

System & Resource Outlook Update

Economic Planning Department

Electric System Planning Working Group (ESPWG)

January 25th, 2022

Agenda

- Outlook Study Status
- Final Base Case Results
- Preliminary Contract Case Results
- Policy Case Update
 - REC Bidding Update
 - Policy Case Scenarios
 - Policy Case Simulation Framework
- Next Steps
- Appendix

Outlook Study Status

- September – October 2021: Finalize reference case assumptions*
- November - December 2021: Conduct simulations and analysis*
- January - March 2022 : Conduct Policy case simulations and analysis, issue draft report*
- April-May 2022: Finalize draft report, seek Business Issues Committee and Management Committee review and approval
- June 2022: Seek Board of Director review and approval

* Collaborate with ESPWG and seek stakeholder input

Final Base Case Results

Base Case Assumption Summary

- 2021-2040 study period
- 2021 Goldbook Load & Capacity
- 2021 Q3 STAR Reliability Assumptions
 - WNY & AC Transmission public policy projects included
 - No additional reliability resources added beyond 2030
 - Upstate Large Loads Included
- External areas updated according to respective load & capacity reports

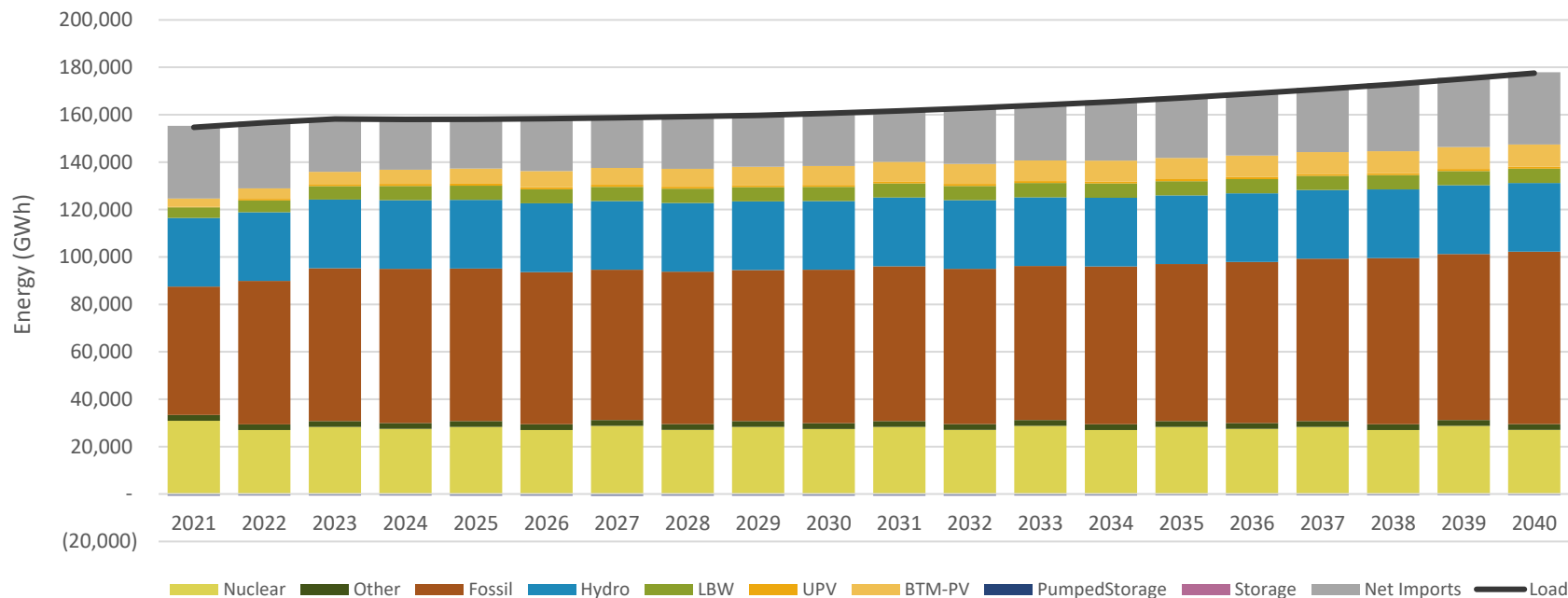
Updates from November 19, 2021 ESPWG

- Removed Moses-Reynolds congestion per discussion with NYPA
- Modeled existing load at Reynolds and Alcoa as fixed withdrawal
- Updated UPNY-ConEd limit to be consistent with recently approved CRP
- **Key Takeaway:** transmission congestion on Moses-Reynolds 115kV eliminated, LBMPs in Zone D decrease significantly

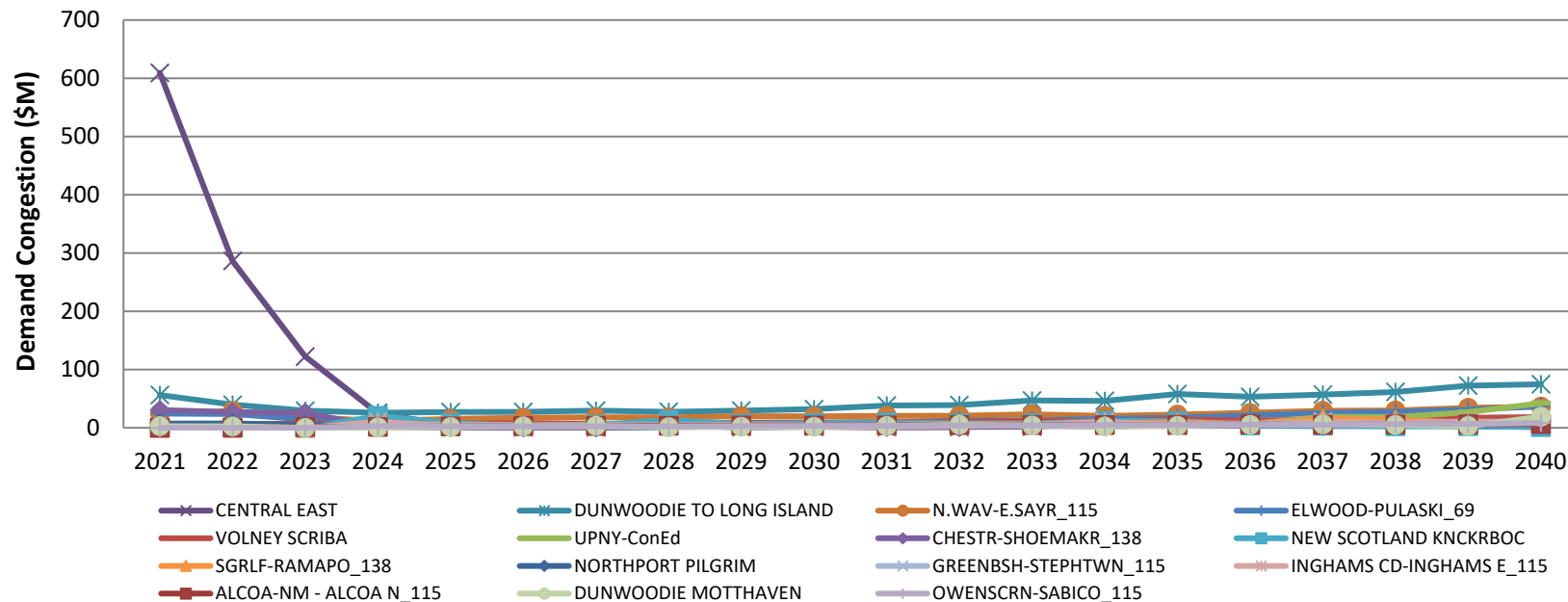
Metrics Reported for Reference Cases

- **Detailed metrics are included in Appendix A & B, and include the following:**
 - **Transmission Congestion**
 - Demand Congestion (\$M) of Top 15 Congested Constraints
 - **Generation Output**
 - Annual Generation by NYISO Zone (GWh)
 - **Import/Export Energy**
 - Net Energy Import Energy by External Interface or Controllable Transmission Line (GWh)
 - **Locational Based Marginal Prices (LBMPs)**
 - Average Annual LBMP by NYISO Zone (\$/MWh)
 - **Generator Payment**
 - Annual Generator Payments by NYISO Zone (\$M)
 - **Load Payment**
 - Annual Load Payments by NYISO Zone (\$M)
 - Production cost software post-processing calculation adjustment was required to accommodate for impact of large loads on Load Payment metric in NYISO system
 - **Curtailment**
 - Renewable Energy Curtailment by NYISO Zone (% and GWh)
- **Selected key metrics are included in the next few slides**

