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Independent System Operator

2023-2042 System & Resource Outlook Update

Sarah Carkner, Manager, Long Term Assessments
Nischal Rajbhandari, Technical Specialist, Long Term Assessments

Electric System Planning Working Group (ESPWG)

April 30, 2024, NYISO

Agenda

- **Scope & Schedule Review**
- **Policy Case Updates**
  - Preliminary Results & Renewable Pocket Analyses
  - Capacity Expansion Sensitivity Update
- **Next Steps**
- **Outlook Data Catalog**
- **Appendix**
  - Preliminary Capacity Expansion Sensitivity Results

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Supplemental Material Posted

- **In addition to today's presentation, an excel spreadsheet with final Contract Case results has been posted with today's meeting materials**
  - This spreadsheet was originally posted with the 3/1/24 ESPWG materials with final Base Case results and will be updated accordingly to include the Policy Case results for the System & Resource Outlook
- **Additionally, an excel spreadsheet with simulated historic hourly production profiles for renewable resources has been posted with the meeting materials**
  - Data reflects hourly aggregate zonal LBW, UPV, and OSW net capacity factor profiles for years 2000-2022

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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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Updated Targeted Study Schedule

2024 Q2	Month	April					May				June			
	Week	1	2	3	4	5	1	2	3	4	1	2	3	4
	~~Capacity Expansion Model Development~~													
	~~Capacity Expansion Results & Analyses~~													
	Production Cost Model Development	X	X	X	X	X	X	X						
	Production Cost Results & Analyses	X	X	X	X	X	X	X	X	X				
	Sensitivities	X	X	X	X	X	X	X	X	X				
	Report & Appendices	X	X	X	X	X	X	X	X	X	X	X	X	X

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Policy Case:

Preliminary Results & Renewable Pocket Analyses

Renewable Generation Pocket Process

- Pocket definitions kept consistent with those identified in the 2021-2040 System and Resource Outlook study
- Renewable generation pockets are presented for year 2030 for the Contract Case and year 2035 for the Policy Case scenarios
  - Renewable pocket analysis for the Contract Case was presented at the 4/4/24 ESPWG
- A pocket is formed by local transmission congestion (if transmission lines are congested for more than 100 hours) causing bottlenecks for renewable generation
- Pocket metrics (e.g., curtailment, number of congested hours, energy deliverability, etc.) are reported

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Key Considerations

- Contract and Policy Cases include the approved Phase 1 and 2 transmission upgrades and NYPA's Smart Path Project
- Hydro resource model changes reflect limited pondage capability of most hydro units in New York, except Niagara units
- Renewable generation capacity significantly increased (45% higher) in the Contract Case as compared to the prior Outlook
  - Renewable capacity increases further in the Policy Case scenarios evaluated (approximately ~4 GW and 12 GW additional capacity respectively for Lower & Higher Demand Policy Case scenarios by 2035)
- Leveraged NYISO's Interconnection Queue and NYSERDA's LSR Supply Curve tool to inform generic resource placements for the Lower and Higher Demand Policy Case scenarios
- Other assumptions for generic resource sizing and placement were presented at the 03/21/24 ESPWG meeting

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Large Load Assumptions

Lower Demand Policy Large Load Forecast (GWh)											
Year	WEST	GENESEE	CENTRAL	NORTH	MOHAWK VALLEY	CAPITAL	HUDSON VALLEY	MILLWOOD	DUNWOODIE	NYC	L ISLAND
2025	1,010	1,470	2,010	1,290	400	0	0	0	0	0	0
2030	1,340	1,720	4,440	2,080	450	0	0	0	0	0	0
2035	1,340	1,720	4,440	2,080	450	0	0	0	0	0	0
2040	1,340	1,720	4,440	2,080	450	0	0	0	0	0	0
2042	1,340	1,720	4,440	2,080	450	0	0	0	0	0	0

Higher Demand Policy Large Load Forecast (GWh)											
Year	WEST	GENESEE	CENTRAL	NORTH	MOHAWK VALLEY	CAPITAL	HUDSON VALLEY	MILLWOOD	DUNWOODIE	NYC	L ISLAND
2025	1,400	1,470	2,010	1,910	400	0	0	0	0	0	0
2030	2,360	2,580	8,040	4,250	450	0	0	0	0	0	0
2035	2,360	2,580	8,460	4,250	450	0	0	0	0	0	0
2040	2,360	2,580	8,460	4,250	450	0	0	0	0	0	0
2042	2,360	2,580	8,460	4,250	450	0	0	0	0	0	0

Please refer to the 2023 Gold Book for additional information on large load assumptions

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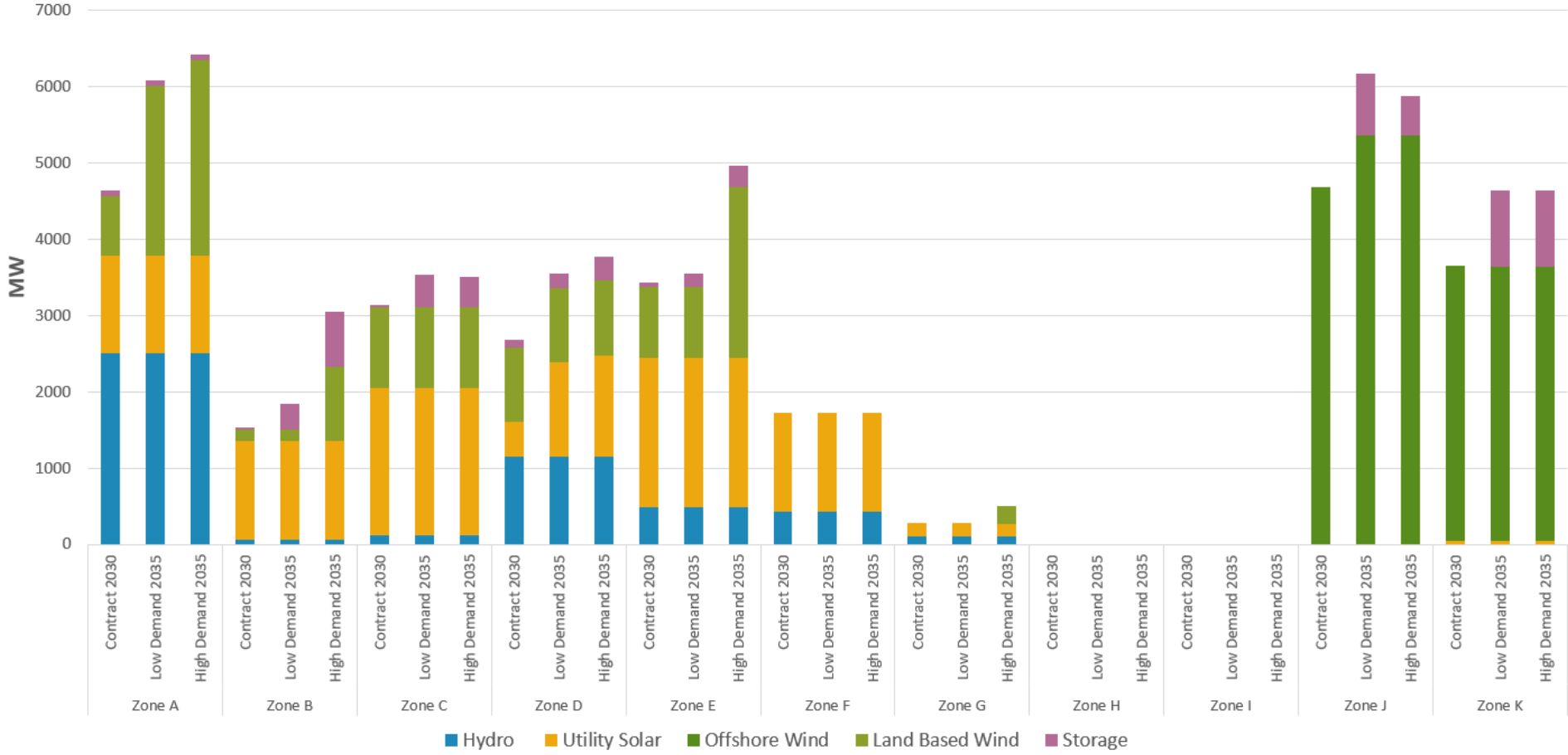
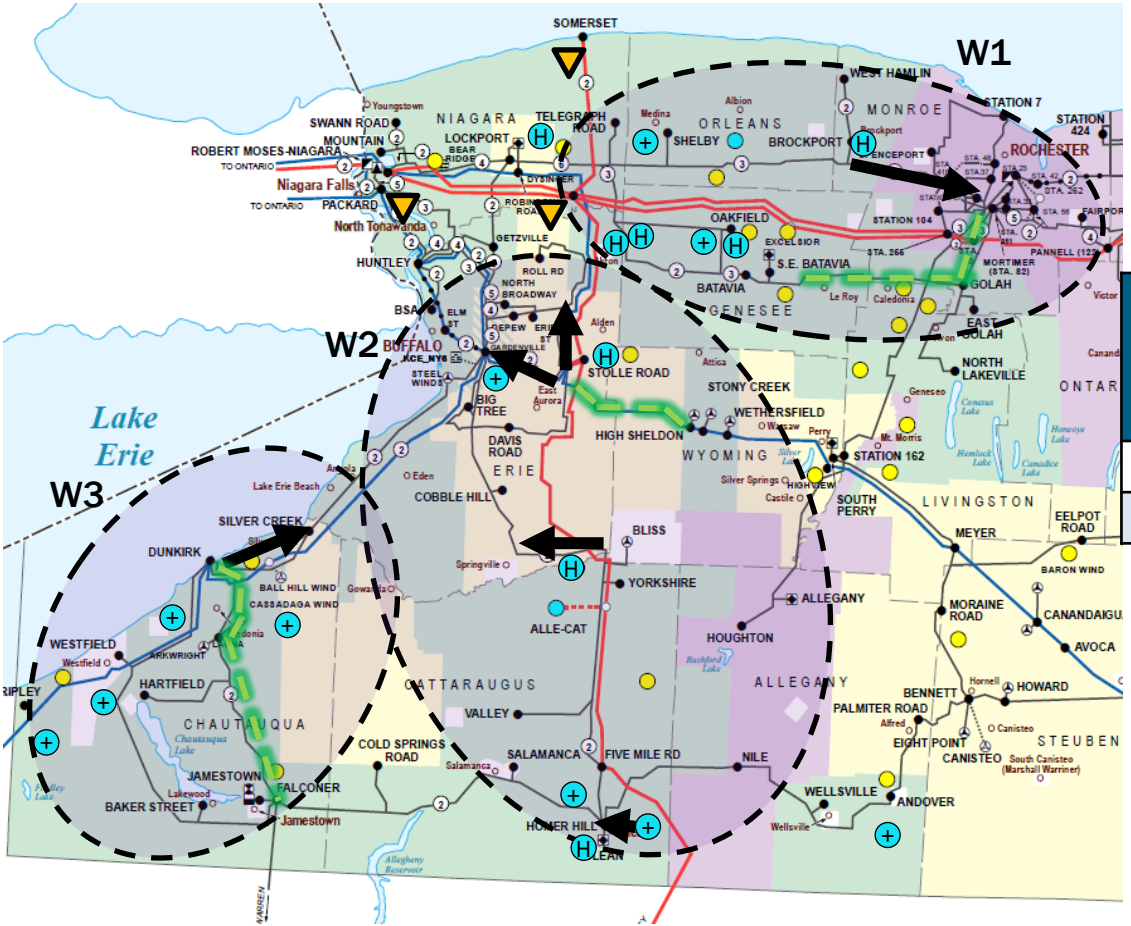
Zonal Installed Capacity by Case



