

System & Resource Outlook Update

Economic Planning Department

Electric System Planning Working Group (ESPWG)

Monday May 23rd, 2022 – WebEx Teleconference

Agenda

- **Outlook Study Status and Background Information**
- **Policy Case Scenario 1 (S1) Results**
- **Renewable Pocket Detailed Analysis**
 - Contract & Policy S1
 - Energy Deliverability
- **Next Steps**

Outlook Study Status

- September – October 2021: Finalize reference case assumptions*
- November - December 2021: Conduct simulations and analysis*
- January, February, March, April 2022, **May 2022**: Conduct Policy case simulations and analysis
- ***May-July 2022***: Issue draft report, finalize draft report, seek input from Market Monitoring Unit, Business Issues Committee and Management Committee review and action
- ***August 2022***: Seek Board of Directors review and approval
- ***Following issuance, the NYISO will conduct a public information session on the Outlook***

*Collaborate with ESPWG and seek stakeholder input

Information in italics represents an update from the previous status or schedule

2019 CARIS Phase 1 “70x30” Scenario Renewable Generation Pockets

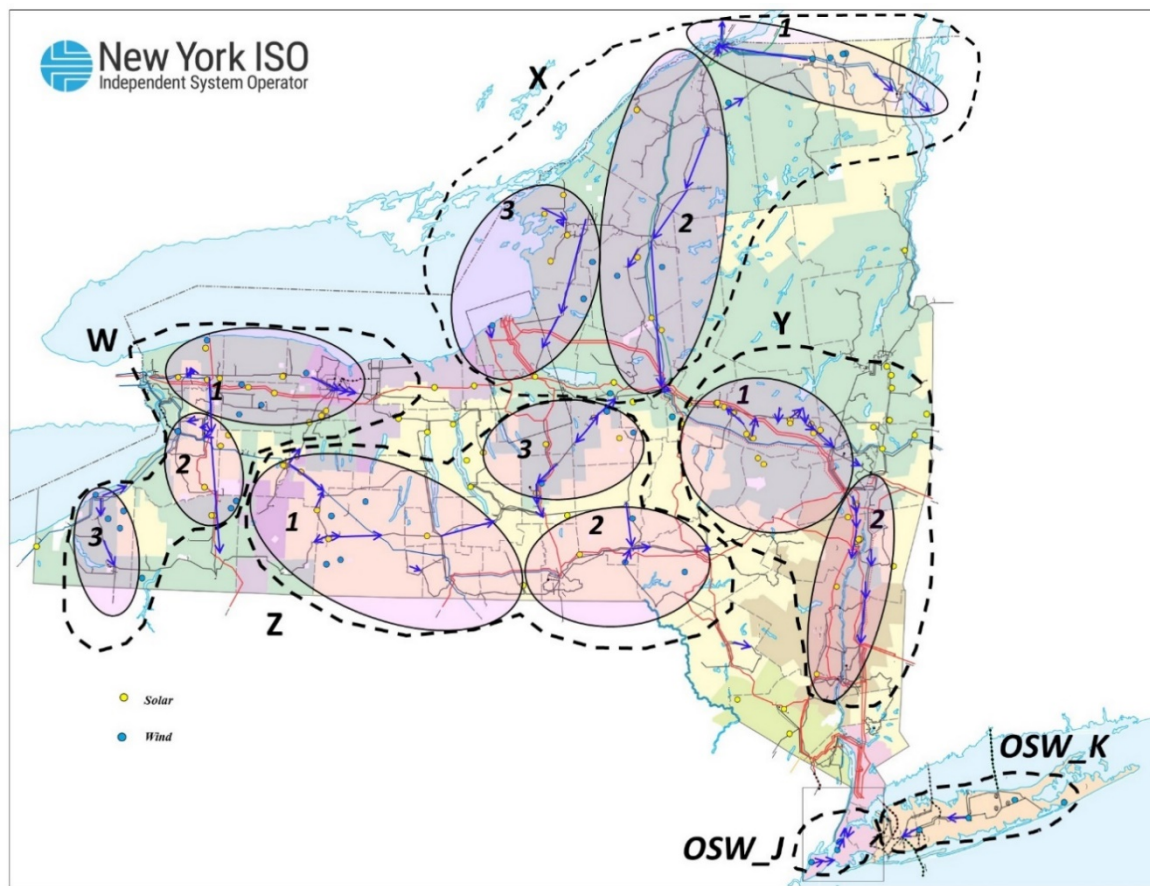


Figure 75
from 2019
CARIS
Phase 1
Report

Policy Case Assumptions: Generation Resources for year 2030

Resource Type	2019 CARIS 1 70X30 Scenario Load Case (MW)	2021 System and Resource Outlook Contract Case (MW)	2021 System and Resource Outlook Policy S1 Case (MW)
HYDRO	4,467	4,489	4,402
UPV	10,831	4,804	4,804
OSW	6,098	4,316	5,036
LBW	6,476	3,670	9,610
Total*	27,872	17,279	23,852

* Total Installed Capacity

Outlook Renewable Generation Pocket Process

- Pockets identified in 2019 CARIS Phase 1 70x30 scenario will serve as the starting point
- Pockets will be identified for 2030 year for the following cases:
 - Contract Case
 - Policy Case Scenario 1
 - Policy Case Scenario 2
- Pocket definitions (lines & generators) will be published
- Pocket metrics (curtailment, energy deliverability, etc.) will be reported

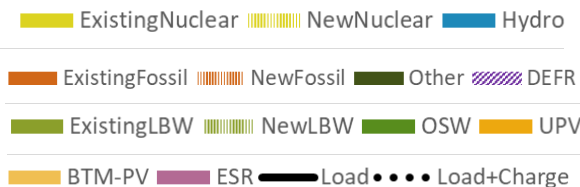
Policy Case Assumptions: Major Transmission Projects

Three additional major transmission projects are included in the Policy Case assumptions:

- NYPA Northern New York Priority Transmission Project
- Champlain Hudson Power Express
- Clean Path New York

Policy Case: Preliminary Scenario 1 (S1) Results

Policy Case Capacity Expansion Cases



Generator Placement in Production Cost Model

- Policy Case generators were placed at available points of interconnections based on the latest Interconnection Queue using points that were not already utilized for contracted units in the Contract Case.
- For years 2035 and 2040, Policy Case generators were placed in adjacent higher kV buses (rather than a large injection at a single bus) in the same zone to provide better clarity on the neighboring transmission constraints in the pocket area
- The NYISO conducted iterative analysis to identify the need for these adjacent locations; however, the NYISO did not minimize zonal curtailment.

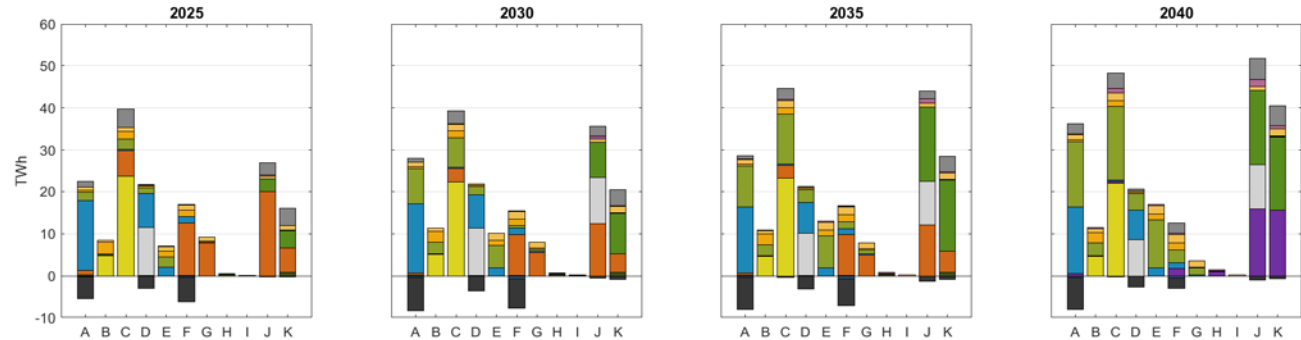
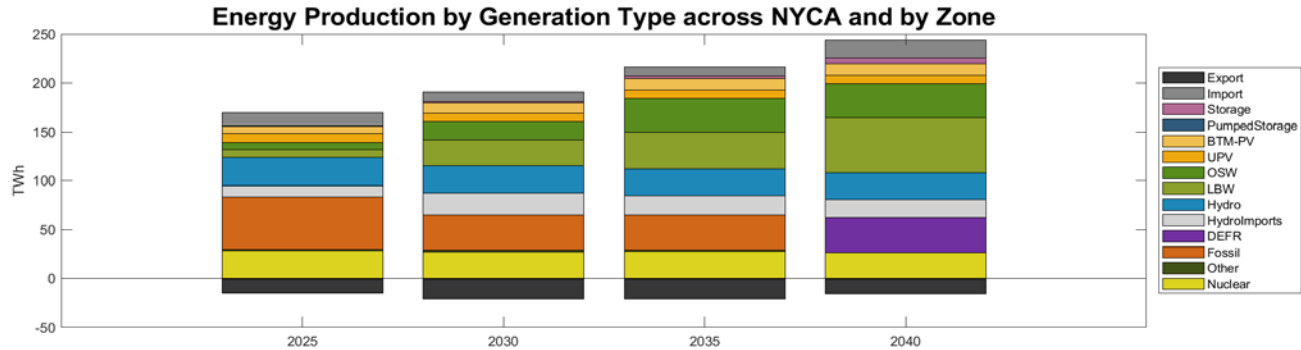
Production Cost Simulation Results