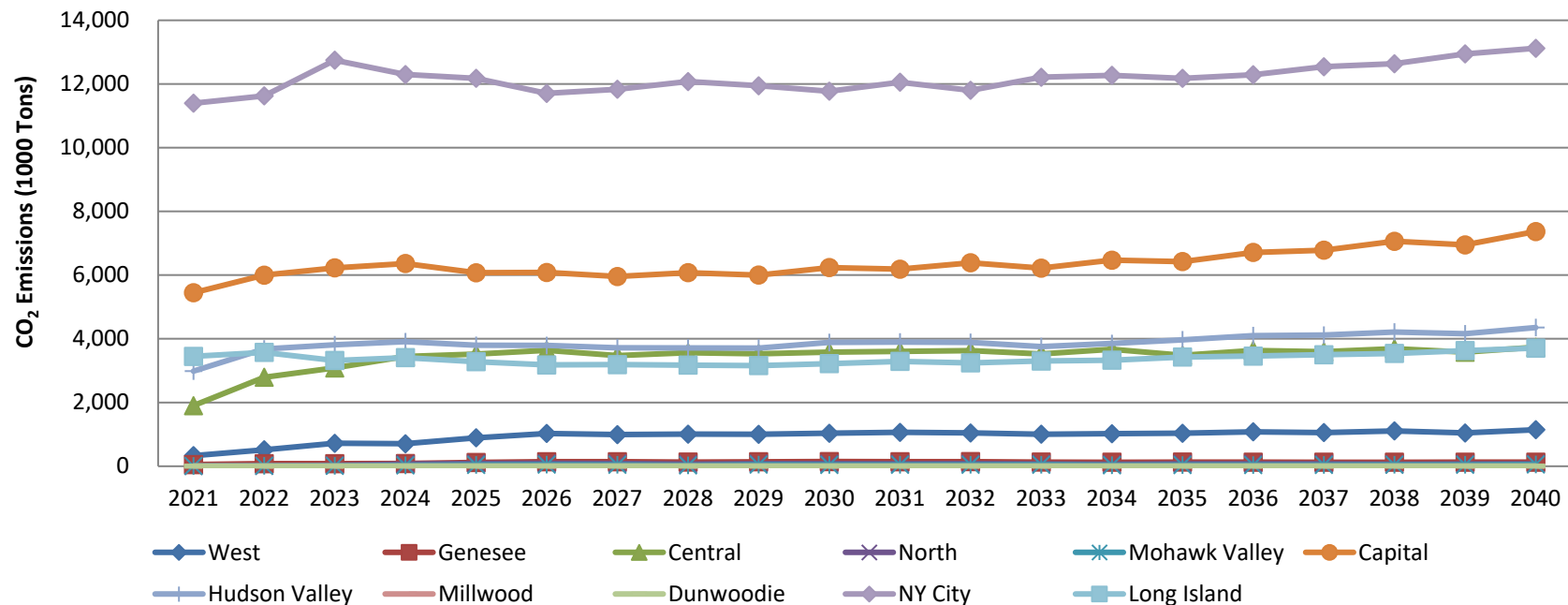
Base Case: Projected NYCA Generation and Net Imports (GWh)



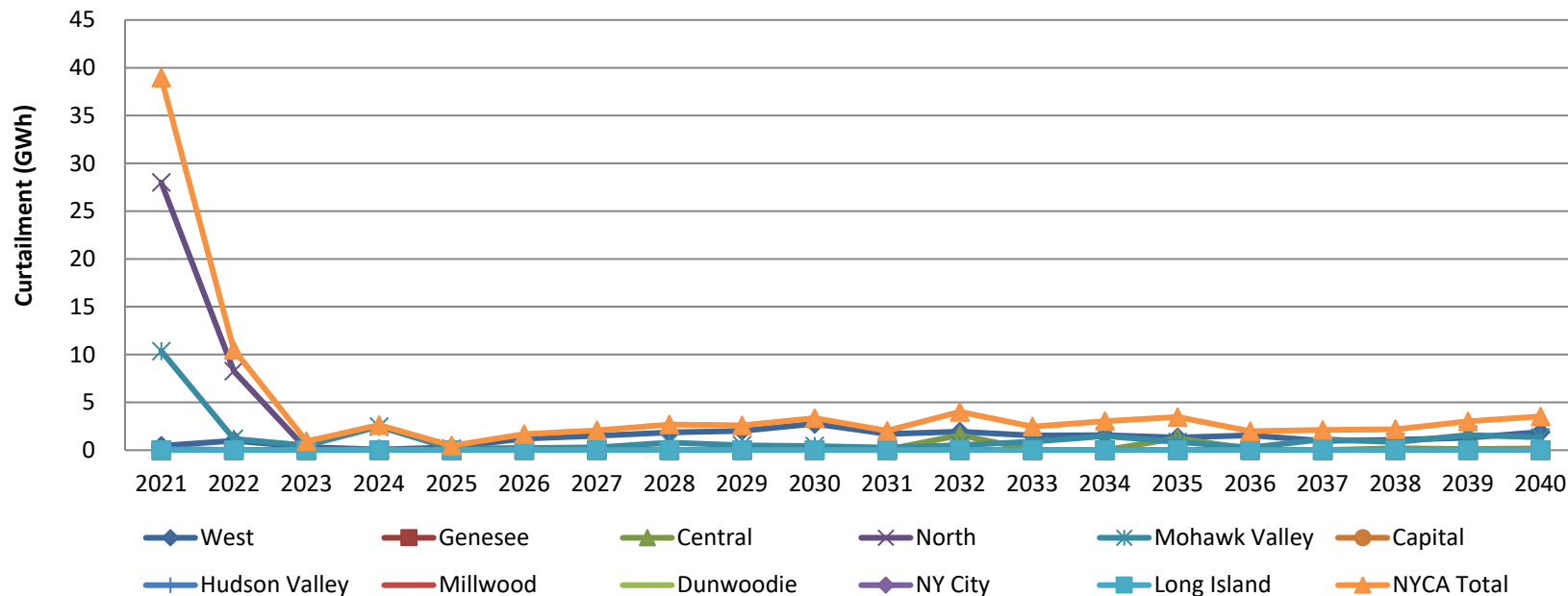
Base Case: Demand Congestion by Constraint (\$M)



Base Case: Projected CO2 Emissions (1000 Tons)



Base Case: Projected Zonal Curtailment (GWh)



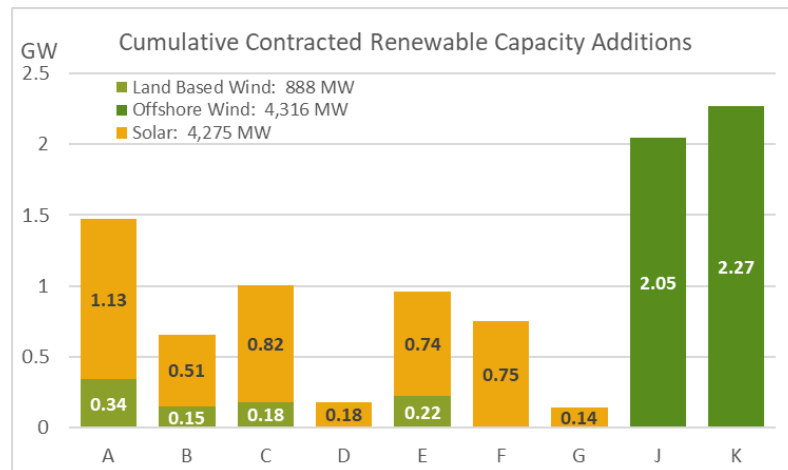
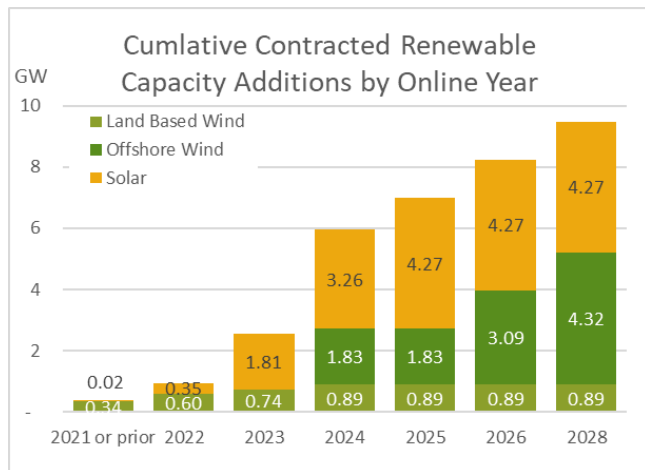
Base Case Key Takeaways

- A significant decrease in congestion on the Central East Interface is observed due to AC Transmission Projects and reduced imports from Ontario
- The Base Case has limited changes to the forward-looking resource mix based on inclusion rules as defined in the Economic Planning Process Manual

Preliminary Contract Case Results

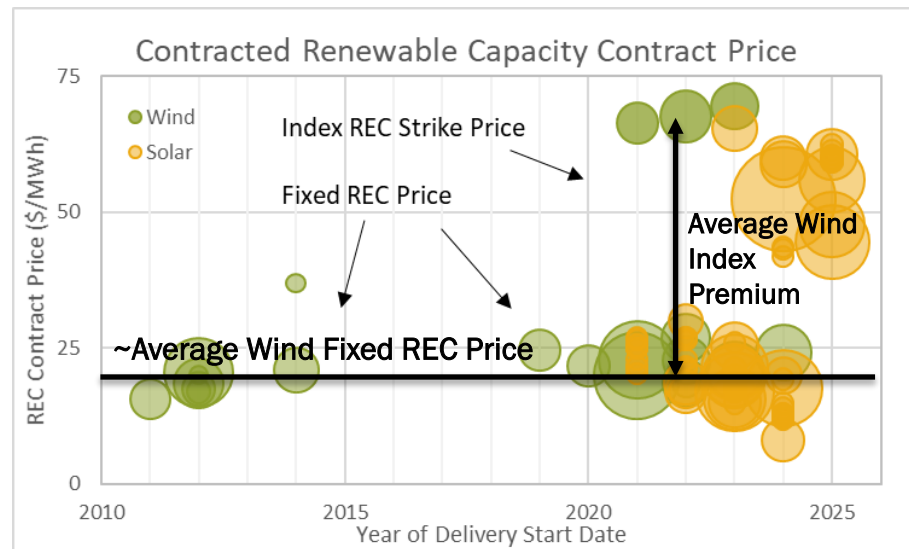
Contract Case Assumption Summary

- Same Assumptions as Base Case plus ~9GW contracted renewable projects



REC Contract Prices and Modeling

- REC contract prices to be included as negative bid adder in the contract and policy case to represent impact of out of market payments
- Aggregate premium of Index REC Strike price to Fixed RECs would be used in proxy to represent negative bid adder for Index RECs



