual SO_2 and annual NO_X programs oversupplied as emissions reduced well below annual caps leading to persistently low allowance prices
- Ozone season NO_X program updates and regulatory uncertainty due to judicial orders have recently created uncertainty for the seasonal programs
  - Stringent new caps may not be enforced in 12 of 22 states, which represent 70% of the new program caps. Prior less stringent requirements are to be enforced in these states.
- Total price of NO_X emissions in the ozone season is the sum of the annual and ozone season NO_X allowance prices
- More information, such as program and state applicability, is available on the US EPA Cross-State Air Pollution Rule (CSAPR) Programs website at: https://www.epa.gov/csapr

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Proposed Emissions Allowance Price Forecast

- Accepting feedback on proposed emissions allowance price forecast and values
- Emissions allowance price forecasts from 2021-2040 Outlook
  - Methodology (slides 19-22): Link
  - Final Forecast Values: Link

	Proposed 2023-2042 System and Resource Outlook Emission Allowance Price Forecast ($Nominal/ton)						
	SO_2	Annual NO_X	Ozone Season NO_X Group 2	Ozone Season NO_X Group 3	Ontario CO_2	RGGI CO_2	Mass CO_2
2023	$ 2	$ 3	$ 900	$ 3,600	$ 47	$ 14	$ 8
2024	$ 2	$ 3	$ 925	$ 3,600	$ 58	$ 14	$ 8
2025	$ 2	$ 3	$ 950	$ 3,600	$ 69	$ 15	$ 9
2026	$ 2	$ 3	$ 975	$ 3,600	$ 80	$ 15	$ 9
2027	$ 2	$ 3	$ 1,000	$ 3,600	$ 91	$ 16	$ 9
2028	$ 2	$ 3	$ 1,025	$ 3,600	$ 102	$ 17	$ 10
2029	$ 2	$ 3	$ 1,050	$ 3,600	$ 112	$ 18	$ 10
2030	$ 2	$ 3	$ 1,075	$ 3,500	$ 123	$ 19	$ 10
2031	$ 2	$ 3	$ 1,100	$ 3,500	$ 123	$ 20	$ 11
2032	$ 2	$ 3	$ 1,125	$ 3,500	$ 123	$ 22	$ 11
2033	$ 2	$ 3	$ 1,150	$ 3,500	$ 123	$ 23	$ 11
2034	$ 2	$ 3	$ 1,175	$ 3,400	$ 123	$ 25	$ 12
2035	$ 2	$ 3	$ 1,200	$ 3,400	$ 123	$ 27	$ 12
2036	$ 2	$ 3	$ 1,225	$ 3,300	$ 123	$ 29	$ 12
2037	$ 2	$ 3	$ 1,250	$ 3,300	$ 123	$ 31	$ 12
2038	$ 2	$ 3	$ 1,275	$ 3,200	$ 123	$ 33	$ 13
2039	$ 2	$ 3	$ 1,300	$ 3,100	$ 123	$ 36	$ 13
2040	$ 2	$ 3	$ 1,325	$ 3,000	$ 123	$ 39	$ 13
2041	$ 2	$ 3	$ 1,350	$ 3,000	$ 123	$ 42	$ 13
2042	$ 2	$ 3	$ 1,375	$ 2,900	$ 123	$ 45	$ 14

Contract Case Assumptions 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 Credit (REC) contracts database. 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 Assumptions Update

Policy Case Assumptions

- **Policy Case will include incremental changes to the Contract Case, including additional assumptions specific to achievement of policy objectives**
  - More detailed information on these assumptions is included in the assumption matrix posted with today's meeting materials
- **Fuel price and emission allowance price assumptions will be the same as the Base & Contract Case forecasts**
- **Load forecasts will vary for each Policy Case Scenario**
  - 3 Scenarios will be modeled in the Policy Case for the 2023-2042 Outlook
    - "Low Load" Scenario, "High Load" Scenario, and "State" Scenario