- The following slides show results from production cost simulations
- Some important differences between capacity expansion and production cost models to remember when viewing:
 - Production cost results are nodal including neighboring systems whereas the capacity expansion model was zonal without neighboring systems
 - Production cost results are hourly vs. representative time slices in capacity expansion
 - Production cost accurately captures curtailment due to specific transmission constraints

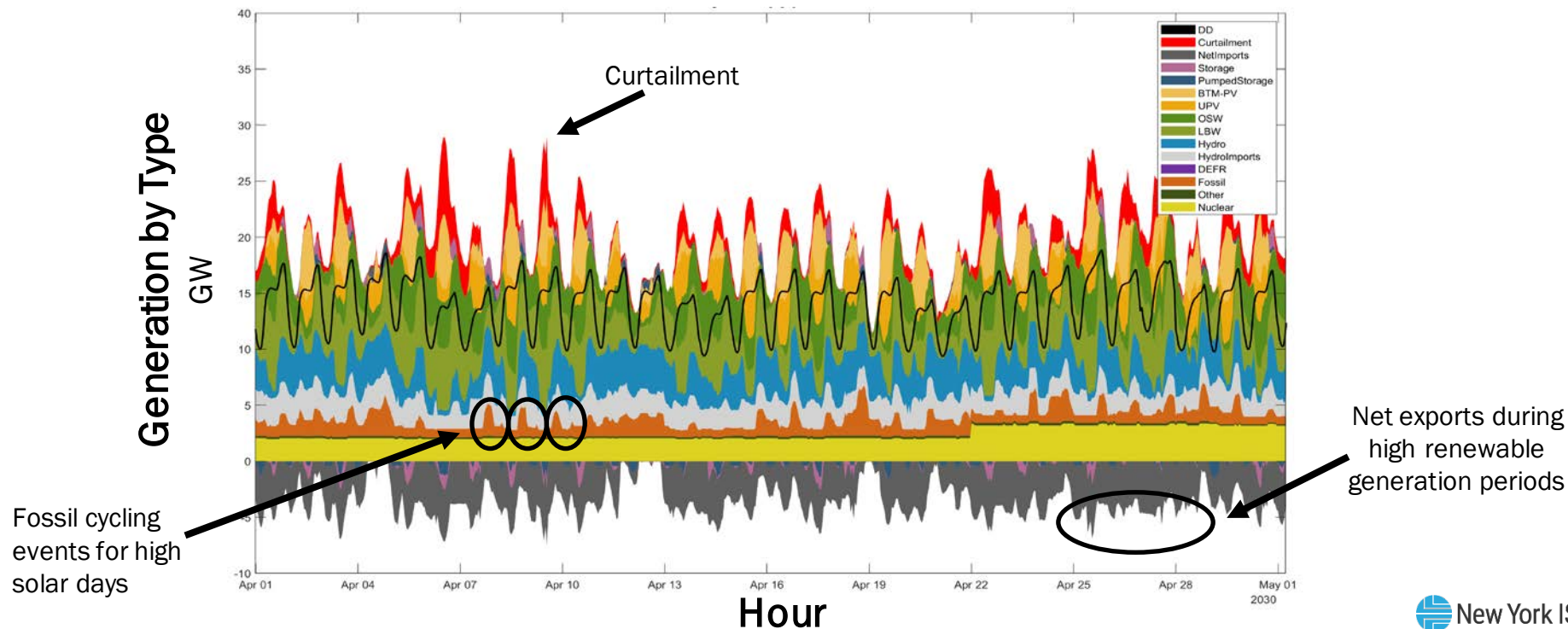
Note On 2040 Policy Case Simulations

- For the 2040 study year, production cost simulations had difficulty solving. Approximately 8% of simulation hours were infeasible and simulation run-times exceeded 24 hours.
- To resolve, only bulk constraints were secured during simulations. The constraints less than 200kV were “relaxed,” meaning the facilities are monitored but not secured.
- 2040 results provide a directional, rather than detailed, assessment of the transmission constraints.