Production Cost Modeling of RECs

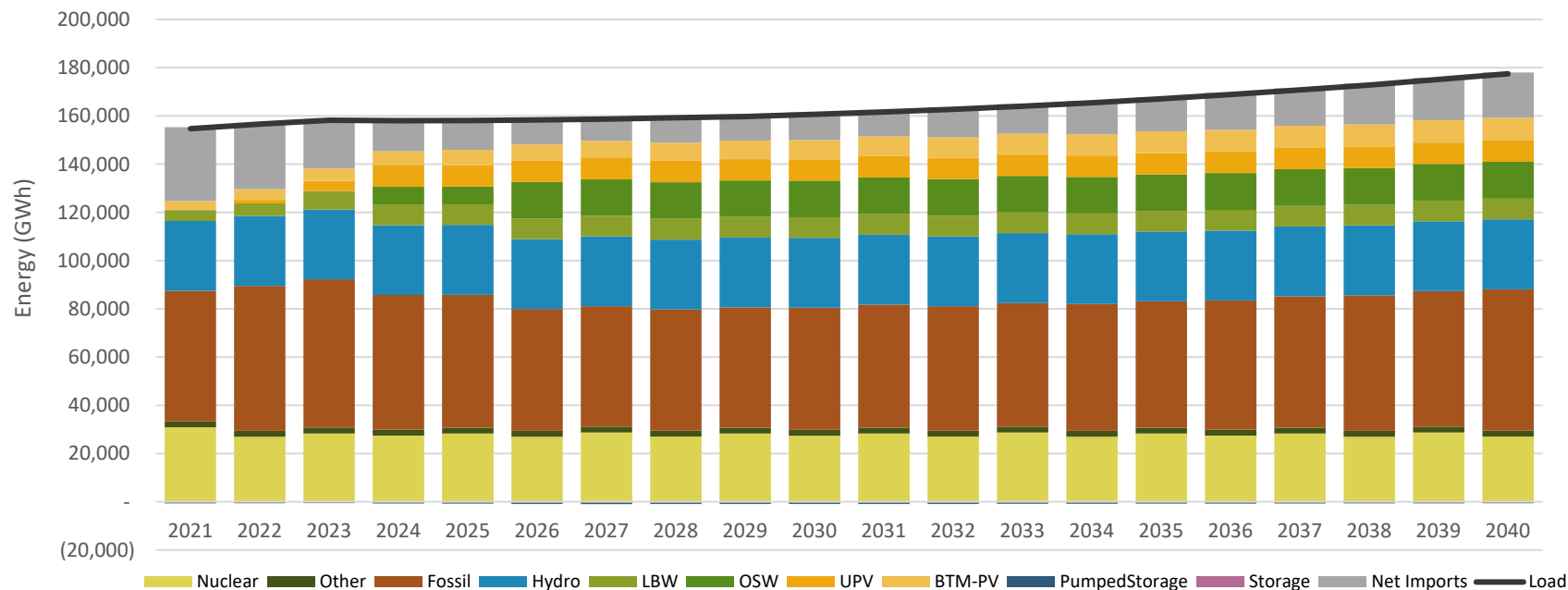
- Index RECs are difficult to model in production cost simulations and therefore the following bid values were used for fixed and index:

$$\text{Modeled Fixed REC Bid} = -\text{REC Price}$$

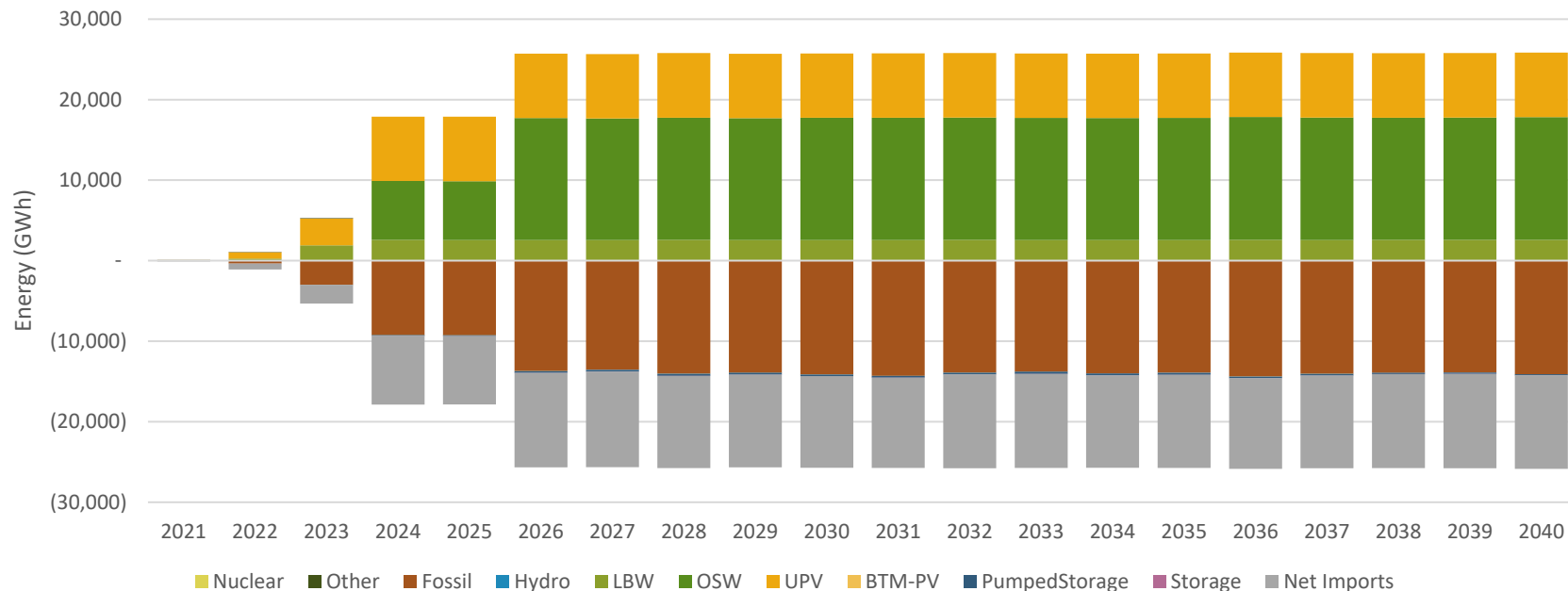
$$\text{Modeled Index REC Bid} = -(\text{Index Strike Price} - \text{Average Index Premium})$$

- Index REC bids are offset by the average index premium by generator type
- For example, if average wind fixed REC is \$21, the average wind index REC is \$55, and Wind Plant X index REC is \$60, modeled REC bid = $-(\$60 - (\$55 - \$21)) = -\26
- Generally, REC bidding models only help to determine the appropriate curtailment order in production cost model

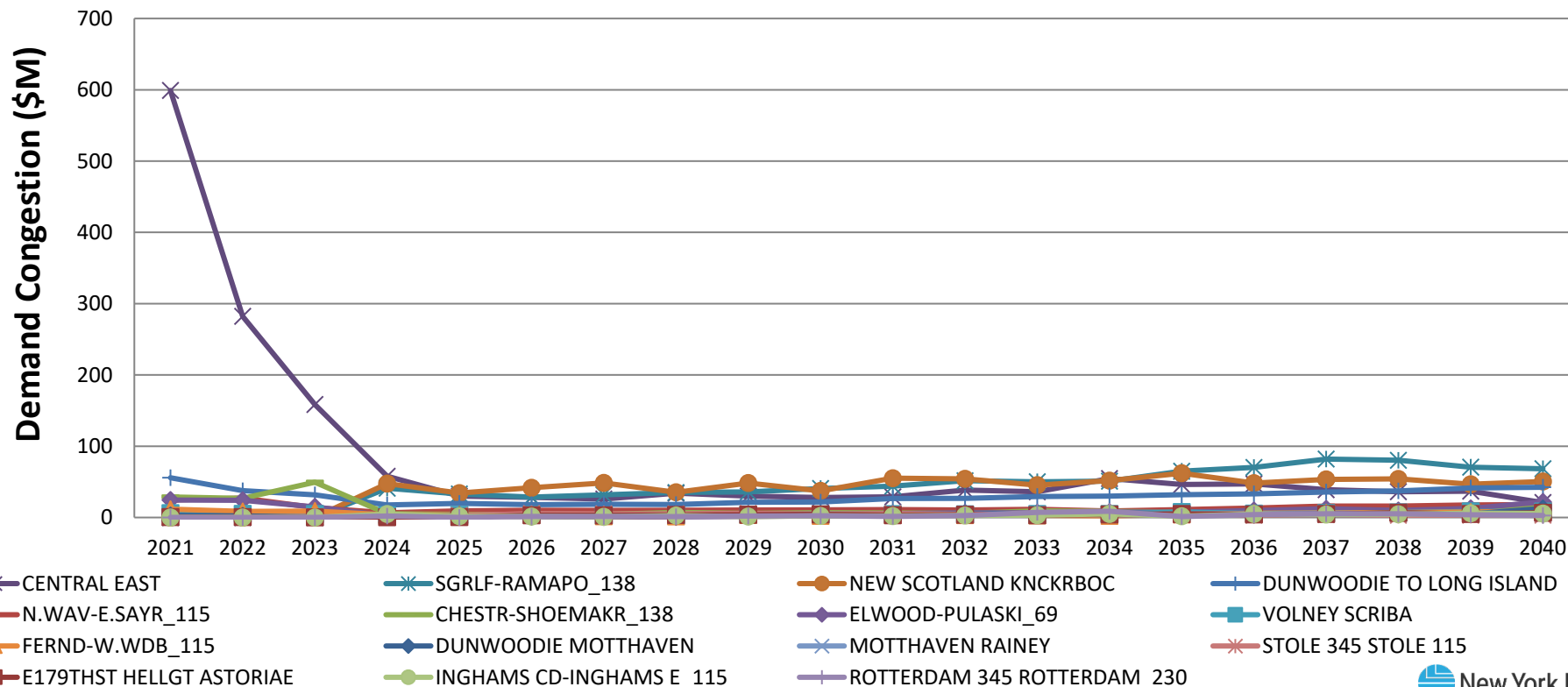
Contract Case: Projected NYCA Generation and Net Imports (GWh)