Pocket W



Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Large Load

Key	Awarded Resource*	Lower	Higher	Lower + Higher
Wind	●	L	H	+
Solar	●	L	H	+

Type	Total Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Wind	1,265	2,709	3,877	98%	97%	92%
Solar	2,570	2,570	2,570	96%	91%	92%

**Reflects generation capacity that has been awarded contracts and incremental to Base Case generators and is included as firm in all Contract & Policy Case scenarios*

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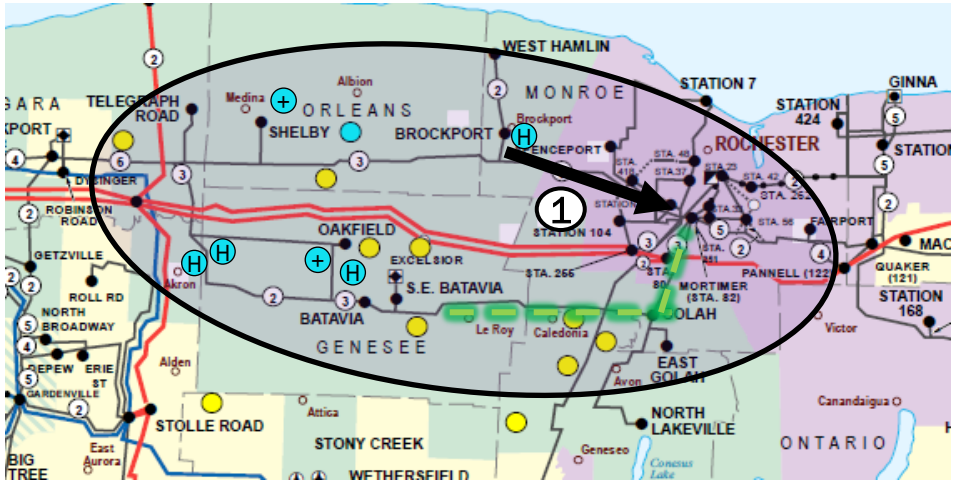
Pocket W1

Western NY: Niagara-Orleans-Rochester

Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind		L	H	+
Solar		L	H	+



ID	Constraint	Number of Limiting Hours		
		Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
1	MORTIMER 115.00-SWDN-113 115.00	-	200	3,377

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Wind	147	339	1,001	100%	100%	84%
Solar	2,030	2,030	2,030	96%	90%	92%

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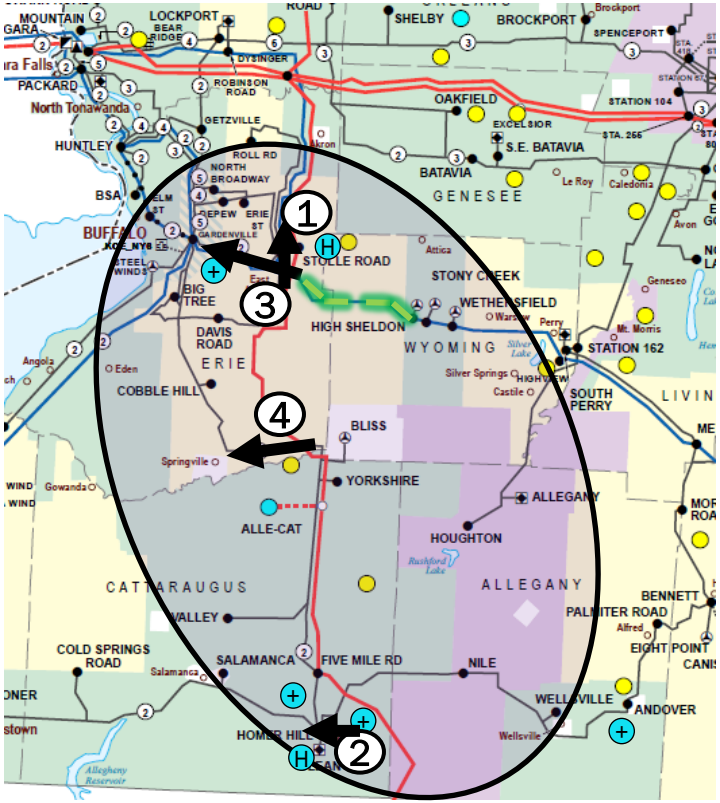
Pocket W2

Western NY: Buffalo-Erie



Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind		L	H	+
Solar		L	H	+

ID	Constraint	Number of Limiting Hours		
		Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
1	ERIE 115 115.00-PAVMT115 115.00	1,455	2,177	2,491
2	DUGN-157 115.00-HOMERHIL 115.00	-	459	476
3	STOLLE115 115-GIRDLE RD 115	132	187	245
4	FREEDOM 115.00-BIXBY_HL 115.00	11	6	2,581

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Wind	813	1,476	1,959	97%	97%	96%
Solar	60	60	60	99%	99%	97%

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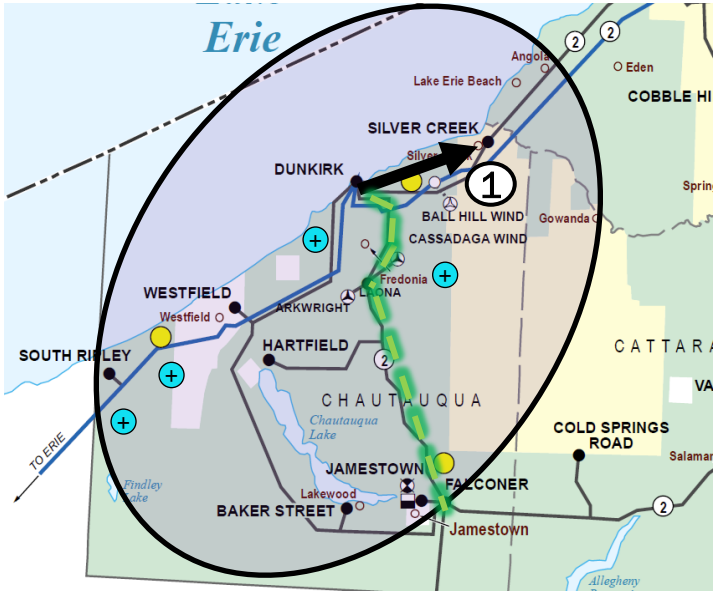
Pocket W3