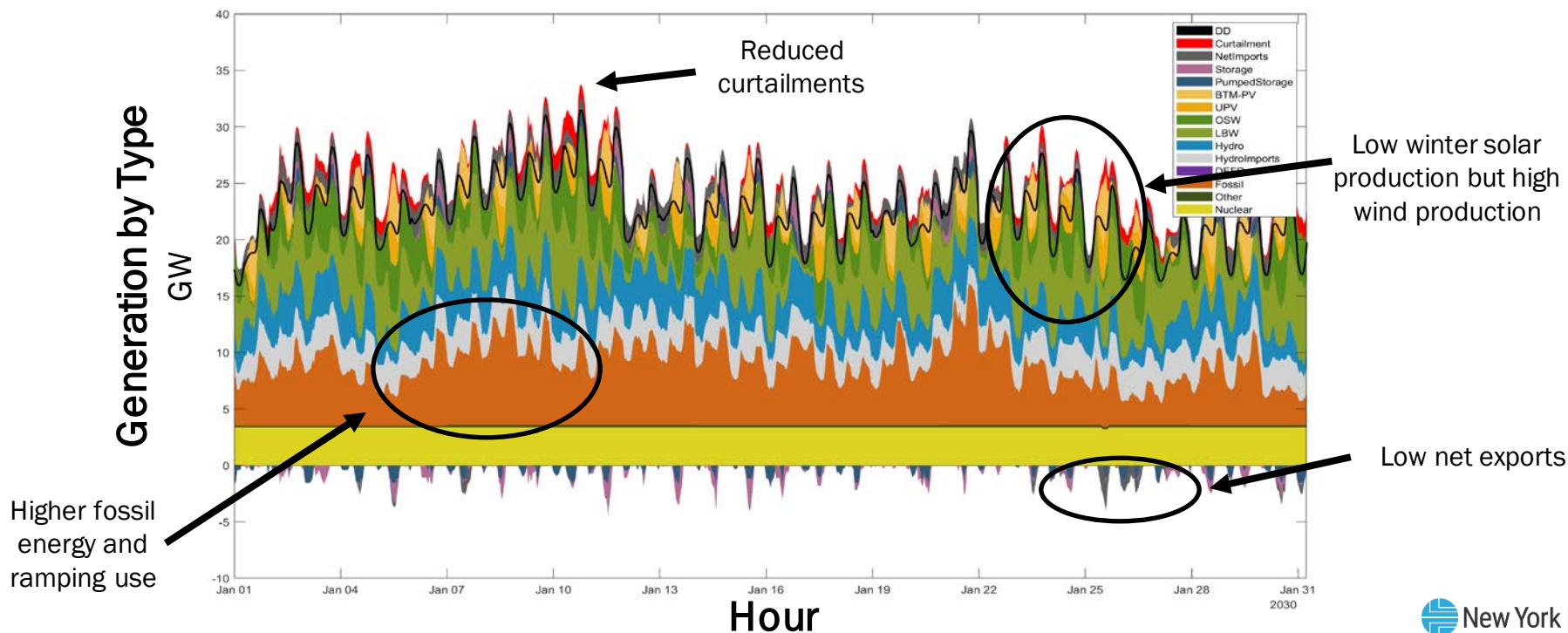
Policy Case (S1) Energy Production



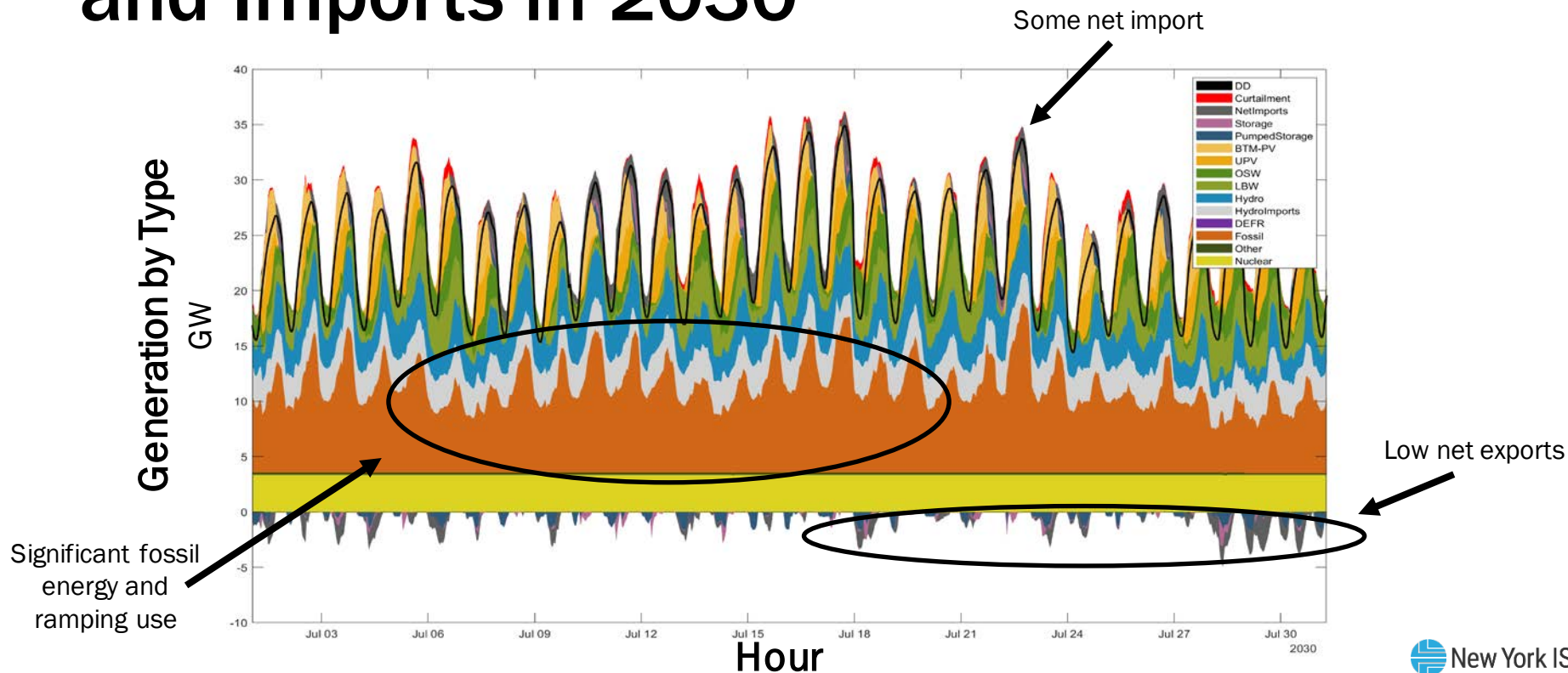
Policy Case (S1) Spring Generation and Imports in 2030



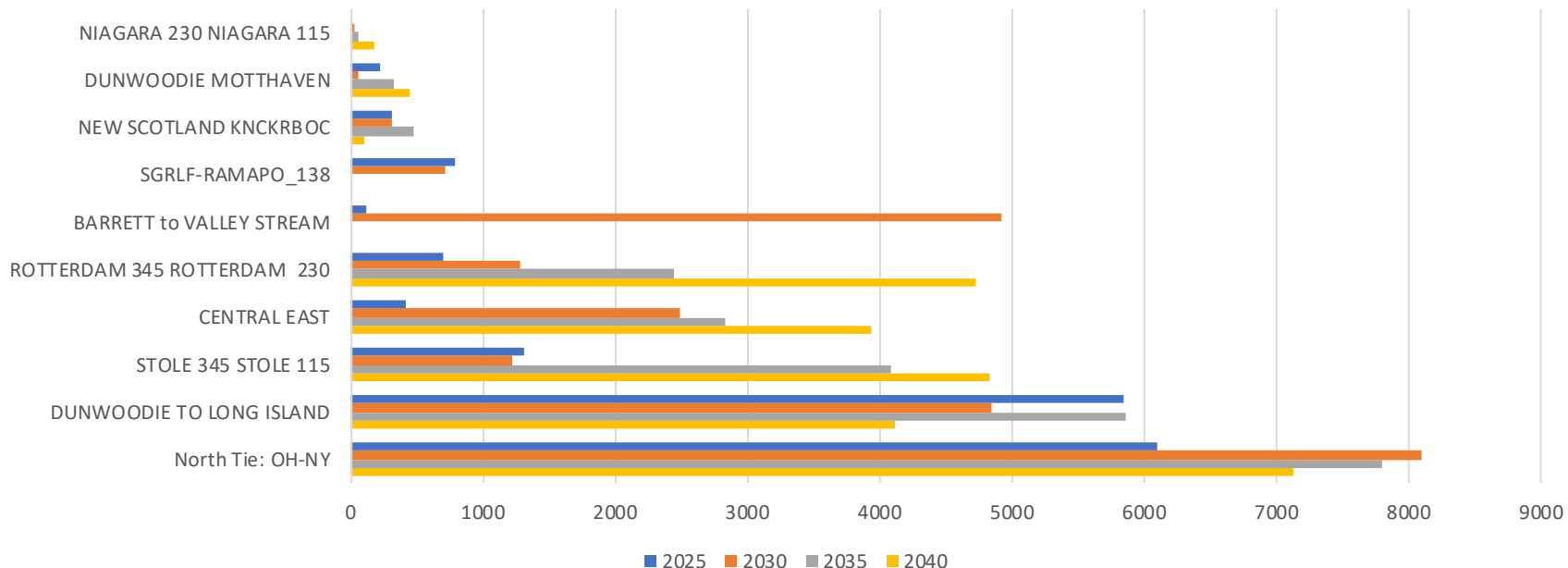
Policy Case (S1) Winter Generation and Imports in 2030



Policy Case (S1) Summer Generation and Imports in 2030



Congested Hours by Constraint

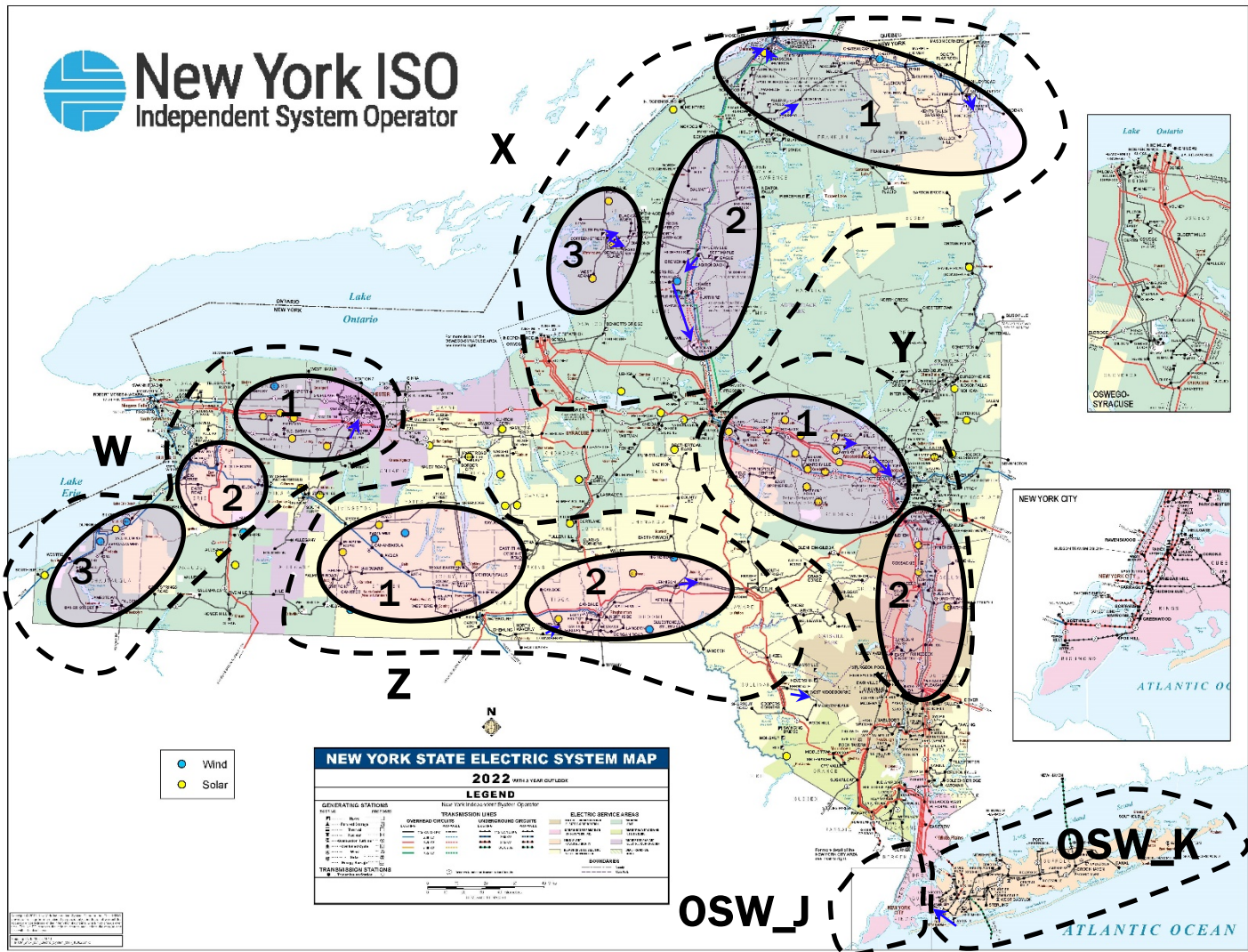


Renewable Generation Pockets

Renewable Generation Pockets

- A threshold of 100 congested hours (~ 1%) per constraint in any case will be used to screen for pocket reporting
- In Contract Case only 1 pocket from 2019 pocket definitions does not appear (Z3) while remaining pockets are less congested with fewer constrained facilities
- Policy Case S1 produced all 13 pockets with transmission congestion and curtailment, details are provided in the next slides