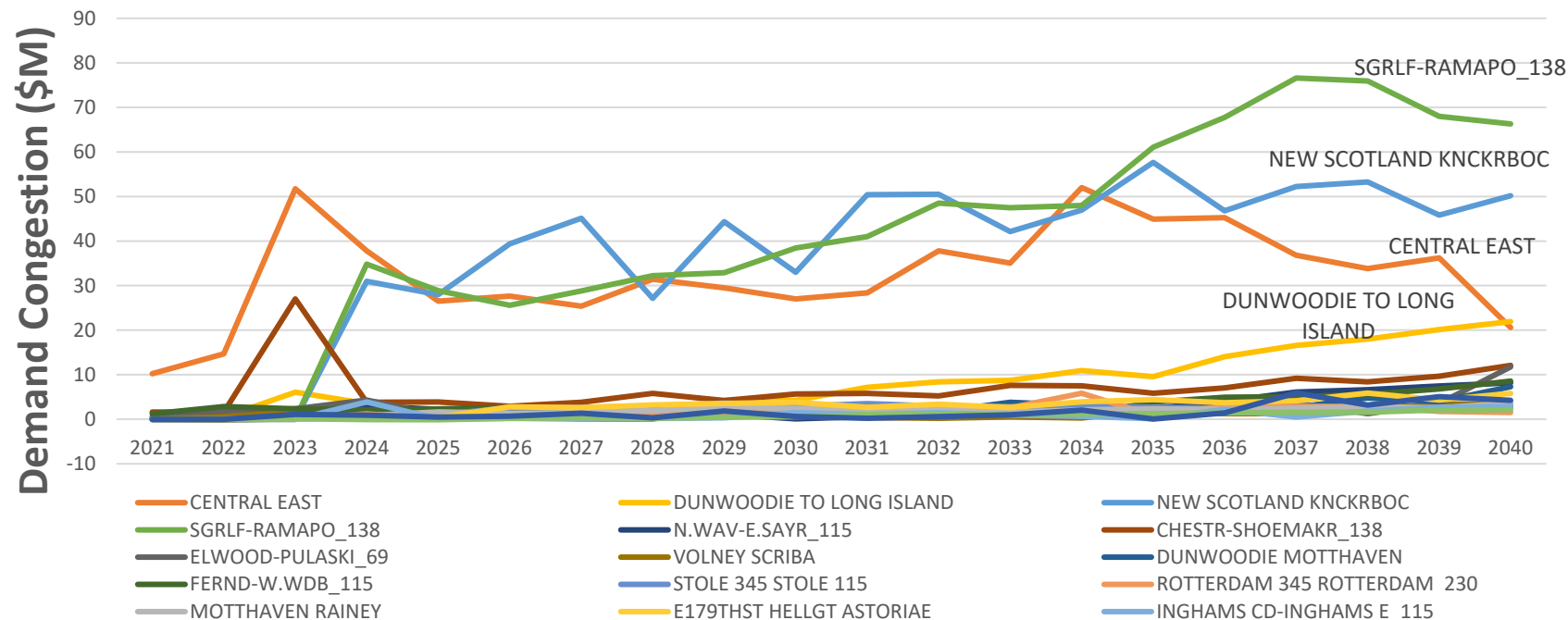
(Contract – Base) Delta NYCA Generation and Net Imports (GWh)



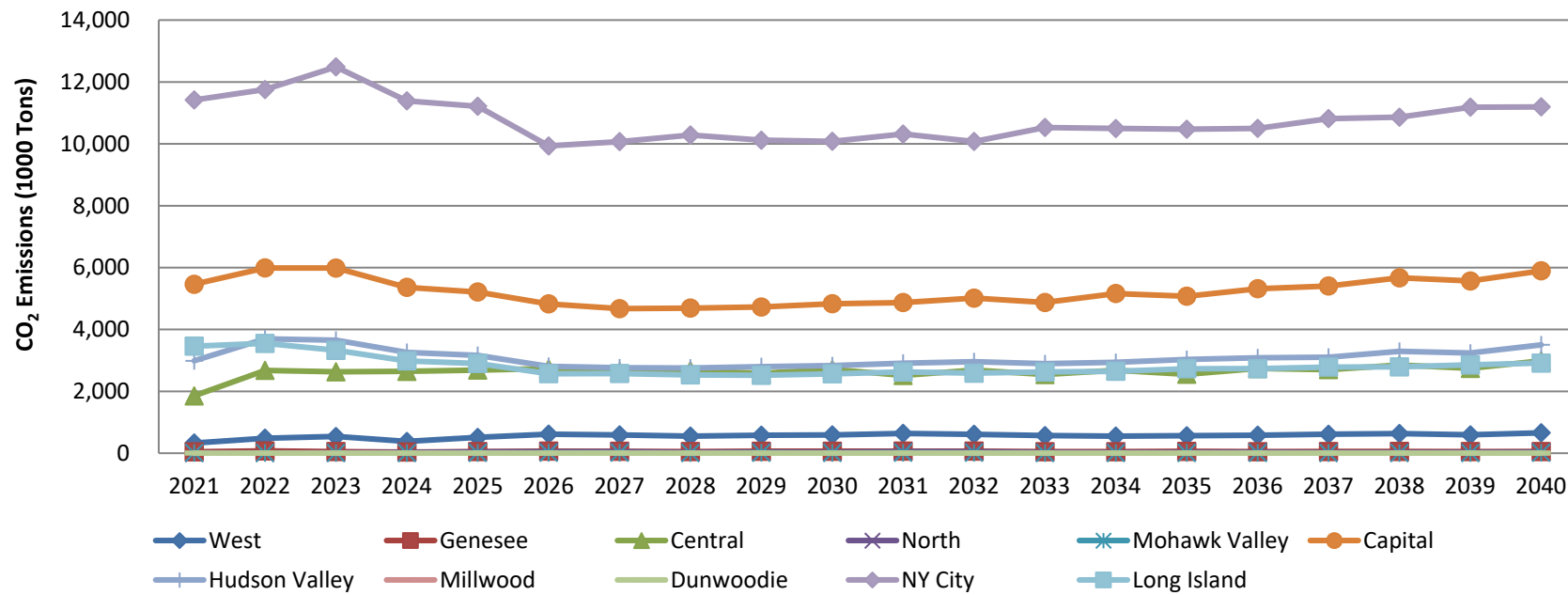
Contract Case: Projected Demand Congestion by Constraint (\$M)



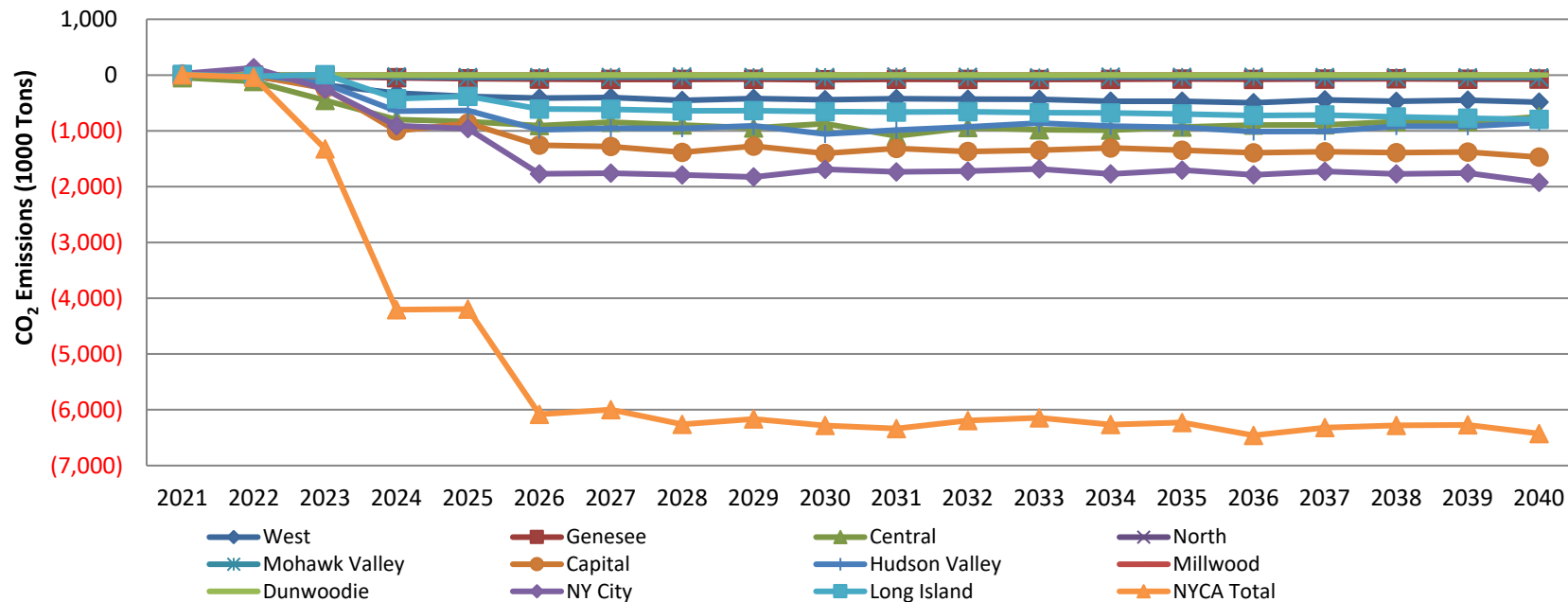
(Contract – Base) Demand Congestion by Constraint (\$M)