Western NY: Chautauqua

Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind	●	L	H	+
Solar	●	L	H	+



ID	Constraint	Number of Limiting Hours		
		Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
1	SLVRC141 115.00-DUNKIRK1 115.00	-	1,691	1,771

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Wind	305	894	917	100%	95%	94%
Solar	480	480	480	100%	94%	93%

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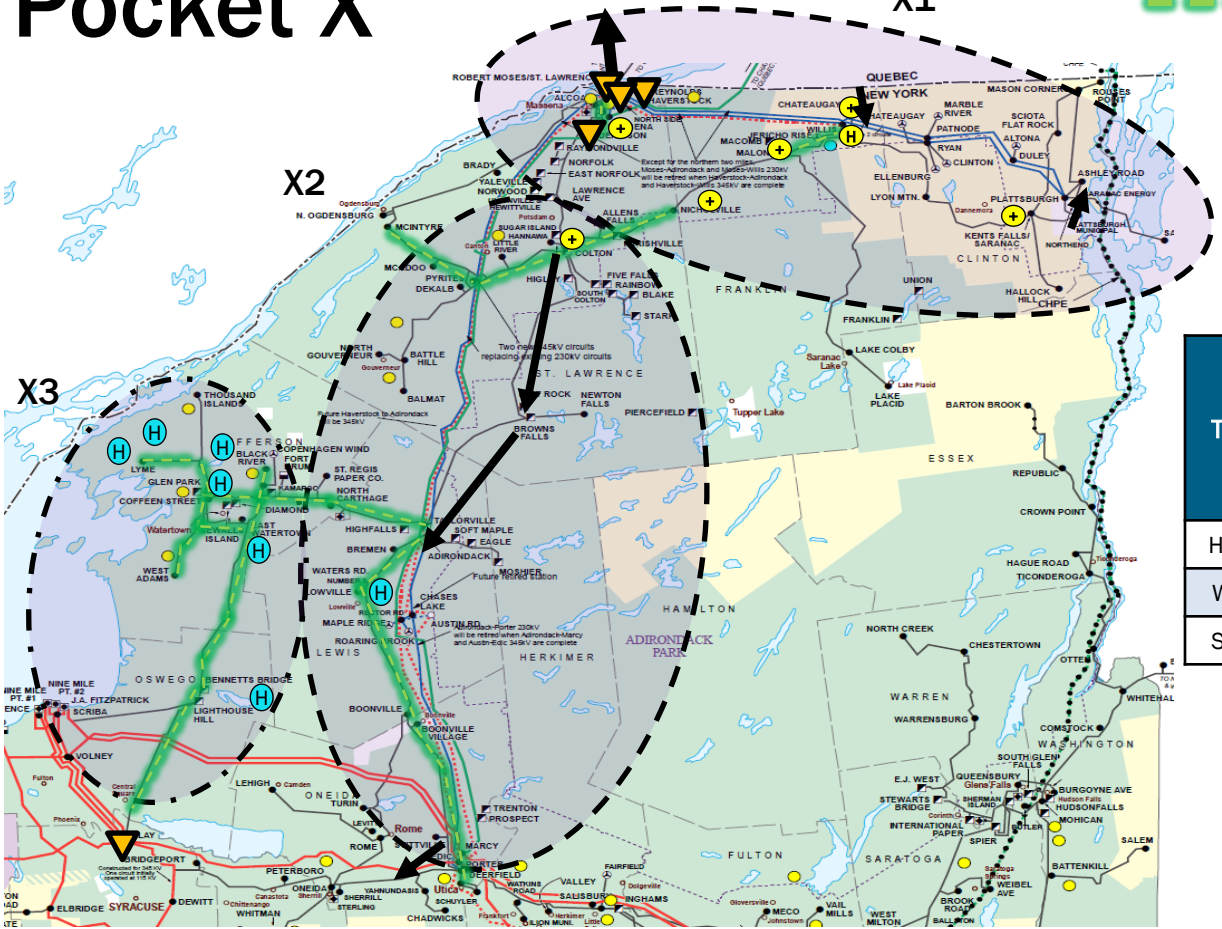
Pocket X



Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Large Load

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind		L	H	+
Solar		L	H	+

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Hydro	1,631	1,631	1,631	97%	92%	96%
Wind	1,562	1,562	2,492	94%	91%	96%
Solar	1,239	2,021	2,115	93%	92%	95%

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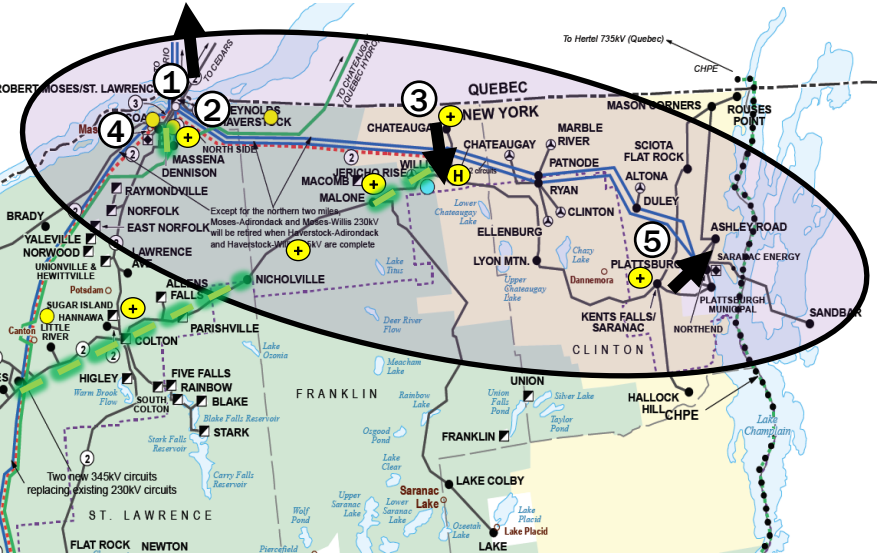
Pocket X1

Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

North Country: Northern Area

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind		L	H	+
Solar		L	H	+



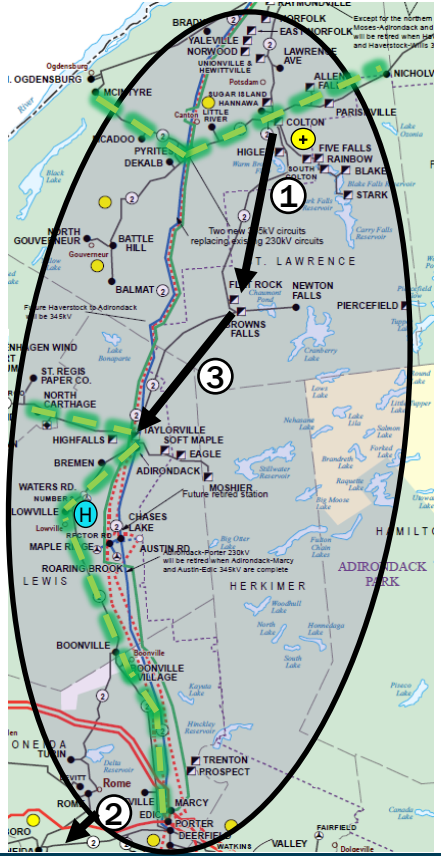
ID	Constraint	Number of Limiting Hours		
		Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
1	North Tie: IESO-NY*	6,561	6,790	6,505
2	MOSES W 230.00-MNH3230 230.00	883	1,268	704
3	CHATG115 115.00-CHATP115 115.00	-	644	-
4	ALCOA-NM 115.00-ALCOA N 115.00	45	165	358
5	ASHLY115 115.00-PLAT 115 115.00	-	156	133

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Hydro	1,155	1,155	1,155	98%	93%	97%
Wind	977	977	977	93%	90%	94%
Solar	690	1,308	1,396	89%	91%	95%

*Note – North Tie: IESO-NY congestion reported for information only as operations protocols would dictate the operation of this line.