2021-2040
System & Resource
Outlook
Renewable
Generation
Pockets:
Contract
Case
identified
for 2030

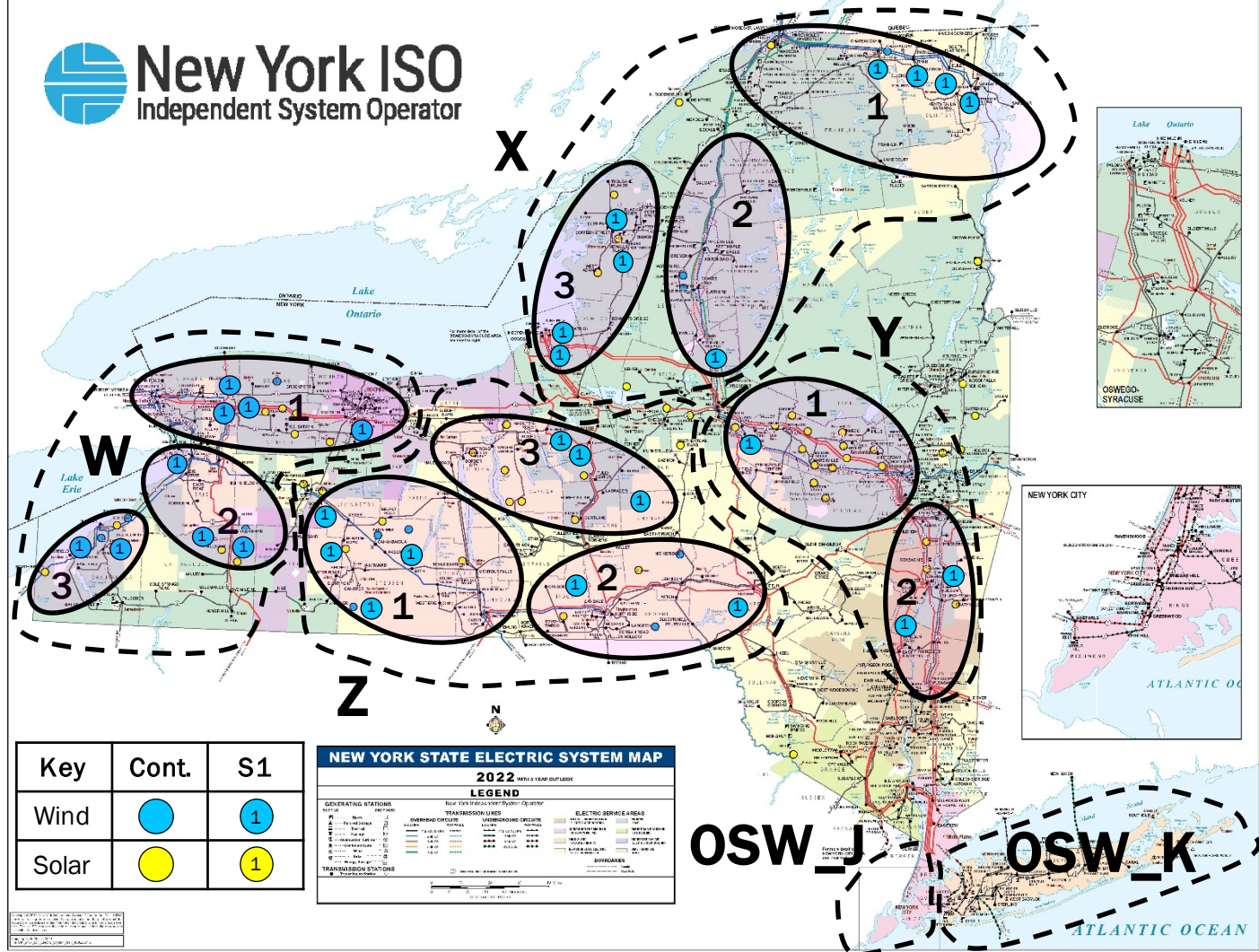


Contract Case Pocket Metrics

Pocket	Type	Capacity (MW)	Scheduled Energy (GWh)	Dispatched Energy (GWh)	Curtailment (GWh)	Energy Deliverability (%)
W1	Wind	200	393	393	0	100%
	Solar	1,130	2,214	2,189	25	99%
W2	Wind	813	2,029	2,028	2	100%
	Solar	60	84	84	0	100%
W3	Wind	305	700	698	2	100%
	Solar	290	448	448	0	100%
X1	Hydro	1,049	7,929	7,929	0	100%
	Wind	678	1,441	1,441	0	100%
	Solar	180	367	367	0	100%
X2	Hydro	250	1,405	1,402	3	100%
	Wind	505	1,154	1,153	0	100%
	Solar	35	54	52	2	96%
X3	Hydro	155	771	760	11	99%
	Wind	80	179	179	0	100%
	Solar	369	609	541	69	90%
Y1	Hydro	30	114	114	0	100%
	Wind	74	179	174	5	97%
	Solar	961	1,801	1,735	66	96%
Y2	Wind	-	-	-	-	-
	Solar	250	421	421	0	100%
Z1	Wind	720	1,628	1,627	0	100%
	Solar	405	711	711	0	100%
Z2	Wind	213	696	689	7	99%
	Solar	60	97	97	0	100%
Z3	Wind	76	136	136	0	100%
	Solar	150	280	280	0	100%
OSW_J	Offshore Wind	2,046	8,366	8,364	2	100%
OSW_K	Offshore Wind	2,270	6,815	4,739	2,076	77%
	Solar	99	159	158	1	100%

- Energy = Scheduled Energy – Curtailment
- Energy Deliverability (%) = Energy / Scheduled Energy
- Hourly simulations underestimate real-time curtailments due to several factors including, but not limited to, not capturing transmission outages, forecast error, and real-time events
- Specific project interconnection configurations are not modeled as part of the Outlook

2021-2040
System & Resource
Outlook
Renewable
Generation
Pockets:
Policy S1
identified
for 2030



Policy S1 Case Pocket Metrics

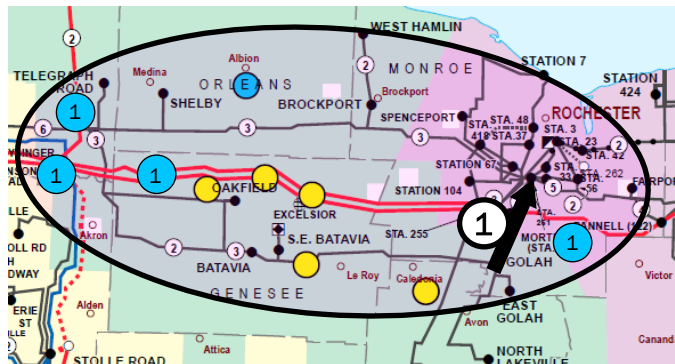
Pocket	Type	Capacity (MW)	Scheduled Energy (GWh)	Dispatched Energy (GWh)	Curtailment (GWh)	Energy Deliverability (%)
W1	Wind	1,543	4,890	4,890	0	100%
	Solar	1,130	2,239	2,203	36	98%
W2	Wind	1,491	4,263	4,012	251	94%
	Solar	60	84	74	10	89%
W3	Wind	916	2,713	2,534	179	93%
	Solar	290	448	420	29	94%
X1	Hydro	1,049	7,929	7,894	35	100%
	Wind	876	2,062	2,013	49	98%
	Solar	180	367	367	0	100%
X2	Hydro	250	1,407	1,336	71	95%
	Wind	598	1,441	1,425	17	99%
	Solar	35	56	47	9	84%
X3	Hydro	155	782	663	119	85%
	Wind	790	2,515	2,463	52	98%
	Solar	369	678	510	168	75%
Y1	Hydro	30	114	112	2	98%
	Wind	101	273	247	26	90%
	Solar	961	1,868	1,705	163	91%
Y2	Wind	255	857	857	0	100%
	Solar	250	422	419	3	99%
Z1	Wind	1,495	4,108	3,409	699	83%
	Solar	405	711	661	50	93%
Z2	Wind	803	2,620	2,400	220	92%
	Solar	60	97	76	22	78%
Z3	Wind	265	750	709	41	95%
	Solar	150	280	269	10	96%
OSW_J	Offshore Wind	2,046	8,368	8,368	0	100%
OSW_K	Offshore Wind	2,990	11,830	9,807	2,023	83%
	Solar	99	159	154	6	96%