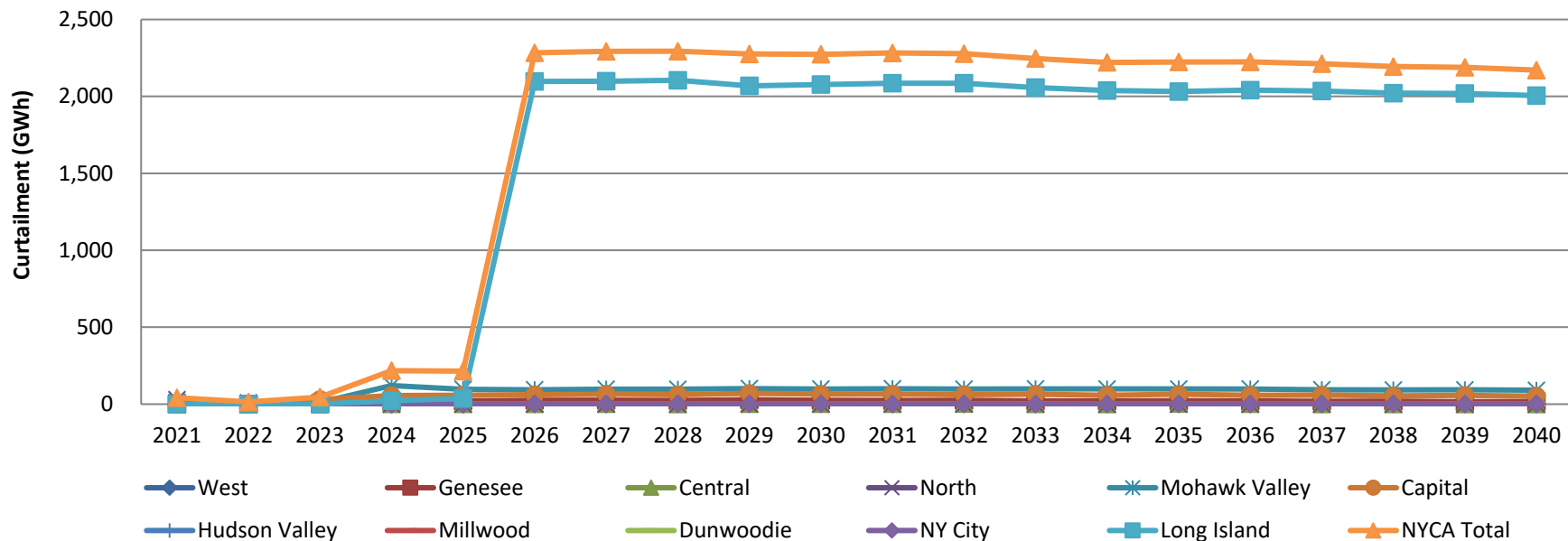
Contract Case: Projected CO2 Emissions (1000 Tons)



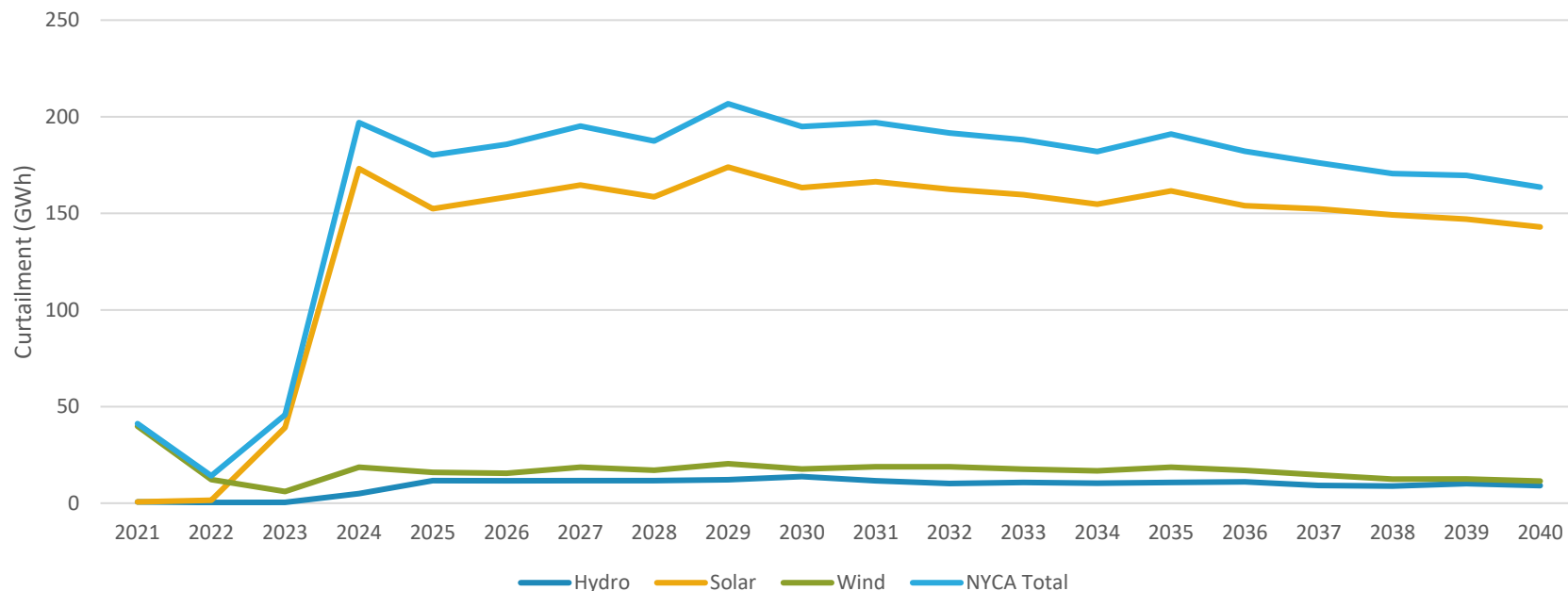
(Contract – Base) Delta CO2 Emissions (1000 Tons)



Contract Case: Projected Zonal Curtailment (GWh)

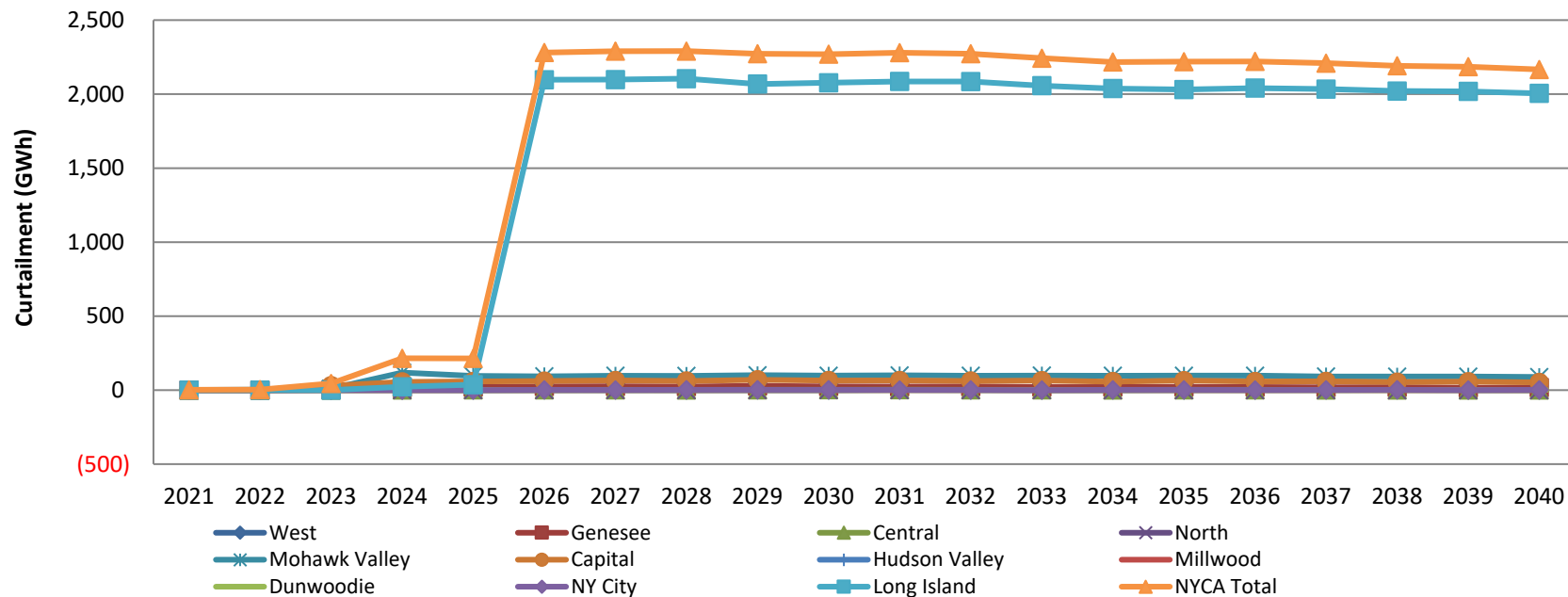


Contract Case: Projected Curtailment by Unit Type (GWh)*



*Excludes offshore wind curtailment

(Contract – Base) Delta Zonal Curtailment (GWh)