Pocket X2

Northern NY: Mohawk Valley Area



Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind		L	H	+
Solar		L	H	+

ID	Constraint	Number of Limiting Hours		
		Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
1	COLTON 115.00-FLAT RCK 115.00	-	1,408	816
2	TRNG STN 115.00-STERLING 115.00	200	497	507
3	BRNS FLS 115.00-TAYLORVL 115.00	-	276	206

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Hydro	252	252	252	97%	87%	93%
Wind	505	505	583	96%	92%	96%
Solar	80	244	250	92%	85%	92%

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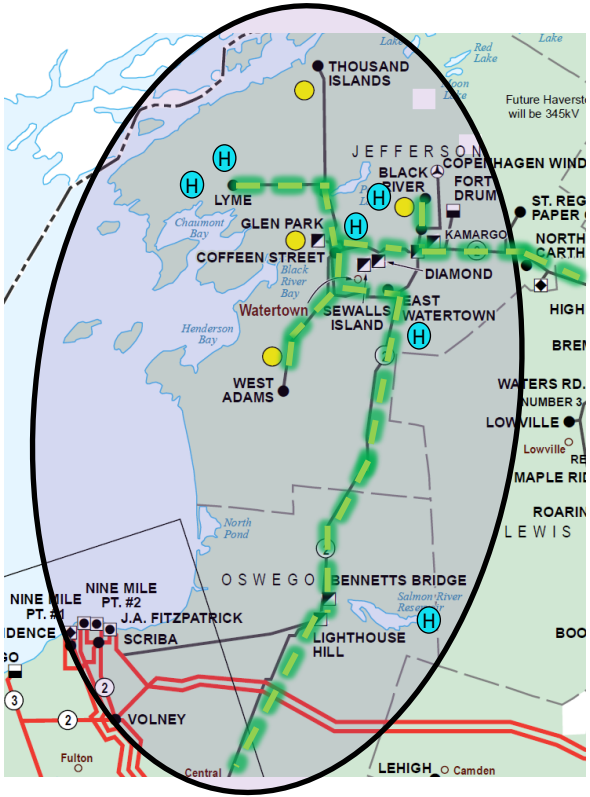
Pocket X3

Northern NY: Ontario Area

Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind		L	H	+
Solar		L	H	+



ID	Constraint	Number of Limiting Hours		
		Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
	-			

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Hydro	224	224	224	98%	94%	97%
Wind	80	80	932	98%	93%	100%
Solar	469	469	469	99%	97%	97%

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Pocket Y

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Hydro	71	71	71	94%	92%	94%
Wind	74	74	475	99%	96%	100%
Solar	1,990	1,990	1,990	95%	93%	94%

Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind	●	L	H	+
Solar	●	L	H	+

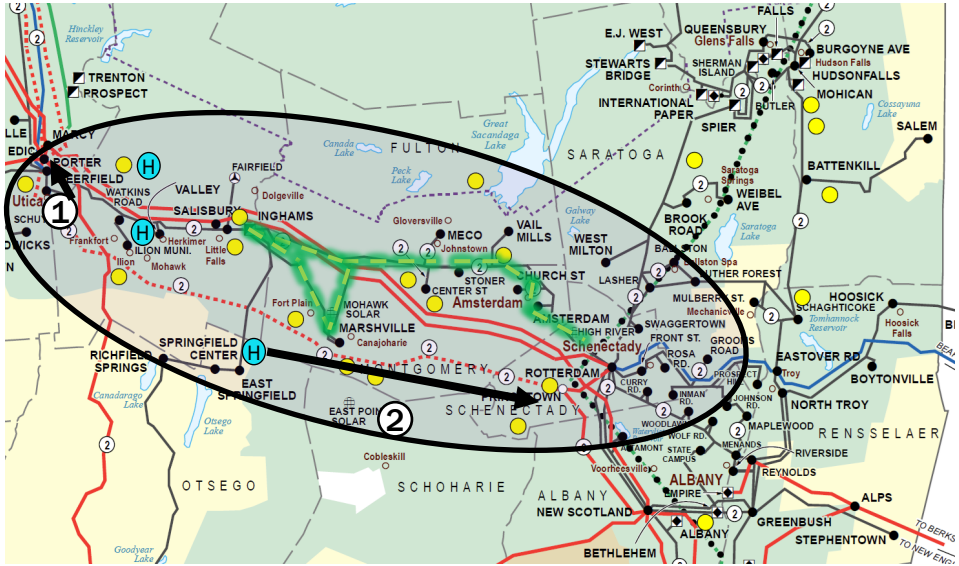
Pocket Y1

Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Capital Region: Mohawk Valley Area

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind		L	H	+
Solar		L	H	+



ID	Constraint	Number of Limiting Hours		
		Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
1	DEERFD-H 115.00-PORTER 1 115.00	904	865	893
2	CENTRAL EAST	2,020	1,991	1,533

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Hydro	32	32	32	94%	93%	96%
Wind	74	74	324	99%	96%	100%
Solar	1,700	1,700	1,700	94%	92%	93%

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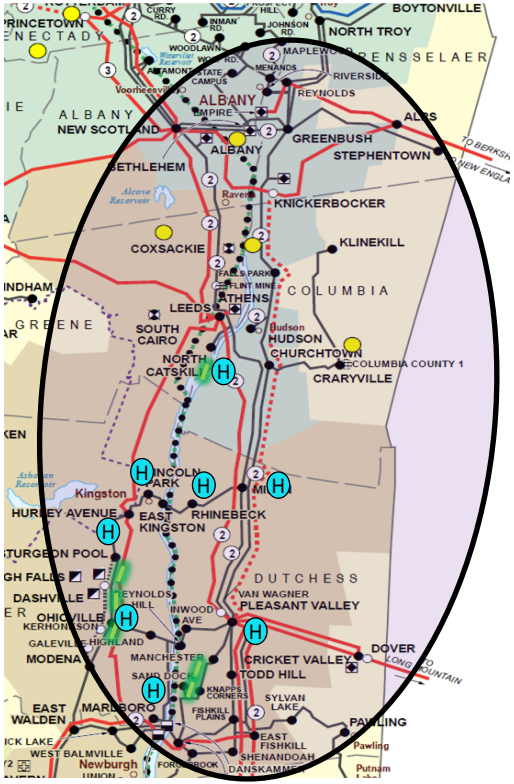
Pocket Y2

Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Capital Region: Hudson Valley Area



Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind		L	H	+
Solar		L	H	+

ID	Constraint	Number of Limiting Hours		
		Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
	-			

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Hydro	39	39	39	94%	90%	93%
Wind	-	-	151	-	-	100%
Solar	290	290	290	98%	98%	97%

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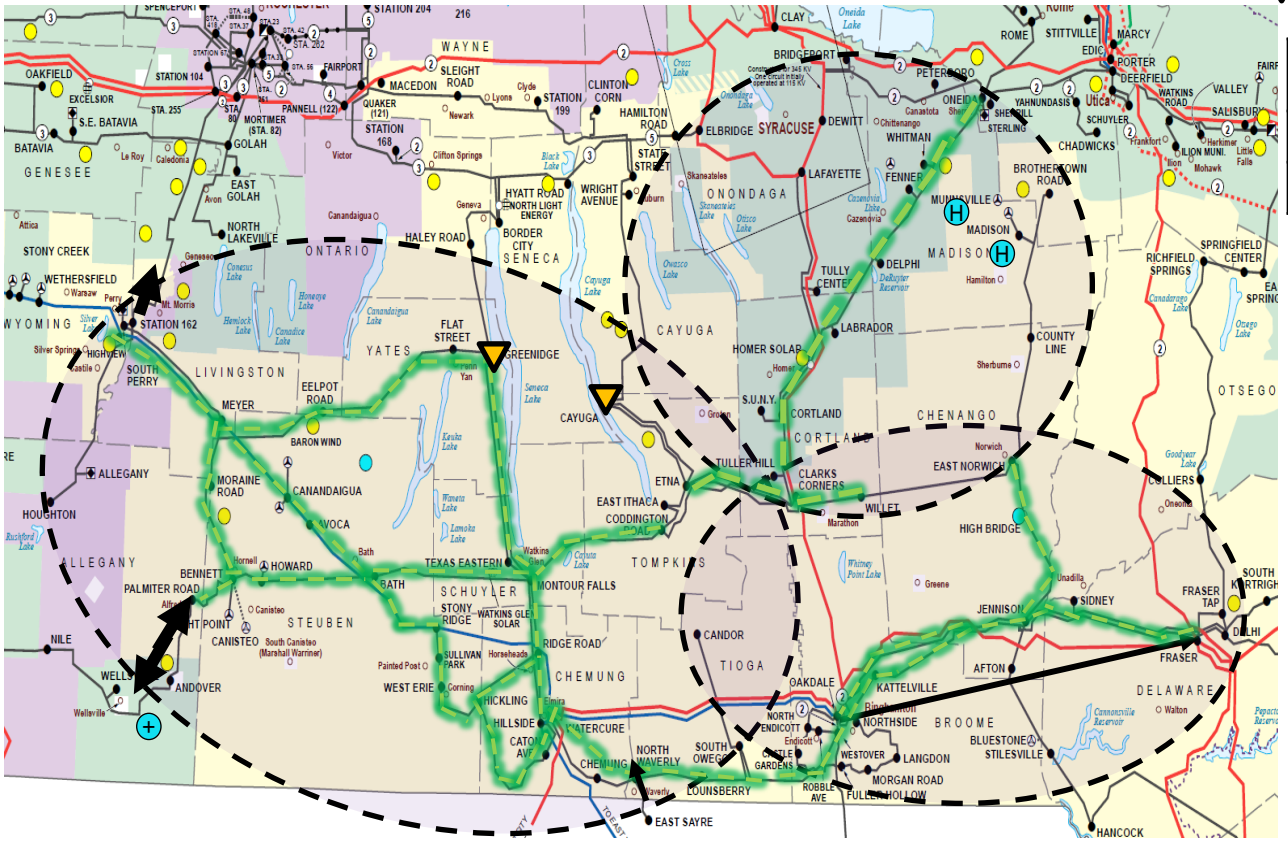
Pocket Z

Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Large Load



Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind		L	H	+
Solar		L	H	+

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Wind	980	980	1,087	100%	99%	99%
Solar	1,422	1,422	1,422	99%	97%	97%

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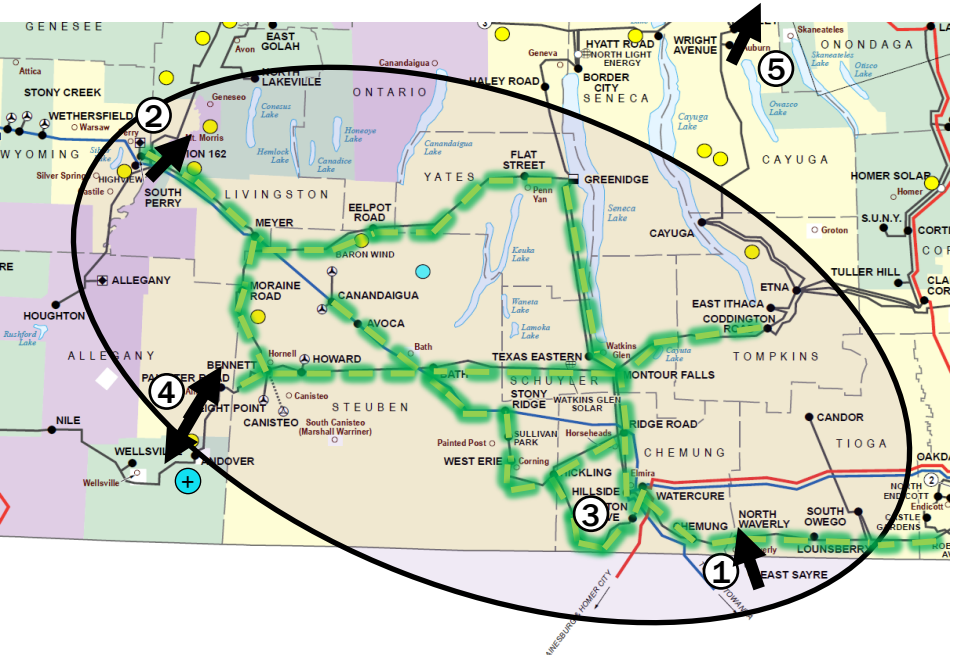
Pocket Z1

Southern Tier: Finger Lakes Area

Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind		L	H	+
Solar		L	H	+



*Note - North Waverly - E. Sayre 115 kV congestion reported for information only as operations protocols would dictate the operation of this line.

ID	Constraint	Number of Limiting Hours		
		Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
1	N.WAV115 115.00-26E.SAYR 115.00*	4,247	4,393	5,051
2	S.PER115 115.00-STA 158S 115.00	1,032	1,062	1,066
3	HILSD230 230.00-HILSD230 230.00	-	104	76
4	PALMT115 115.00-ANDOVER1 115.00	251	50	45
5	STATE ST. 115 – WRIGHT AVE. 115	551	463	539

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Wind	691	691	691	100%	98%	99%
Solar	927	927	927	99%	98%	97%

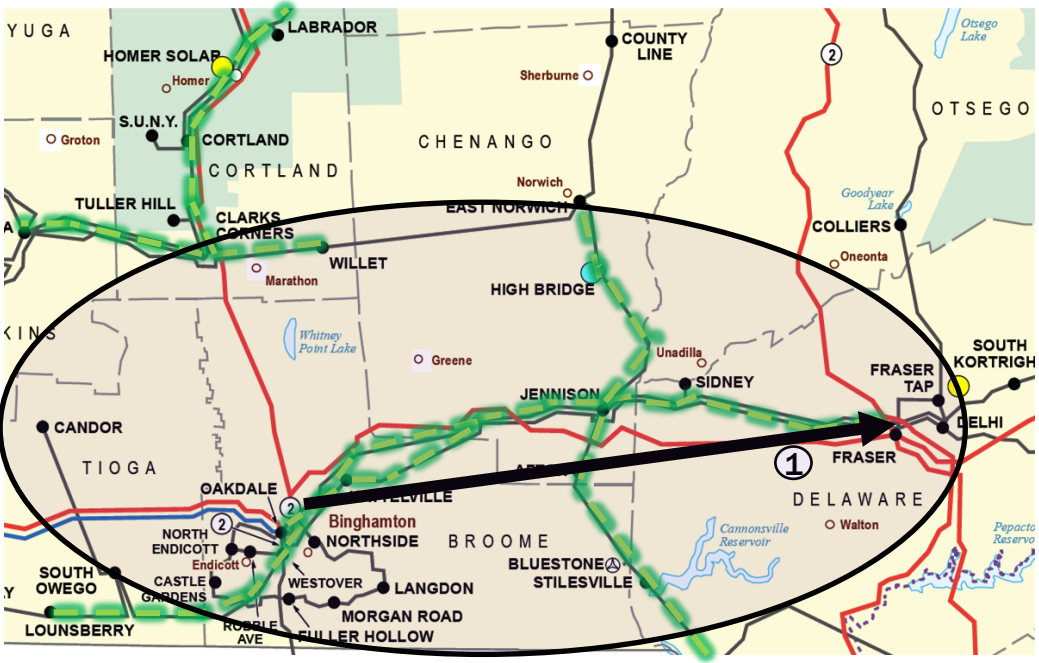
Pocket Z2

Southern Tier: Binghamton Area

Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind	●	L	H	+
Solar	●	L	H	+



ID	Constraint	Number of Limiting Hours		
		Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
1	FRASR345 345.00-OAKDL345 345.00	150	258	136

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Wind	213	213	213	100%	100%	100%
Solar	205	205	205	97%	94%	95%

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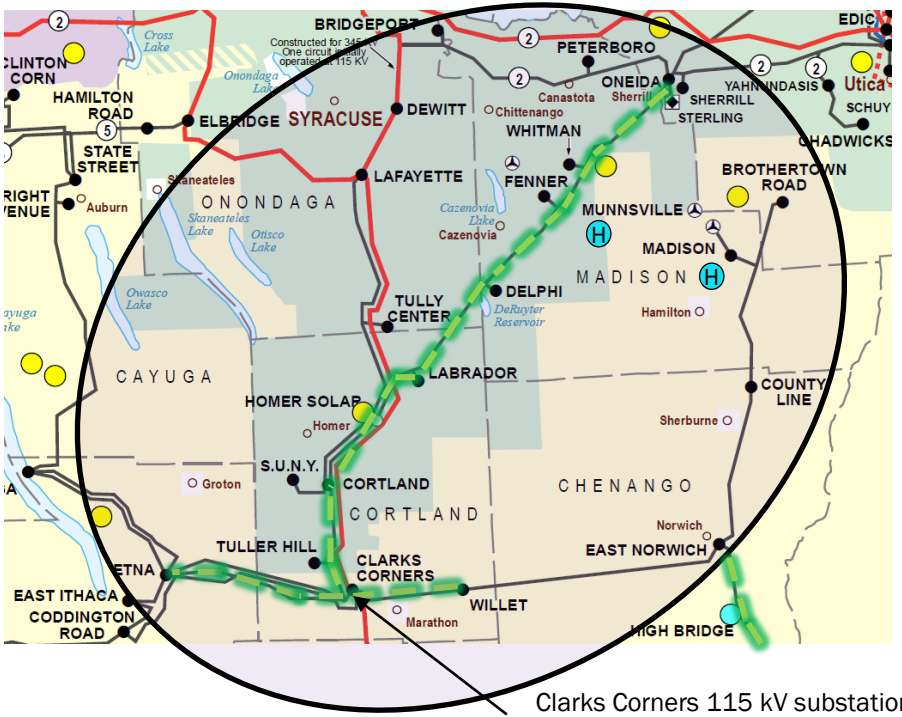
Pocket Z3

Southern Tier: Syracuse Area

Black arrows represent lines in the current 2023-2042 Outlook Contract and Policy Cases that meet the 100 congested hours criteria

Green highlights represent Phase 1 and 2 transmission upgrades

Key	Awarded Resource	Lower	Higher	Lower + Higher
Wind		L	H	+
Solar		L	H	+



ID	Constraint	Number of Limiting Hours		
		Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
	-			

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand	Contract Case	Policy Case: Lower Demand	Policy Case: Higher Demand
Wind	76	76	183	98%	96%	99%
Solar	290	290	290	99%	96%	97%

Clarks Corners 115 kV substation loop in-loop out line from Etna – Willet. No upgrade to line ratings.