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Policy Load Forecast Summary

Lower Demand Policy Forecast

Year	NYCA Annual Energy (GWh)	NYCA Summer Peak (MW)	NYCA Winter Peak (MW)
2025	151,339	32,279	24,651
2030	153,043	30,490	29,624
2035	172,946	31,557	38,297
2040	199,498	32,918	47,493
2042	207,998	33,601	49,967

Higher Demand Policy Forecast

Year	NYCA Annual Energy (GWh)	NYCA Summer Peak (MW)	NYCA Winter Peak (MW)
2025	152,800	33,063	24,835
2030	159,823	33,358	31,531
2035	189,803	36,241	43,617
2040	228,583	40,324	57,436
2042	242,109	41,830	61,809

State Scenario Policy Forecast

Year	NYCA Annual Energy (GWh)	NYCA Summer Peak (MW)	NYCA Winter Peak (MW)
2025	150,133	29,568	21,833
2030	161,858	29,861	26,999
2035	198,833	34,033	37,047
2040	228,107	37,915	45,062
2042	236,937	39,167	47,046

The Outlook High Policy Scenario load shapes are currently under compilation & review, and final forecast values may differ slightly.
See the Appendix for additional detail on the Policy Case load forecasts.

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Capacity Expansion Enhancements

- Several recommended enhancements to the capacity expansion model, based on “lessons learned” discussions with stakeholders and the MMU review of the 2021-2040 Outlook, are currently undergoing review, testing, and evaluation
- Ongoing assessment of proposed enhancements to the capacity expansion model for use in the Policy Case, including:
  - Addition of external pools
  - Time representation methodology
  - Addition of generation supply curves for renewable technologies
  - Updated ELCC curves

**Topics in blue will be discussed in further detail on the following slides*

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Capacity Expansion Enhancements (cont.)

- 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, recommend a framework that selects representative days for each year and preserves chronology within each representative day
  - Representative days with chronology preserved will track battery state-of-charge within each day and better capture intra-day generation mix
  - Ongoing evaluation of potential representative days to be considered
  - Additional detail on the methodology and proposed representative days to be provided at a future ESPWG

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Capacity Expansion Enhancements (cont.)

- Updated ELCC curves - evaluation of declining capacity value curves
- 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, recommend calculating marginal ELCC curves for resource types based on updated information in the 2023-2042 Outlook database consistent with the methodology used in the "Grid In Evolution Study" for "Lower Demand" and "Higher Demand" Policy Scenarios, and recommend implementing ELCC curves for resource types based on the Integration Analysis for the "State Scenario"
  - Updated regional ELCC curves for LBW, OSW, UPV, and storage would be based on factors such as hourly input load forecast and resource contribution (by technology type) to quantify the capacity value for that resource type at varying levels of installed capacity
  - These methods will base ELCC values on the load levels and capacity mix specific to each scenario

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Next Steps

Next Steps

- **Continue assumptions developments**
  - Base Case lockdown date: 10/15/2023
  - Contract and Policy Case lockdown date: 10/30/2023
- **Continue model development of production cost and capacity expansion models**
- **Upcoming Stakeholder Presentations**
  - Tuesday, October 24th

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Questions, Comments, & Feedback?

Email additional feedback to:
JFrasier@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