- Energy = Scheduled Energy – Curtailment
- Energy Deliverability (%) = Energy / Scheduled Energy
- Hourly simulations underestimate real-time curtailments due to several factors including, but not limited to, not capturing transmission outages, forecast error, and real-time events
- Specific project interconnection configurations are not modeled as part of the Outlook

Pocket W1

Western NY: Niagara-Orleans-Rochester

Hours Constrained (if > 100 Hours)



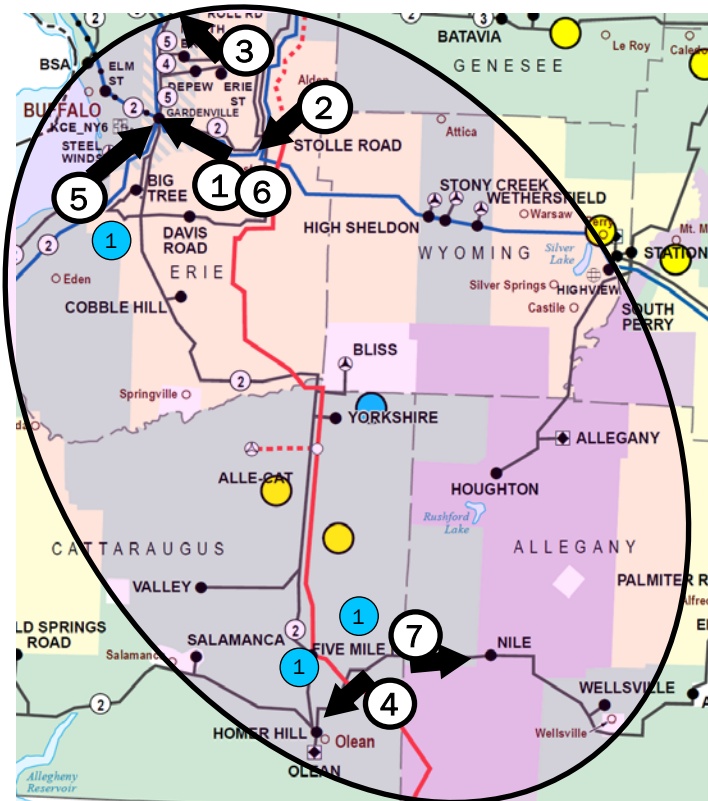
ID	Constraint	Contract	Policy S1	Policy S2
1	GOLAH115 115-MORTIMER 115	845	979	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Wind	200	1,543		100%	100%	
Solar	1,130	1,130		99%	98%	

Key	Cont.	S1	S2	All
Wind				
Solar				

Pocket W2

Western NY: Buffalo-Erie



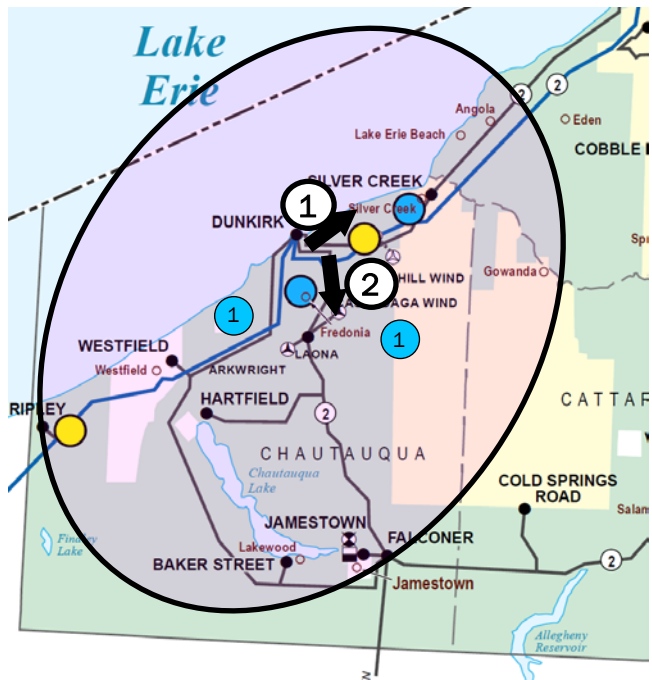
Hours Constrained (if > 100 Hours)

ID	Constraint	Contract	Policy S1	Policy S2
1	STOLE115 115-GIRD115 115	3,816	1,442	
2	STOLE115 115-STOLE345 345	2,040	1,215	
3	CLSP-181 115-URBN-922 115	12	199	
4	DUGN-157 115-HOMERHIL 115	8	2,833	
5	BETH-149 115-GRDNVL1 115	0	827	
6	GARDV115 115-GIRD115 115	0	158	
7	DUGN-157 115-NILE115 115	0	116	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Wind	813	1,491		100%	94%	
Solar	60	60		100%	89%	

Pocket W3

Western NY: Chautauqua



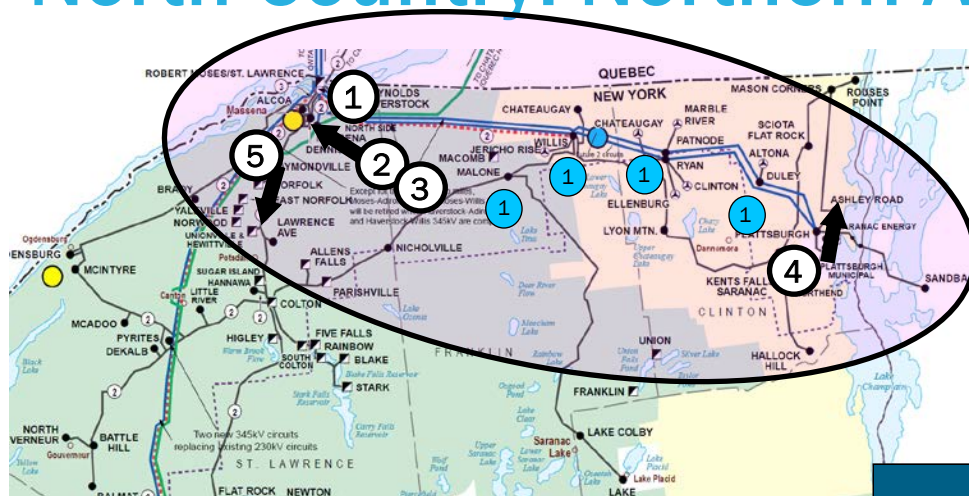
Hours Constrained (if > 100 Hours)

ID	Constraint	Contract	Policy S1	Policy S2
1	EDNK-161 115-ARKWRIGH 115	297	106	
2	SLVRC141 115-DUNKIRK1 115	13	2,270	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Wind	305	916		100%	93%	
Solar	290	290		100%	94%	

Pocket X1

North Country: Northern Area



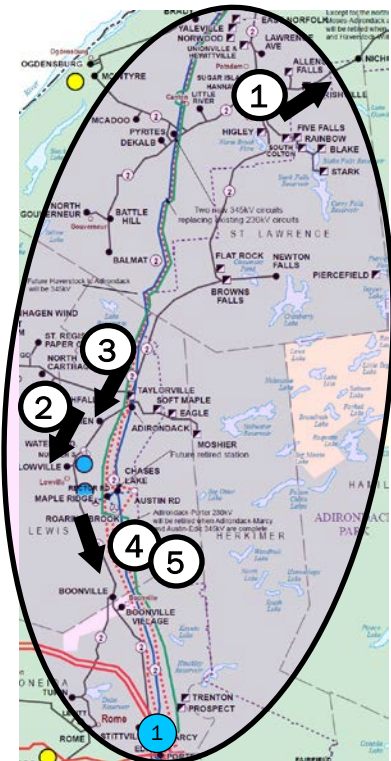
Hours Constrained (if > 100 Hours)

ID	Constraint	Contract	Policy S1	Policy S2
1	North Tie: OH-NY	7,678	8,098	
2	ALCOA-NM 115-ALCOA N 115	926	967	
3	ALCOA-NM 115-DENNISON 115	782	859	
4	NOEND115 115-PLAT 115 115	128	94	
5	LWRNCE-B 115-SANDST-5 115	0	146	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Hydro	1,049	1,049		100%	100%	
Wind	678	876		100%	98%	
Solar	180	180		100%	100%	

Pocket X2

Northern NY: Mohawk Valley Area



Hours Constrained (if > 100 Hours)