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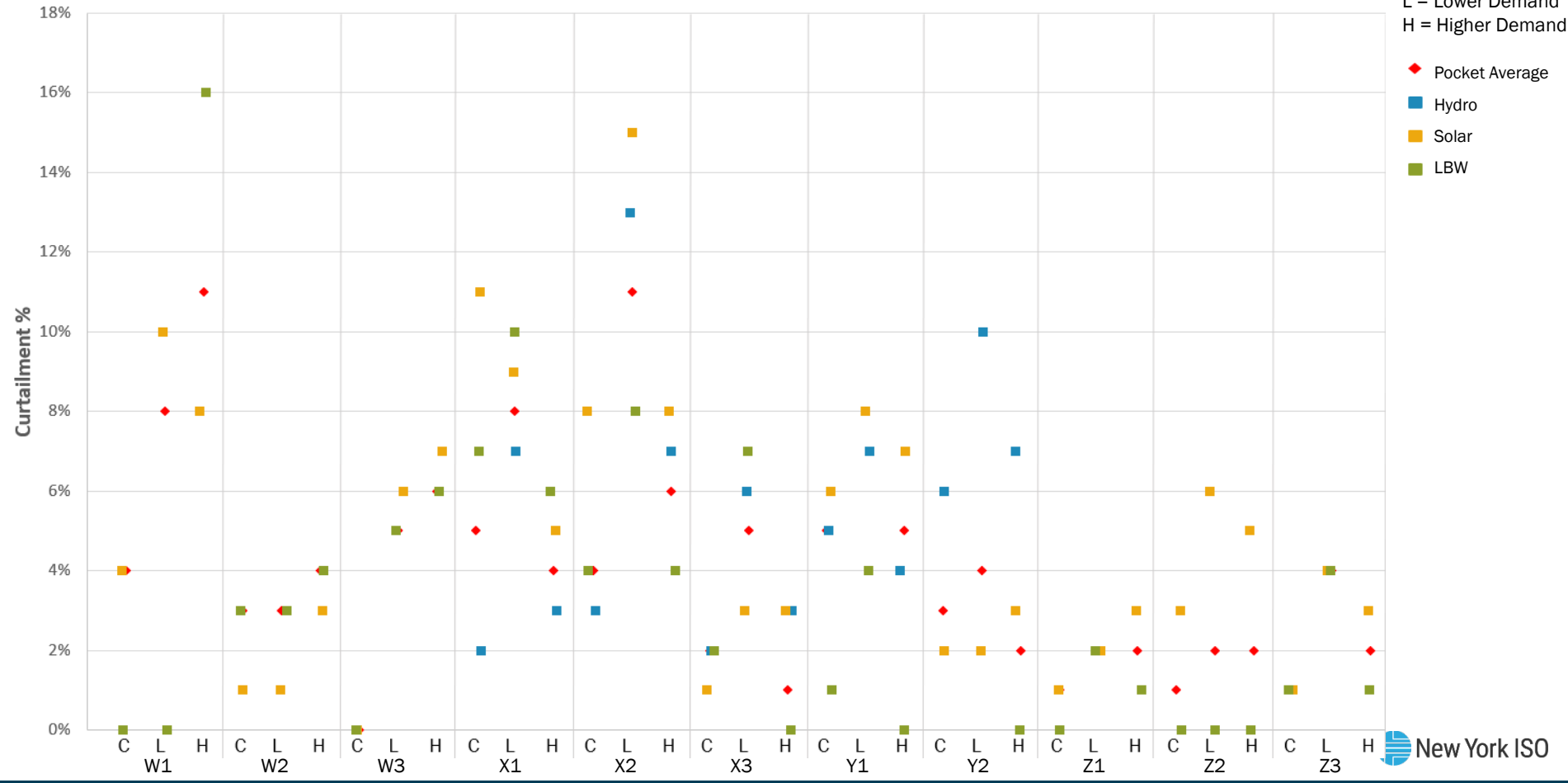
Average Renewable Resource Curtailment Rates



DRAFT – FOR DISCUSSION PURPOSES ONLY

Key Findings

- Transmission upgrades to the system, including the Phase 1 and 2 upgrades and NYPA's Smart Path project, play a key role in increasing energy deliverability of resources and decreasing congestion on the lower kV system
- Many of the pockets identified as high or medium risk in the 2021-2040 Outlook study show little to no congestion due to subsequent transmission upgrades
- Higher load levels and the addition of large loads to the system might increase energy deliverability of upstate resources due to their relative proximity to renewable generators
- Addition of renewable resources can cause increased competition among resources and can result in increased levels of curtailment
- Some pockets (Pockets X and Y) are impacted by the level of bulk system congestion on major interfaces, such as Central East, since these pockets are directly upstream of the congested interface

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Policy Case:

Capacity Expansion Sensitivity Update

Capacity Expansion Sensitivity Analysis

- **NYISO presented its proposal for sensitivity analysis for the 2023-2042 System & Resource Outlook at the 4/4/24 ESPWG**
  - Preliminary results for these sensitivities on the Higher Demand Policy Case are included in the appendix
- **The preliminary list of proposed sensitivities for this Outlook has been updated to address stakeholder feedback received to date**
  - An updated list is included on the following slide

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List of Proposed Sensitivities

Key:
- Preliminary analysis completed
- Next priority
- Tentative, as time allows in process
- Unlikely, based on time/resources required to conduct sensitivity

- HQ import reduction
- Annual build limitations for renewable resources
- Analysis of large load impacts
  - Remove load portion attributed to large loads
- CO_2 emissions price forecast
- Prescribed nuclear retirements
- Capacity margin targets adjustment (e.g., IRM/LCRs)
- Flexible load modeling
  - Add flexible load (e.g., LDVs) to Lower and/or Higher Demand Scenarios; remove from State Scenario

- Annual build limitations for DEFRs & battery energy storage
- Reduce OSW build costs
- Bulk limit (i.e., interface) relaxation
- Zero-net imports relaxation*
- Headroom relaxation*
- 100% of H_2 production in state*
- Reduce/remove electrolysis*
- Alternative fuel prices
- "Extreme year"
- Delayed winter peaking system

**Would only apply to the State Scenario*

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Preliminary Key Findings: Sensitivity Analysis

- **Candidate resources are primarily built for one of two reasons: to satisfy capacity needs or to serve energy demand**
  - Sensitivity analysis in the capacity expansion model can provide insight on the key drivers for resource mix and impacts on projected resource growth
- **Sensitivity analysis conducted to date shows that assumption changes that impact energy needs have a larger impact on model results**
  - Total energy demand and availability of clean emitting resources (e.g., hydro, nuclear) to meet projected demand are two of the primary drivers in the resulting resource mix
- **Absent major assumption changes, the capacity mix at the end of the study period is generally comparable to the main scenario results**

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Next Steps for Policy Case Scenarios

- **Continue to conduct sensitivity analysis in the capacity expansion model for the Policy Case scenarios**
  - Sensitivity analysis will be conducted in accordance with priorities outlined on the previous slides
- **Include results of sensitivity analysis in an appendix for the System & Resource Outlook report**

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Next Steps

Next Steps

- Continue model development of State Scenario Policy Case in the production cost model
- Conduct renewable pockets analysis for the State Scenario
- Continue additional sensitivity analysis in capacity expansion model
- Draft System & Outlook report and appendices
- Continue stakeholder engagement

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2023-2042 System & Resource Outlook Data Catalog

Report

Report Placeholder

Study Summary

Summary Placeholder

Report Appendices

Production Cost Model Benchmark DRAFT
Production Cost Assumptions Matrix DRAFT
Capacity Expansion Assumptions Matrix DRAFT

Data Documents

Reference Case Input Assumptions DRAFT
Reference Case Results DRAFT

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

November 2, 2023
- 2023-2042 Outlook Reference Case Assumptions Update & Preliminary Base Case Results

November 21, 2023
- 2023-2042 Outlook Reference Case Updates

December 19, 2023
- 2023-2042 Outlook Reference Case Updates & Preliminary Contract Case Results

January 23, 2024
- 2023-2042 Outlook Reference Case Updates

February 22, 2024
- 2023-2042 Outlook Reference Case Updates & Final Base & Contract Case Results

March 1, 2024
- 2023-2042 Outlook Preliminary Renewable Pocket Analysis & Preliminary Capacity Expansion Scenario Results

March 21, 2024
- 2023-2042 Outlook Policy Case Updates

April 4, 2024
- 2023-2042 Outlook Policy Case Updates

2021-2040 System & Resource Outlook Data Catalog

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Questions, Comments, & Feedback?