Policy Case Update

Pipe & Bubble Representation for Capacity Expansion Model

Years	Interface/Interzonal Pipes	+ Limit (MW)	- Limit (MW)	Source
All	DYSINGER EAST	3,050	*	10/2021 Ops study stability limit ¹
All	WEST-CENTRAL	*	*	
All	MOSES-SOUTH	4,050	-1,500	1/2015 Ops study stability limit ^{1,2}
2021-2023	CENTRAL-EAST (summer)	2,380	-2,380	Operational nomogram ³
2021-2023	CENTRAL-EAST (winter)	2,615	-2,615	Operational nomogram ³
2024-2040	CENTRAL-EAST (summer)	3,255	-3,255	Operational nomogram ³
2024-2040	CENTRAL-EAST (winter)	3,490	-3,490	Operational nomogram ³
2021-2023	UPNY-CONED	6,150	*	2021 CRP limit
2024-2040	UPNY-CONED	6,525	*	2021 CRP limit
All	SPR/DUNWOODIE - NYC - LI	*	*	
All	NYC-LI	0	-350	Wheel contract
2027-2040	CLEAN PATH NEW YORK	1,300	-1,300	Tier 4 contracts ⁴
2025-2040	CHAMPLAIN HUDSON POWER EXPRESS	1,250	-1,250	Tier 4 contracts ⁴

1: See "Interface Limits & Ops Studies" here: <https://www.nyiso.com/reports-information/>

2: Northern New York Smart Path Transmission Project will increase transfer capability to Moses-South by ~1000 MW and is reflected in the limit noted above:

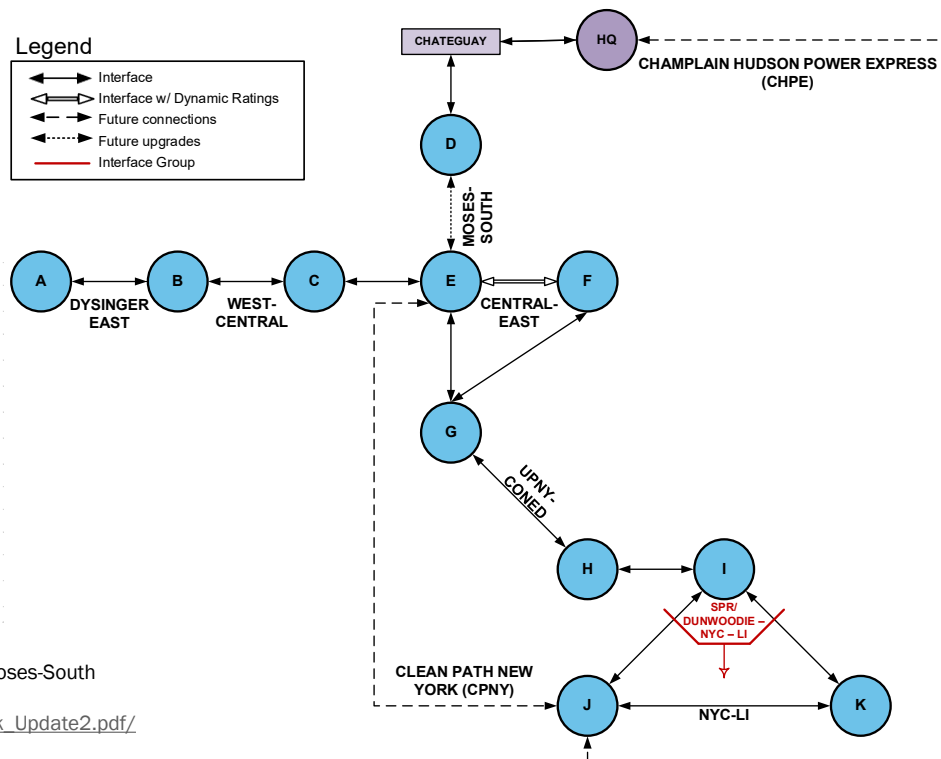
https://www.nyiso.com/documents/20142/27019028/ESPGWG_System_Resource_Outlook_Update2.pdf/

3: Max Limit Applied Proportionally to Operational Nomogram:

<https://www.nyiso.com/documents/20142/3692791/Central-East%20Voltage-Collapse-Limit-Evaluation-FINAL.pdf/>

4: See Case Number Case Number 15-E-0302 for additional information on Tier 4 contracts:

<https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=15-e-0302&CaseSearch=Search>

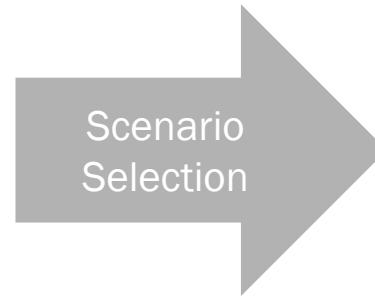


Proposed Capacity Expansion Methodology

- For the 2021 Outlook study, the Capacity Expansion model will be used to assess a multitude of scenarios for the Policy Case
- The Capacity Expansion will model two of these scenarios, which will be used as capacity inputs to the production cost model in MAPS
 - The NYISO is seeking input from stakeholders during the selection of two scenarios for further analysis using production cost models
 - See the following slide for additional detail on this process

Proposed Capacity Expansion Methodology

Capacity Expansion Scenarios



Production Cost Scenarios

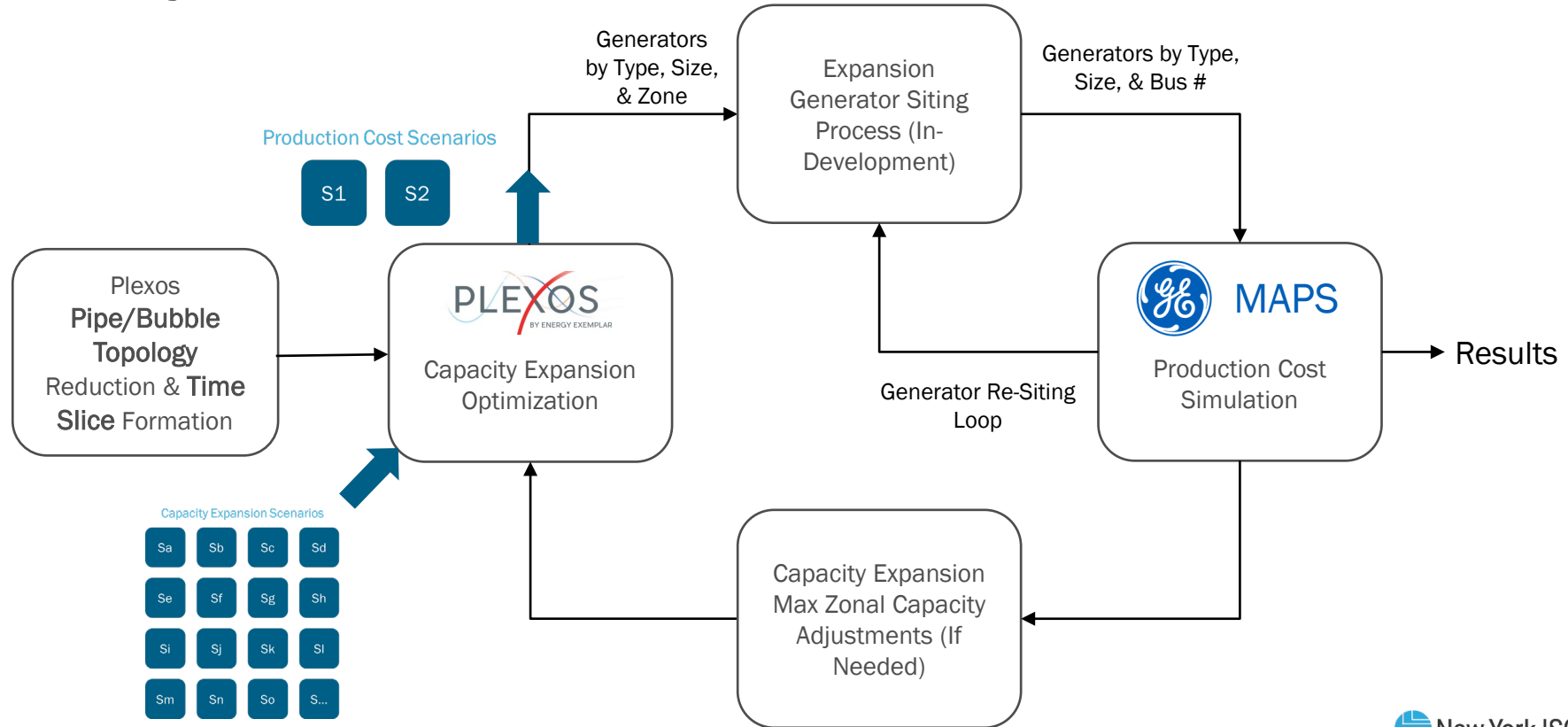


Potential Capacity Expansion Scenarios

- Candidate technologies available
- Nuclear re-licensing/retirement
- High/low renewable technology cost
- High/low /alternative load forecasts
- High/low gas prices
- High/low emission prices
- Enable/disable/accelerate retirements
- Include/exclude max capacity builds
- Relax/accelerate CLCPA targets
- Reduced hydroelectric energy output

Scenario suggestions from stakeholders?