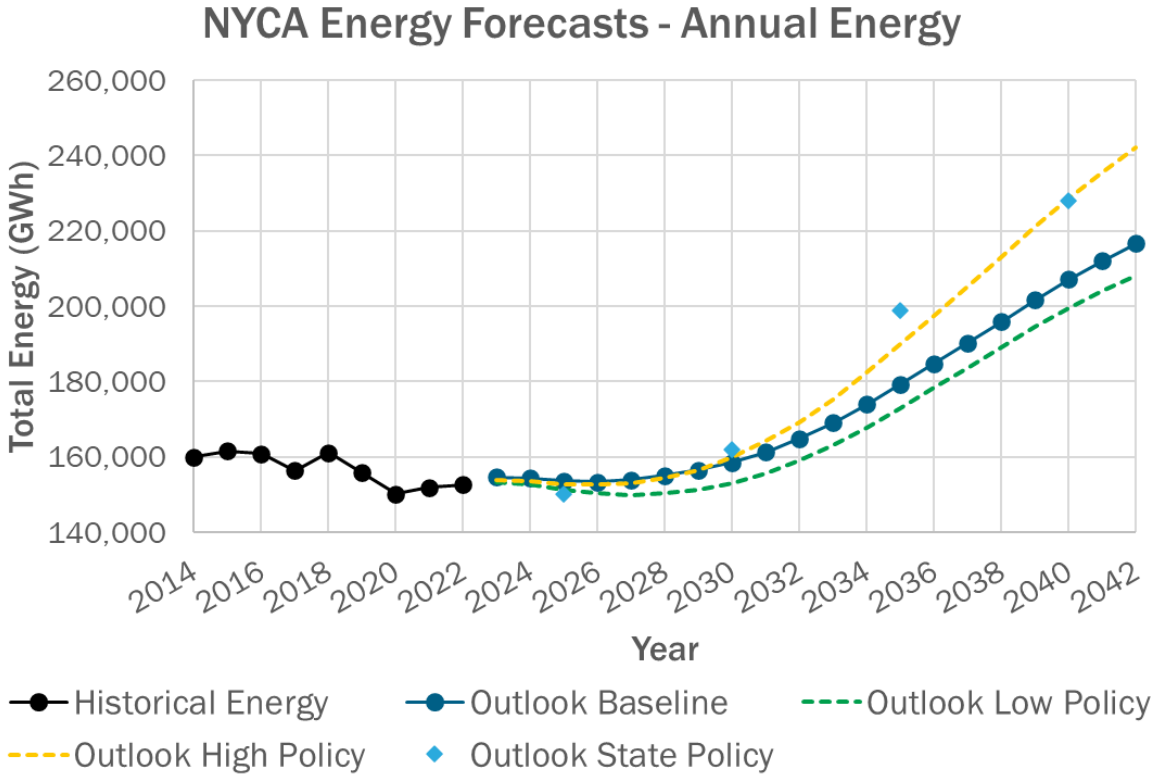
August 22, 2023
- 2023-2042 Outlook Update

Report Appendices

Data Documents

Appendix

Baseline and Policy Load Forecasts



The Outlook Higher Demand Policy Scenario load shapes are currently under compilation & review, and final forecast values may differ slightly.