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

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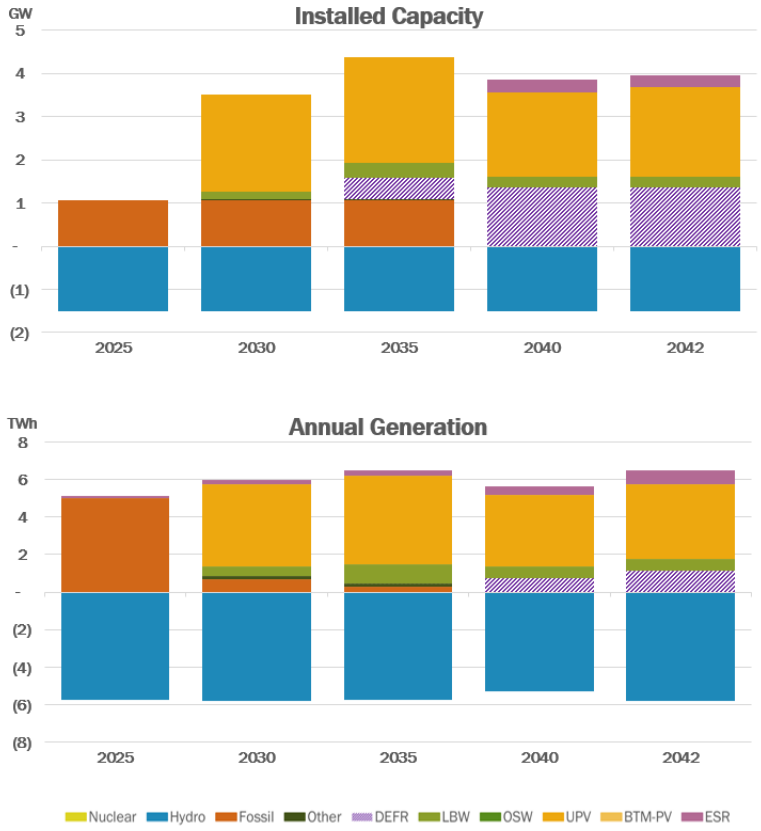
Appendix

Capacity Expansion Sensitivity Results

Lower Demand Policy Case Sensitivity: HQ Import Reduction

**Figures represent the delta between the Sensitivity and Base Scenario (i.e., positive value denotes an increase in that resource type for the sensitivity)*

- **The figure on the right includes results for the sensitivity analysis to assume a reduction in HQ imports (net zero imports in Zone D), as proposed at the 1/23/2024 ESPWG**
  - Results show that the reduction in imports of hydro generation leads to a net increase in zero emitting generation capacity from candidate resources in the NYCA

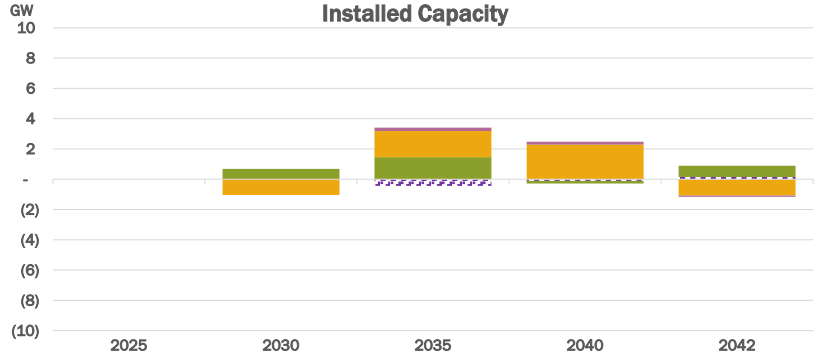


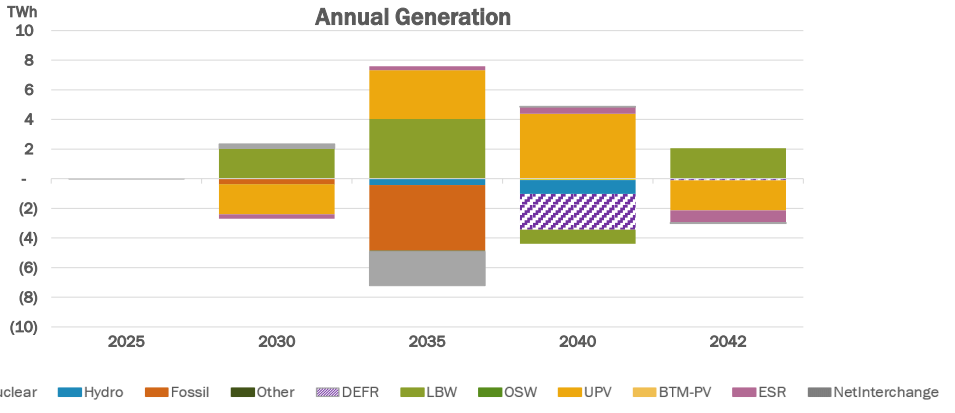
Higher Demand Policy Case Sensitivity: Annual Build Limitations, Renewables

- The figure on the right includes results for the sensitivity analysis to limit capacity built on a yearly basis for renewable resources
- This sensitivity limited new capacity built to no more than 2,000 MW/year NYCA wide per technology type
  - Results show that imposing an annual limitation leads to some renewable capacity built earlier in the study horizon and that the total capacity built by 2042 is comparable to the original scenario results
  - The generation mix through time is impacted by the resulting capacity mix

Higher Demand Policy Case Sensitivity: Annual Build Limitations, Renewables

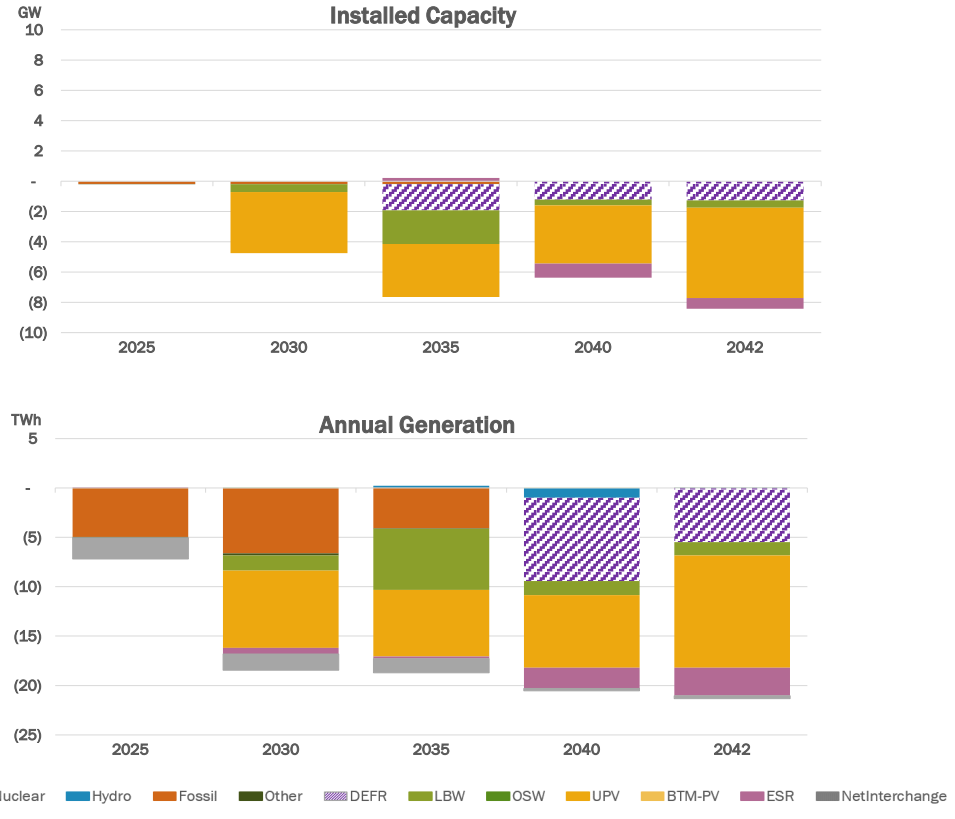
- The figure on the right includes results for the sensitivity analysis to limit capacity built on a yearly basis for renewable resources
- This sensitivity limited new capacity built to no more than 1,000 MW/year NYCA wide per technology type
  - Results show that imposing a more limiting annual limitation leads to more renewable capacity built earlier in the study horizon; that the total capacity built by 2042 is comparable to the original scenario results, with minor differences
  - Increased renewable capacity earlier in the model horizon offsets fossil and/or DEFR generation