Policy Case Simulation Framework



Policy Case Study Years

- **The NYISO requires significant database development and computation time to run the Policy Case due to:**
 - Many capacity expansion scenarios
 - Two production cost scenarios
 - Siting process iterations
- **To accommodate, capacity expansion and production cost models for the Policy Case will be limited to 2025, 2030, 2035, and 2040 study years**

Next Steps

Next Steps

■ Base Case

- Congestion & Relaxed Simulation Analysis Results

■ Contract Case

- Congestion & Relaxed Simulation Analysis Results
- Renewable Generation Pocket Identification
- Energy Deliverability Results

■ Policy Case

- Final refinements of capacity expansion model
- Capacity Expansion Preliminary Results Presentation

Questions, Feedback, Comments?

- Email additional feedback to: JFrasier@nyiso.com

2021 Outlook Data Catalog

ESPWG/TPAS Presentations

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

Final Reports

Data Posted to ESPWG

2022
Release

Assumptions Matrix v1

Updated Capacity Expansion Assumptions Matrix

Contract Case Renewable Projects

Emissions Price Forecast

Fuel Price Forecast

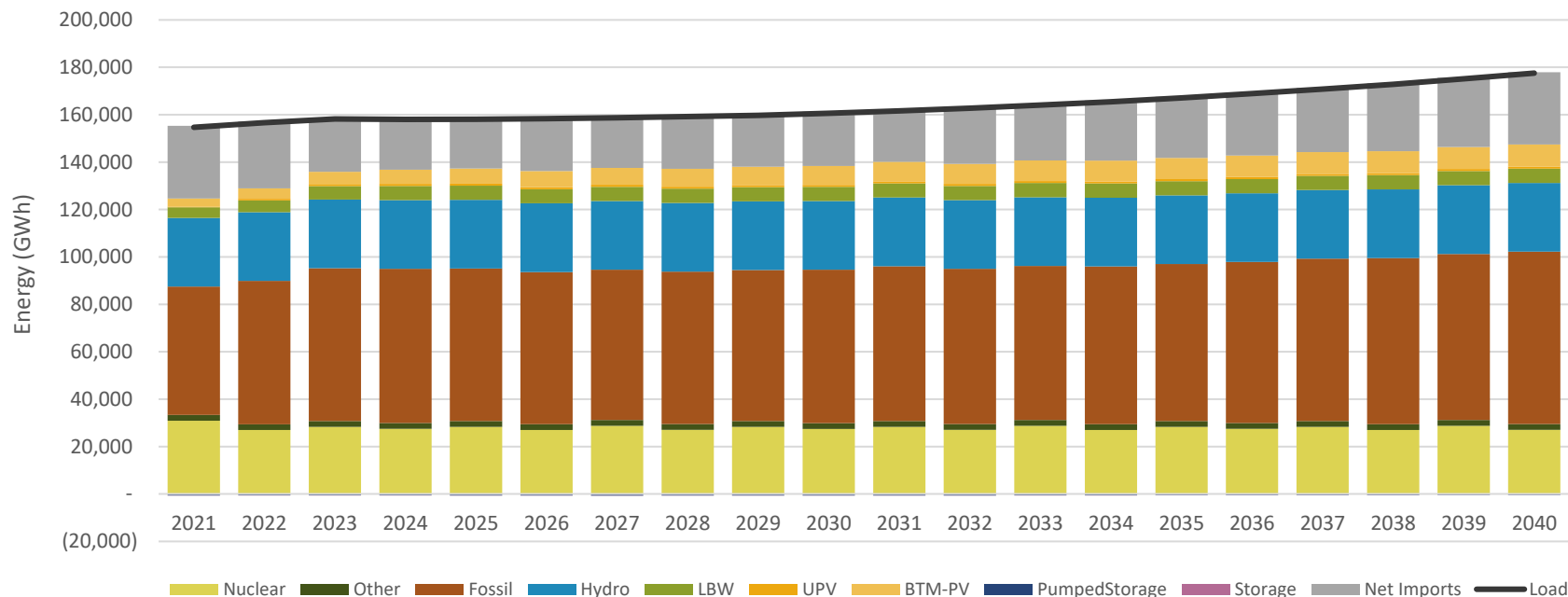
Appendix A:

Detailed Metrics Reported for the Base Case

Metrics Reported

- **Transmission Congestion**
 - Demand Congestion (\$M) of Top 15 Congested Constraints
- **Generation Output**
 - Annual Generation by NYISO Zone (GWh)
- **Import/Export Energy**
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- **Curtailement**
 - Renewable Energy Curtailement by NYISO Zone (% and GWh)

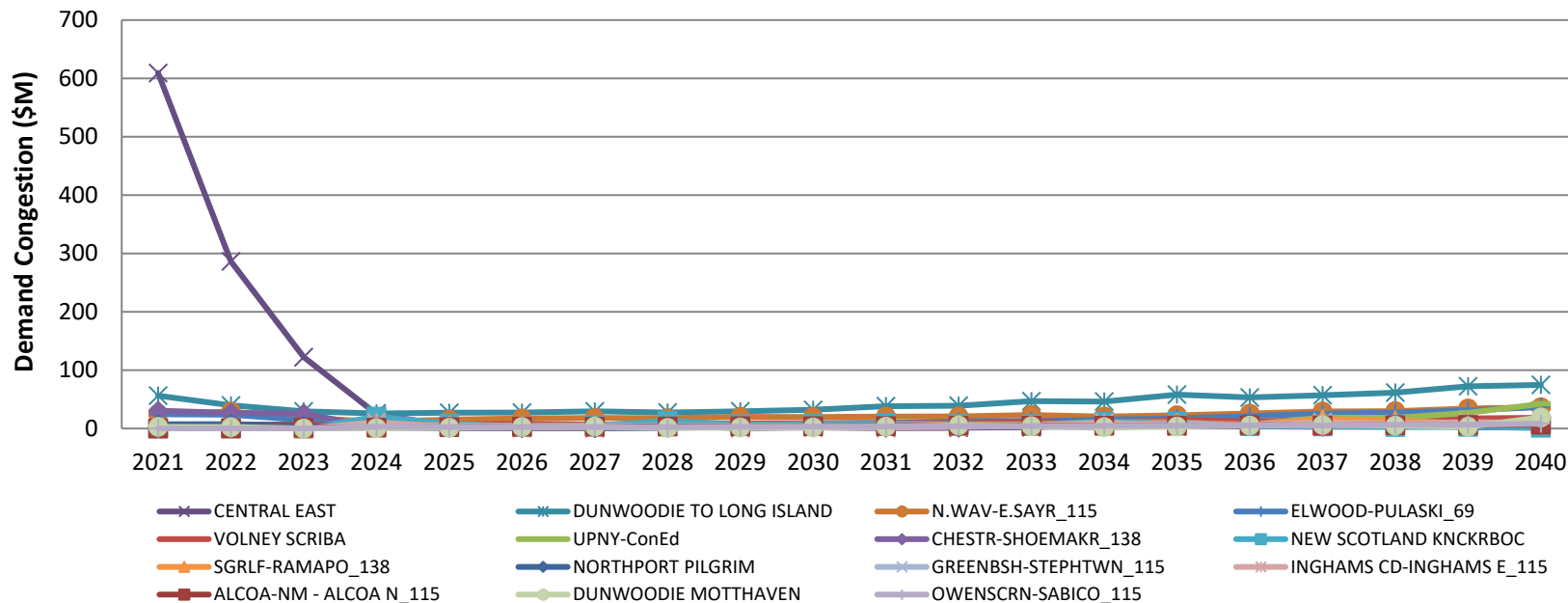
Projected NYCA Generation and Net Imports (GWh)



Demand Congestion by Constraint (\$M)

Demand Congestion (\$M)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
CENTRAL EAST	609	286	122	25	4	1	1	4	1	2	1	1	2	6	3	5	6	7	2	1
DUNWOODIE TO LONG ISLAND	56	40	29	26	27	27	29	27	30	32	38	39	47	46	58	53	57	62	72	75
N.WAV-E.SAYR_115	25	29	18	12	15	17	18	18	20	20	21	21	23	21	23	26	29	30	34	36
ELWOOD-PULASKI_69	24	24	14	8	5	4	1	1	6	8	9	12	13	15	18	21	26	27	31	37
VOLNEY SCRIBA	6	6	7	6	7	8	6	8	9	9	10	10	12	11	15	12	15	15	17	18
UPNY-ConEd	0	0	0	2	2	2	1	3	6	5	5	4	4	5	4	6	19	19	27	42
CHESTR-SHOEMAKR_138	31	27	26	2	1	1	1	2	3	2	1	1	4	2	5	4	3	4	4	6
NEW SCOTLAND KNCKRBOC	0	0	0	20	8	3	5	13	7	8	9	8	7	12	11	4	4	3	3	1
SGRLF-RAMAPO_138	0	0	0	8	5	4	5	5	5	4	6	7	6	7	10	7	16	14	9	7
NORTHPORT PILGRIM	7	8	5	4	2	2	1	1	3	4	4	4	4	4	6	7	7	8	9	11
GREENBSH-STEPHTWN_115	0	0	0	5	5	5	4	5	5	5	5	5	6	6	7	7	8	8	9	9
INGHAMS CD-INGHAMS E_115	0	0	0	11	2	2	2	4	2	1	2	3	5	10	4	7	11	9	11	10
ALCOA-NM - ALCOA N_115	0	1	1	2	2	3	3	4	4	4	4	5	5	5	5	6	5	6	6	7
DUNWOODIE MOTTHAVEN	3	3	0	1	1	3	3	1	2	2	3	5	4	2	3	5	6	5	3	19
OWENSCRN-SABICO_115	0	0	0	3	3	3	3	2	3	3	3	4	4	5	5	5	5	7	7	8