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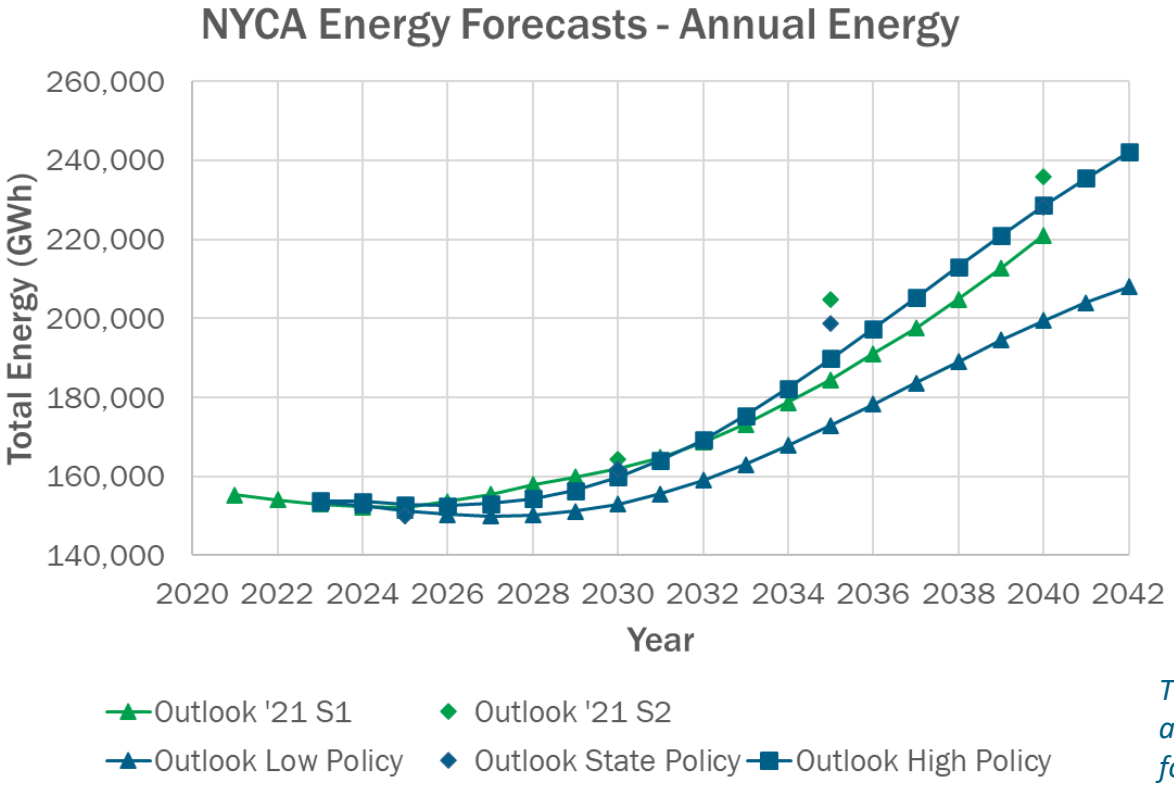
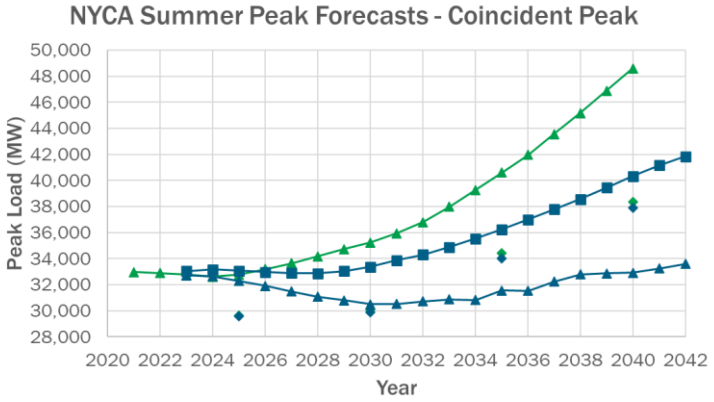
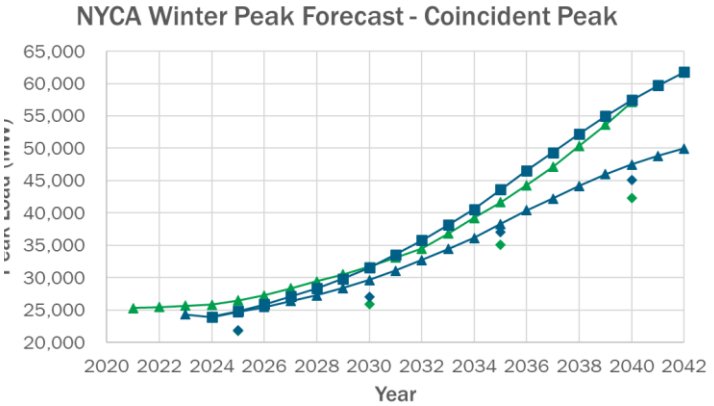
Policy Load Comparison







The Outlook Higher Demand Policy Scenario load shapes are currently under compilation & review, and final forecast values may differ slightly.

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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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