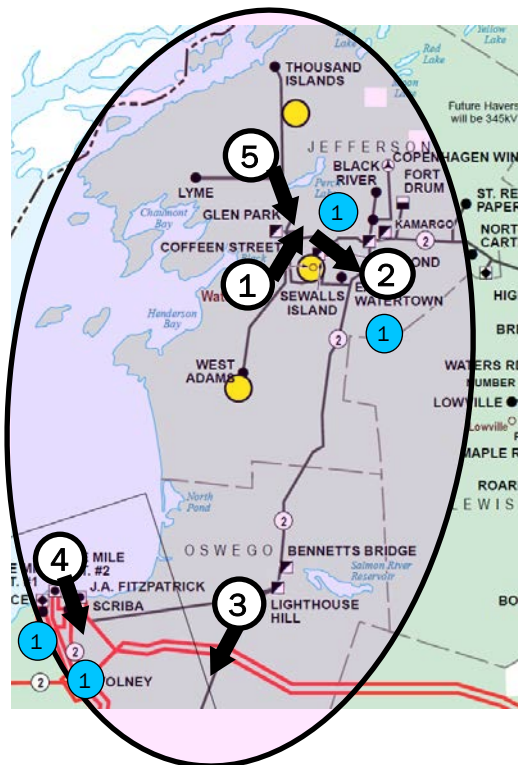
ID	Constraint	Contract	Policy S1	Policy S2
1	NICHOLVL 115-PARISHVL 115	515	183	
2	LOWVILLE 115-Q531_POI 115	434	0	
3	BREMEN 115-Q531_POI 115	182	2,018	
4	BOONVL 115-LOWVILLE 115	96	132	
5	LOWVILLE 115-BOONVL 115	0	540	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Hydro	250	250		100%	95%	
Wind	505	598		100%	99%	
Solar	35	35		96%	84%	

Pocket X3

Northern NY: Ontario Area

Hours Constrained (if > 100 Hours)

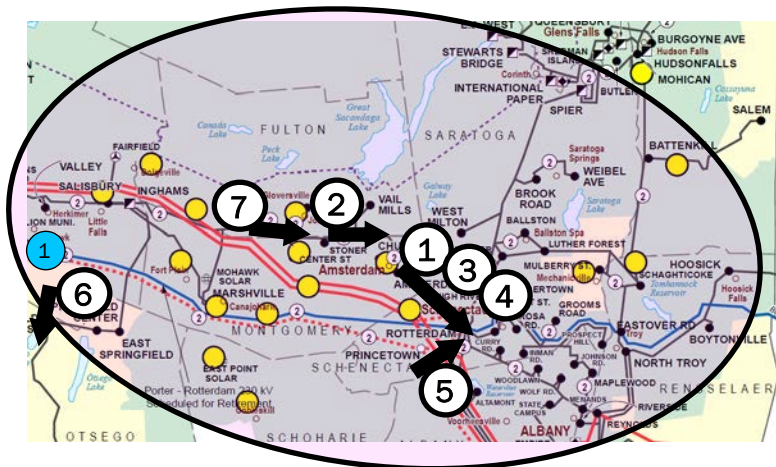


ID	Constraint	Contract	Policy S1	Policy S2
1	COFFEEN 115-GLEN PRK 115	1,119	1,152	
2	COFFEEN 115-E WTRTWN 115	748	223	
3	HTHSE HL 115-MALLORY 115	591	2,495	
4	HMMRMILL 115-WINE CRK 115	0	190	
5	COFFEEN 115-LYMETP 115	0	117	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Hydro	155	155		99%	85%	
Wind	80	790		100%	98%	
Solar	369	369		90%	75%	

Pocket Y1

Capital Region: Mohawk Valley Area



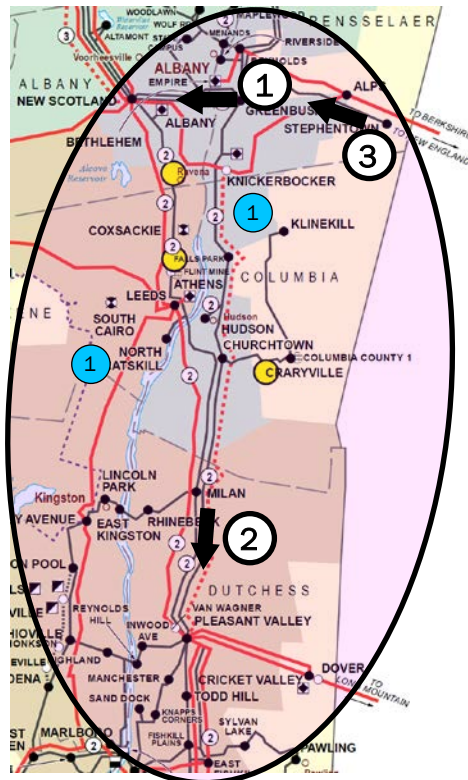
Hours Constrained (if > 100 Hours)

ID	Constraint	Contract	Policy S1	Policy S2
1	RTRDM1 115-Q638POI 115	1,200	1,265	
2	STONER 115-VAIL TAP 115	882	1,666	
3	AMST 115 115-Q638POI 115	302	604	
4	Q638POI 115-AMST 115 115	293	106	
5	ROTTERDA 345-ROTRDM.2 230	61	1,299	
6	COLER115 115-RICHF115 115	0	278	
7	CENTER-N 115-MECO 115 115	0	210	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Hydro	30	30		100%	98%	
Wind	74	101		97%	90%	
Solar	961	961		96%	91%	

Pocket Y2

Capital Region: Hudson Valley Area



Hours Constrained (if > 100 Hours)

ID	Constraint	Contract	Policy S1	Policy S2
1	JMC2+9TP 115-OC W +MG 115	702	0	
2	MILAN 115-BL STR E 115	11	119	
3	STEPH115 115-GBSH+LGE 115	1	134	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Wind		255			100%	
Solar	250	250		100%	99%	

Pocket Z1

Southern Tier: Finger Lakes Area

Hours Constrained (if > 100 Hours)

ID	Constraint	Contract	Policy S1	Policy S2
1	N.WAV115 115-26E.SAYR 115	3,225	1,249	
2	LOUNS115 115-STAGECOA 115	170	366	
3	N.WAV115 115-LOUNS115 115	95	84	
4	MEYER115 115-S.PER115 115	12	179	
5	BATH 115 115-MONTR115 115	5	1,986	
6	MORAI115 115-BENET115 115	0	2,246	
7	BENET115 115-PALMT115 115	0	1,906	
8	MEYER115 115-MORAI115 115	0	1,825	
9	N.WAV115 115-CHEMU115 115	0	147	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Wind	720	1,495		100%	83%	
Solar	405	405		100%	93%	

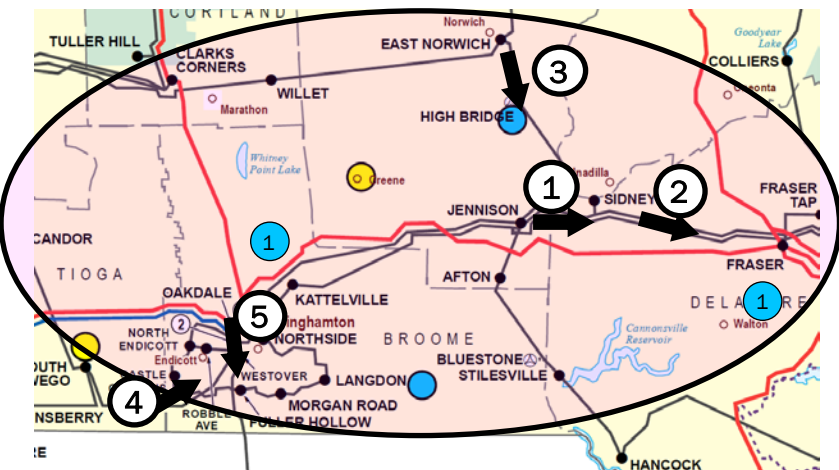
Pocket Z2

Southern Tier: Binghamton Area

Hours Constrained (if > 100 Hours)

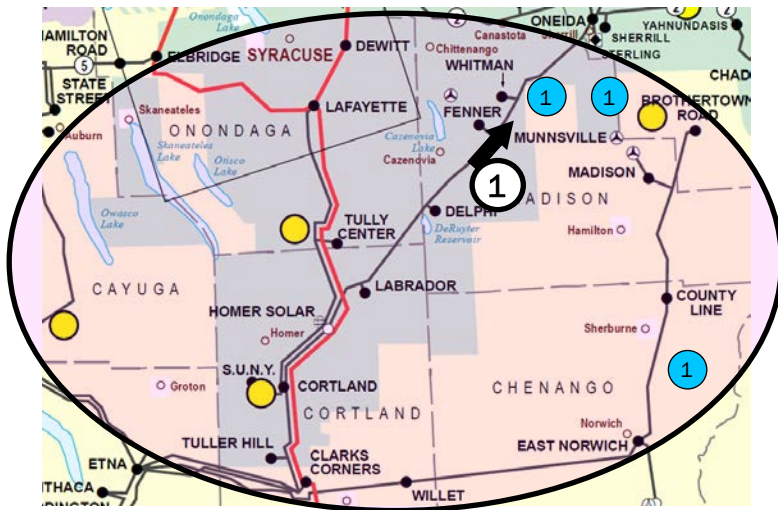
ID	Constraint	Contract	Policy S1
1	JENN 115 115-SIDNT115 115	542	3,459
2	FRASR115 115-SIDNT115 115	0	242
3	E.NOR115 115-JENN 115 115	0	193
4	S.OWE115 115-GOUDEY8- 115	0	167
5	OAKDL230 230-OAKDL115 115	0	119