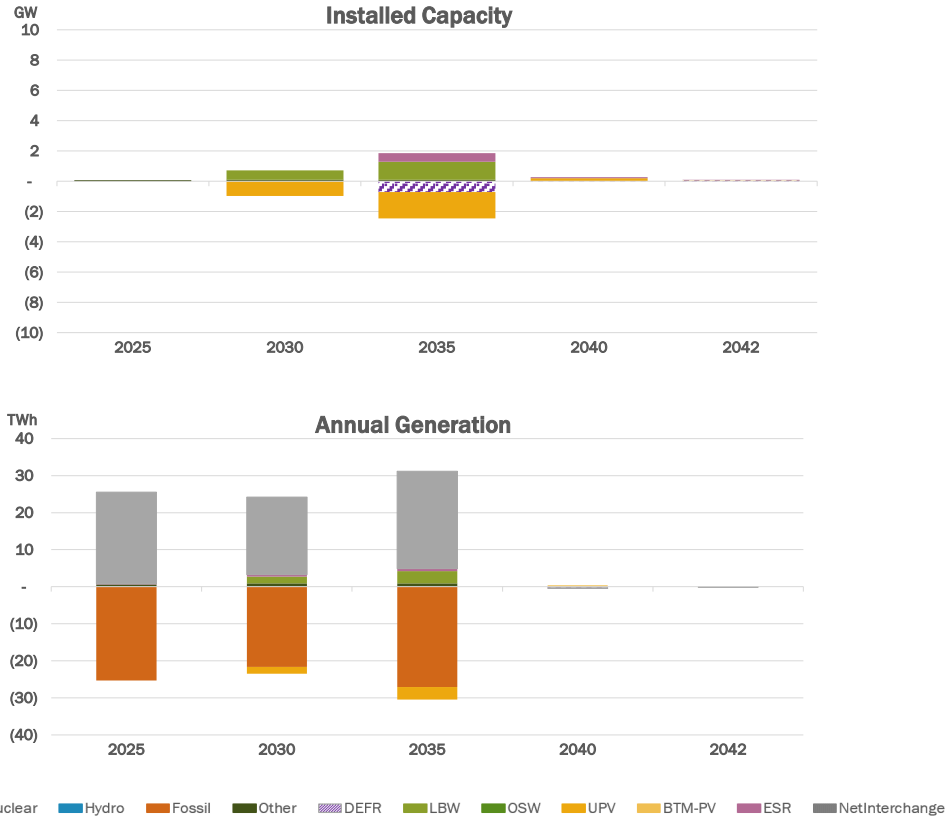
Higher Demand Policy Case Sensitivity: Remove Large Loads

- **The figure on the right includes results for the sensitivity analysis to remove the energy contribution associated with large loads to assess the impact that these loads may have on generation mix**
  - Results show that less generation capacity would be built with lower energy demand; in other words, the incremental demand required to serve large loads leads to more generation capacity built to serve energy needs and policy mandates



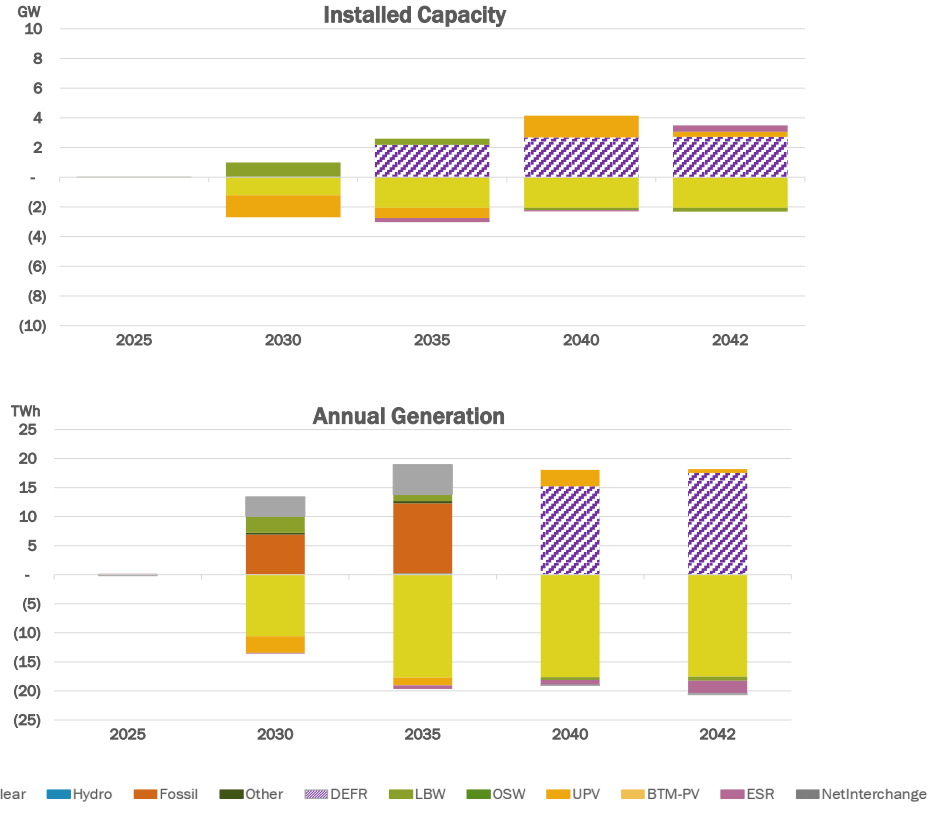
Higher Demand Policy Case Sensitivity: Increase CO_2 Emissions Price Forecast

- The figure on the right includes results for the sensitivity analysis to increase the CO_2 emissions price forecast
- This sensitivity assessed a CO_2 emissions price forecast 5x that of the baseline forecast
  - Results show that increasing the CO_2 emissions price (without other assumption changes) would result in a significant increase in net imports (~20-30 TWh) in lieu of running fossil generation in NY
  - Minimal impacts on the capacity mix built



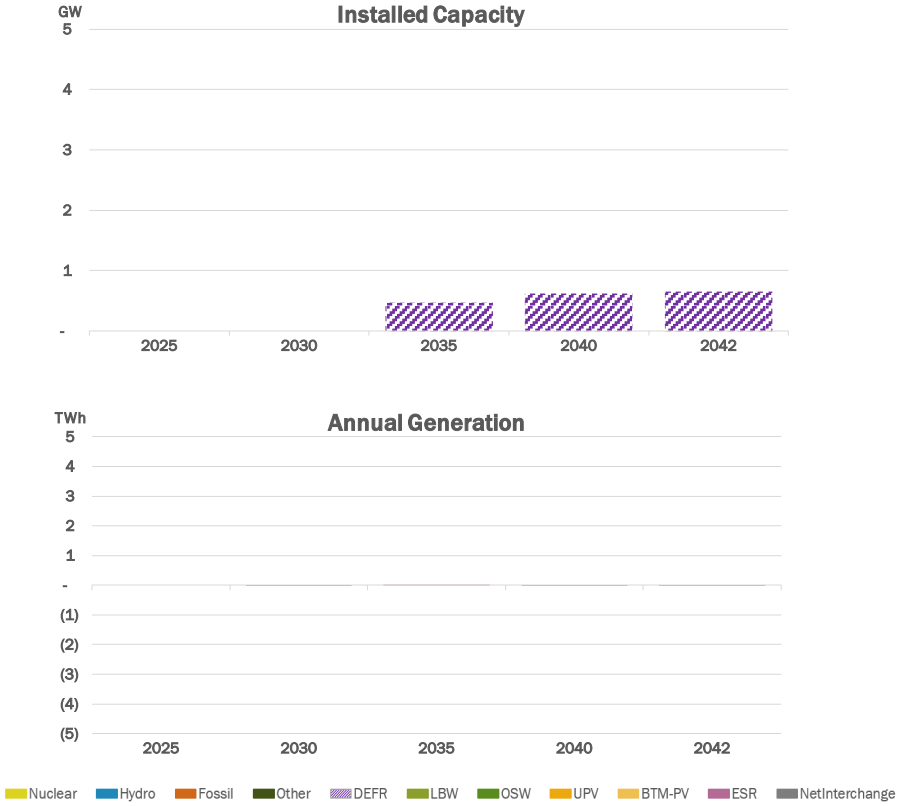
Higher Demand Policy Case Sensitivity: Nuclear Retirements at Relicensing Date

- **The figure on the right includes results for the sensitivity analysis to retire nuclear generators at their relicensing date**
  - Results show that higher amounts of clean generation capacity (~4 GW) would be needed to offset the reduction in zero-emitting generation associated with nuclear generators
  - Nuclear generation is primarily offset with DEFR generation in the Higher Demand Policy Case



Higher Demand Policy Case Sensitivity: Increase NYCA IRM 1%

- **The figure on the right includes results for the sensitivity analysis to increase the NYCA IRM requirement 1% for each year of the study period**
  - Results show that higher amounts of generation capacity would be needed to satisfy the higher capacity margin requirement; DEFR capacity is built to serve the increased requirement
  - Since the energy demand is unchanged from the original scenario, the resulting generation mix is comparable



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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