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Wind	213	803		99%	92%	
Solar	60	60		100%	78%	



Pocket Z3

Southern Tier: Syracuse Area



Hours Constrained (if > 100 Hours)

ID	Constraint	Contract	Policy S1	Policy S2
1	WHITMAN 115-FEN-WIND 115	0	128	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Wind	76	265		100%	95%	
Solar	150	150		100%	96%	

Pocket OSW_J

New York City Offshore Wind & Tier 4 HVDC

Hours Constrained (if > 100 Hours)



ID	Constraint	Contract	Policy S1	Policy S2
1	E179 ST 138-HG 4 138	4,726	5,519	
2	ASTE-ERG 138-CORONA-S 138	1,327	1,888	
3	ASTANNEX 345 E13ST 47 345 1	678	6,723	
4	ASTANNEX 345 E13ST 48 345 1	559	3,234	
5	FRESH KI 138-WILOWBK1 138	339	343	
6	RAINEY8W 138-VERNON-W 138	299	3,044	
7	HG 5 138-ASTORIA 138	210	222	
8	GOWNUSR1 138-GRENWOOD 138	105	225	
9	RAINEY8E 138-VERNON-E 138	16	661	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Offshore Wind	2,046	2,046		100%	100%	

⊕ OSW Point of Interconnection

Pocket OSW_K

Long Island Offshore Wind



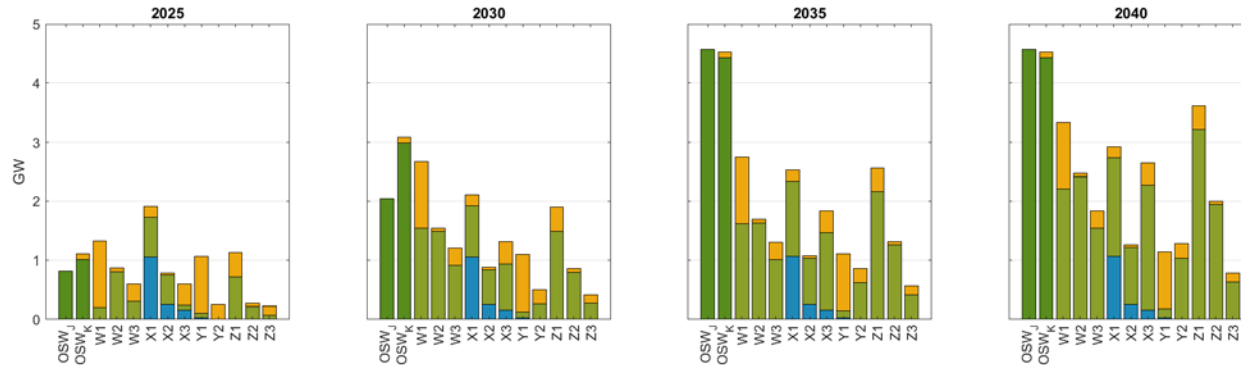
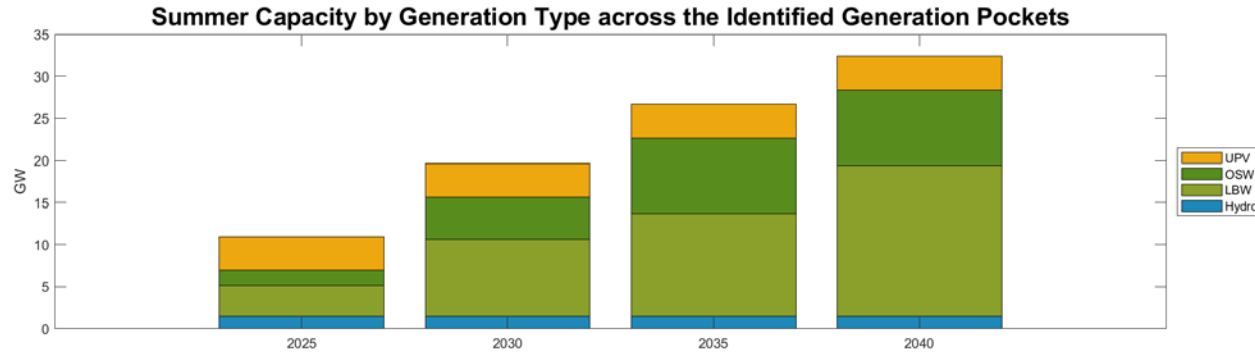
➡ OSW Point of Interconnection

Hours Constrained (if > 100 Hours)

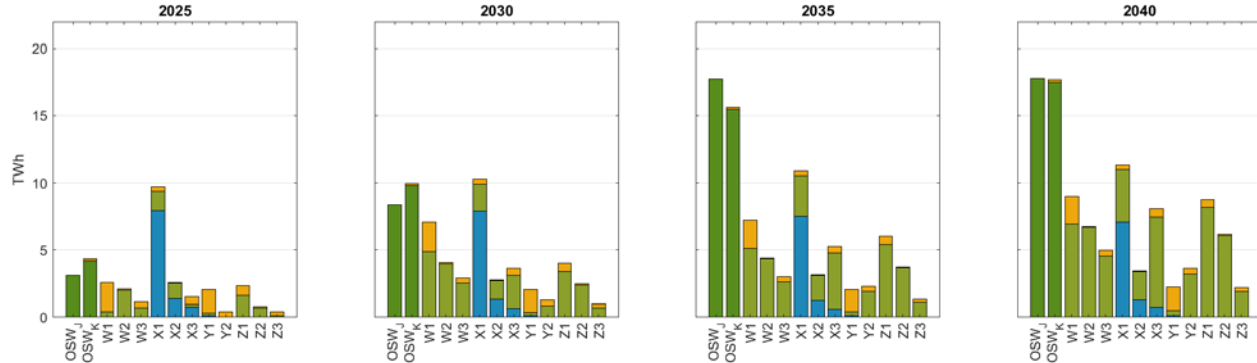
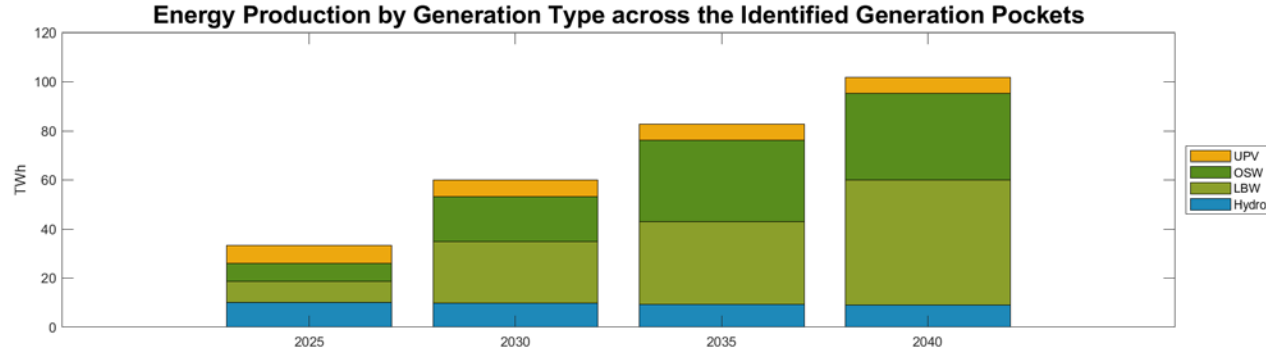
ID	Constraint	Contract	Policy S1	Policy S2
1	Cross Sound Cable	6,305	6,049	
2	BARRETT2 138-VLY STRM 138	4,768	4,922	
3	DUNWOODI 345-SHORE RD 345	3,991	4,362	
4	REACBUS 345-DVNPT NK 345	3,278	2,909	
5	HAUPAGUE 138-C.ISLIP 138	3,066	3,223	
6	Neptune HVDC	2,472	3,125	
7	NRTHPRT1 138-NRTHPRT2 138	1,776	2,114	
8	HOLBROOK 138-RONKONK 138	681	248	
9	CARLE PL 138-E.G.C. 138	477	680	
10	NEWBRGE 138-RULND RD 138	436	630	
11	E.G.C.-2 138-NEWBRGE 138	269	370	
12	VLY STRM 138-E.G.C.-2 138	264	248	
13	HAUPAGUE 138-PILGRM P 138	224	190	
14	BUELL 69-EHAMP 69	158	186	
15	L SUCS 138-SHORE RD 138	0	207	

Type	Capacity (MW)			Energy Deliverability (%)		
	Contract	Policy S1	Policy S2	Contract	Policy S1	Policy S2
Offshore Wind	2,270	2,990		77%	83%	
Solar	99	99		100%	96%	

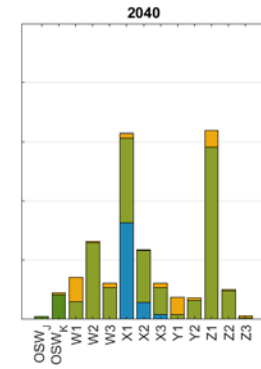
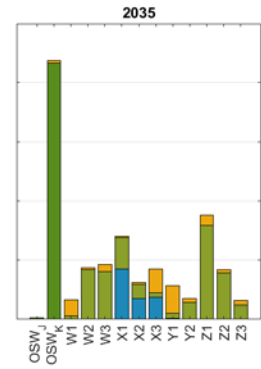
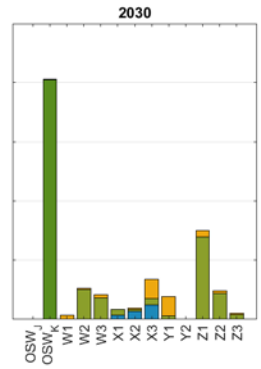
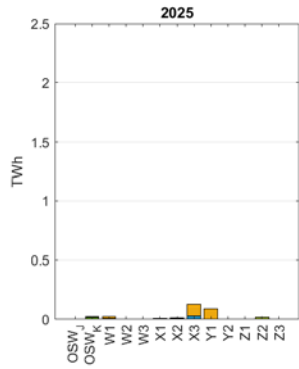
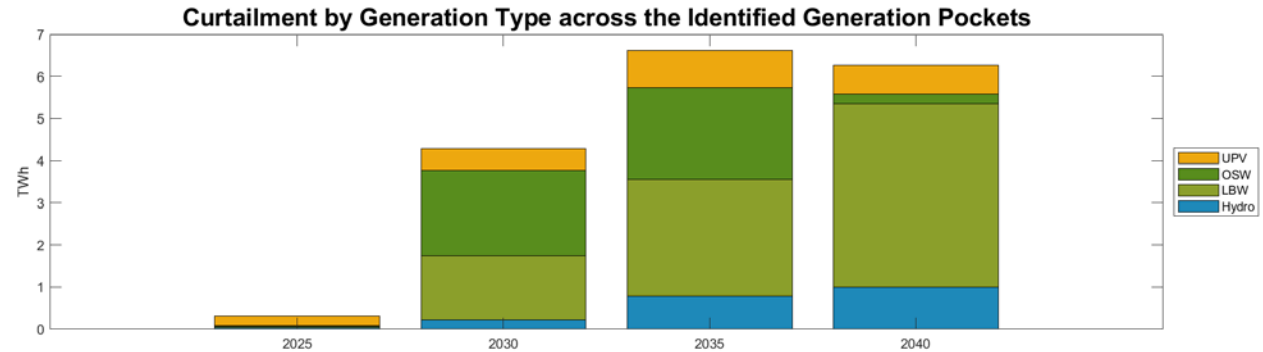
Policy Case (S1) Generation Capacity by Pocket



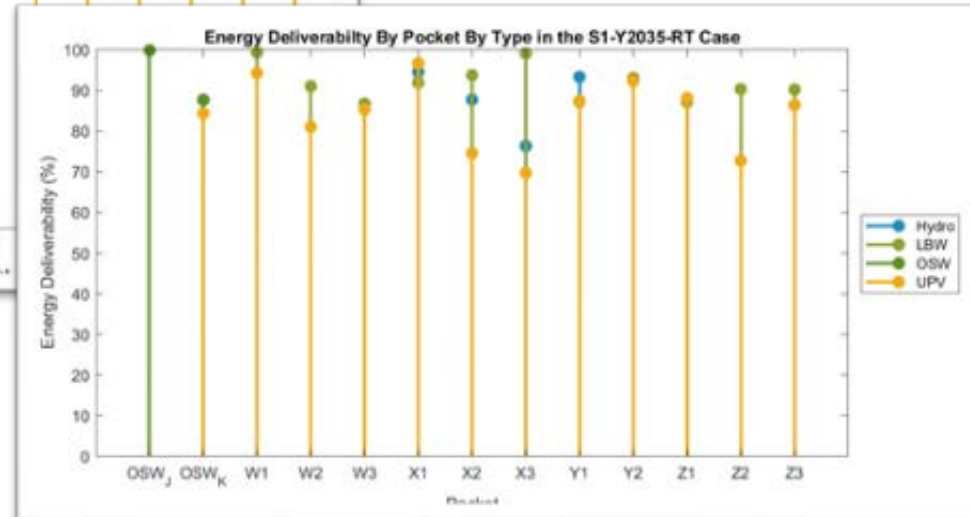
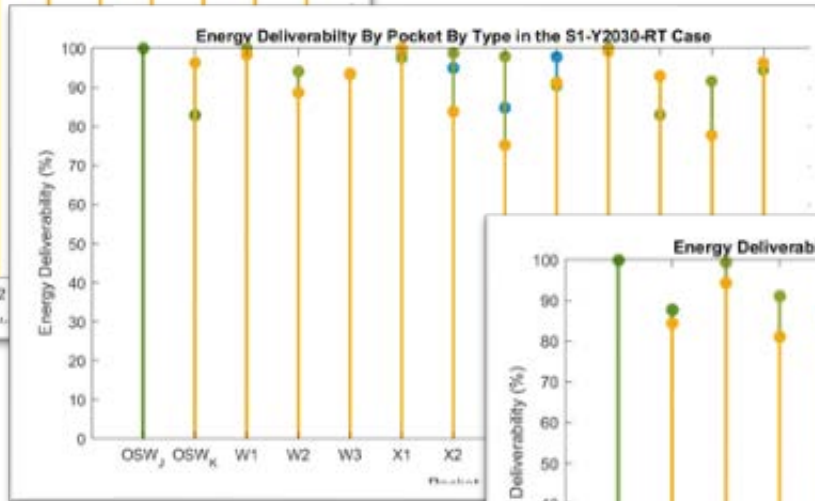
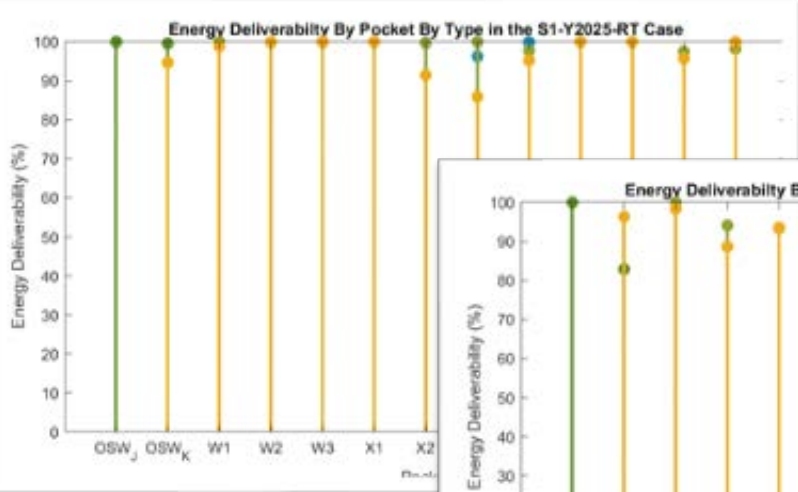
Policy Case (S1) Generation Energy by Pocket



Policy Case (S1) Generation Curtailment by Pocket



Policy Case (S1) Energy Deliverability by Pocket



2025

2030

2035

Next Steps

Next Steps

- **Production cost simulation results for S2**
- **Renewable Generation Pocket for S2**
- **Draft report sections**
- **Upcoming Stakeholder Meetings for Outlook Updates**
 - Thursday June 2nd TPAS
 - Wednesday June 8th Special ESPWG
 - Tuesday June 21st ESPWG

Questions, Feedback, Comments?

- Email additional feedback to: JFrasier@nyiso.com

2021-2040 Outlook Data Catalog

May 20, 2021

Model Benchmark Results

September 22, 2021

System & Resource Outlook Update

October 25, 2021

Capacity Expansion Model Primer

System & Resource Outlook Update

November 19, 2021

System & Resource Outlook Update

December 19, 2021

System & Resource Outlook Update

January 25, 2022

System & Resource Outlook Update

February 9, 2022

System & Resource Outlook Update

Base & Contract Case Results

February 25, 2022

System & Resource Outlook Update

March 8, 2022

System & Resource Outlook Update

March 24, 2022

System & Resource Outlook Update

Contract Case Congestion Analysis

April 1, 2022

System & Resource Outlook Update

April 26, 2022

System & Resource Outlook Update

Final Reports

Data Posted to ESPWG

2022
Release

Assumptions Matrix v1

Capacity Expansion Assumptions Matrix v1

Contract Case Renewable Projects

Emissions Price Forecast

Fuel Price Forecast

Capacity Expansion Assumptions Matrix v2 (Redline)

Capacity Expansion Assumptions Matrix v3 (Redline)

Production Cost Assumptions Matrix v2 (Redline)

Capacity Expansion Assumptions Matrix v4 (Redline)

Capacity Expansion Assumptions Matrix v5 (Redline)

Policy Case Hourly Load Forecasts

Policy Case Zonal Capacity Expansion Preliminary Results

Capacity Expansion Assumptions Matrix v6 (Redline)

Capacity Expansion Assumptions Matrix v7 (Redline)

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