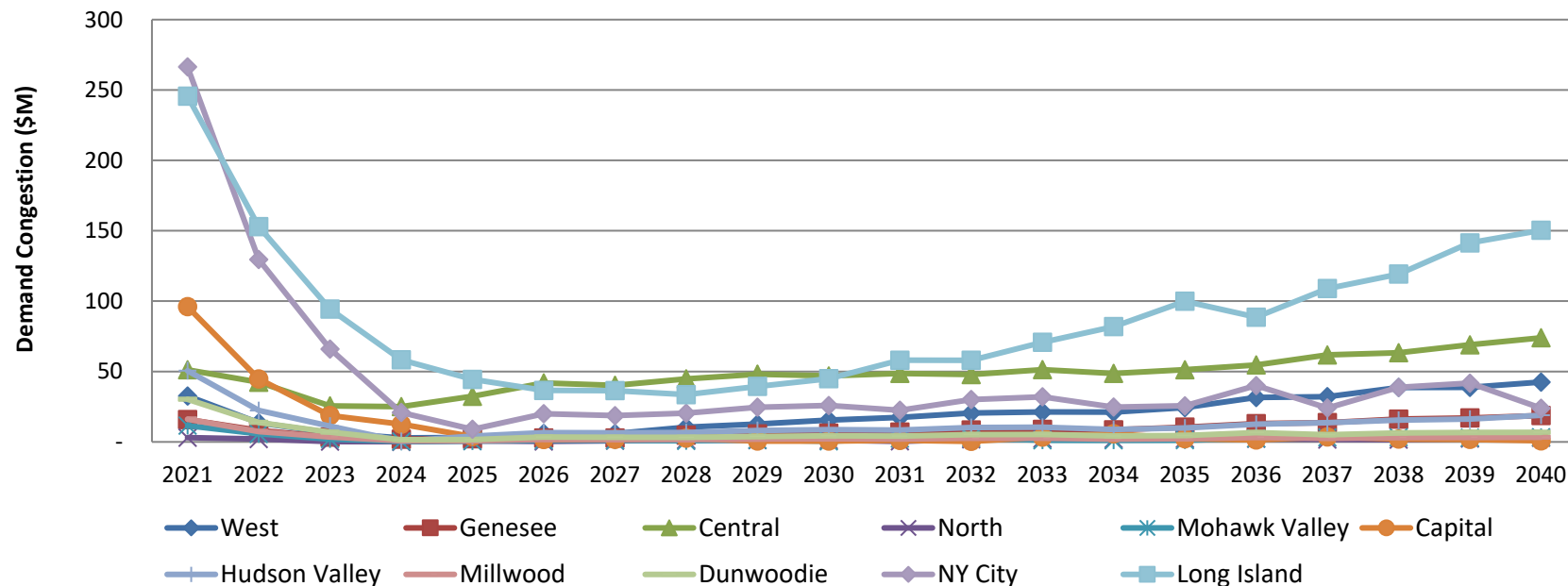
Demand Congestion by Constraint (\$M)



Projected Demand Congestion by Zone (\$M)

Demand Congestion (\$M)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	33	14	6	3	3	6	6	10	13	15	17	20	21	21	24	32	32	39	39	42
Genesee	16	8	3	2	2	3	3	5	6	6	7	8	9	9	10	13	14	16	17	19
Central	51	42	26	25	32	42	40	45	48	47	49	48	51	49	51	55	62	63	69	74
North	3	2	0	0	1	0	1	1	1	1	0	2	2	2	2	2	2	2	2	3
Mohawk Valley	12	6	2	0	1	1	1	1	1	0	2	3	1	1	1	2	3	3	3	3
Capital	96	45	19	13	4	2	2	3	1	1	1	0	3	6	2	1	4	2	2	1
Hudson Valley	51	22	11	0	4	7	6	7	8	9	8	10	10	9	10	13	14	15	16	19
Millwood	16	7	3	1	1	2	2	2	2	2	2	3	3	2	2	3	3	3	3	3
Dunwoodie	30	14	7	2	2	3	3	3	4	4	4	5	5	4	5	7	5	6	7	7
NY City	266	129	66	21	9	20	19	20	25	26	22	30	32	25	26	40	24	39	42	24
Long Island	246	153	94	58	44	37	36	34	39	45	58	58	71	82	100	89	109	119	141	150
NYCA Total	819	442	238	125	103	122	119	130	148	157	172	188	209	209	234	256	270	308	341	345

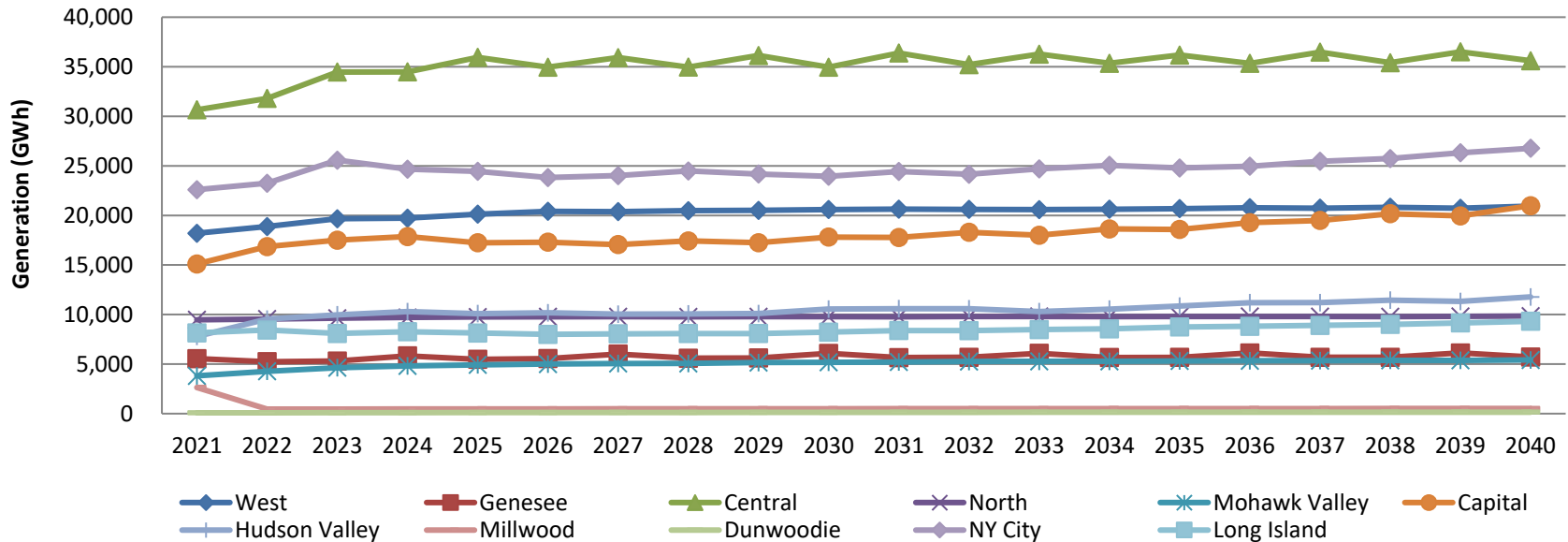
Projected Demand Congestion by Zone (\$M)



Projected Generation by Zone (GWh)

Generation (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	18,200	18,882	19,667	19,723	20,129	20,411	20,385	20,484	20,508	20,595	20,634	20,613	20,585	20,627	20,686	20,779	20,732	20,824	20,720	20,945
Genesee	5,548	5,235	5,308	5,827	5,483	5,554	6,010	5,592	5,617	6,079	5,653	5,685	6,085	5,659	5,680	6,124	5,681	5,686	6,125	5,714
Central	30,659	31,813	34,474	34,488	35,951	34,959	35,929	34,966	36,137	34,964	36,388	35,219	36,275	35,353	36,182	35,348	36,478	35,415	36,512	35,612
North	9,469	9,544	9,626	9,704	9,747	9,770	9,778	9,768	9,779	9,779	9,769	9,800	9,802	9,786	9,795	9,806	9,798	9,777	9,811	9,842
Mohawk Valley	3,807	4,272	4,632	4,813	4,918	5,002	5,055	5,066	5,154	5,175	5,211	5,262	5,276	5,278	5,314	5,334	5,345	5,373	5,371	5,413
Capital	15,097	16,850	17,503	17,864	17,237	17,301	17,059	17,425	17,248	17,815	17,773	18,297	18,002	18,634	18,587	19,275	19,490	20,169	19,953	20,980
Hudson Valley	7,795	9,540	9,965	10,296	10,090	10,172	10,038	10,060	10,097	10,549	10,587	10,584	10,294	10,547	10,852	11,190	11,197	11,451	11,320	11,774
Millwood	2,638	454	461	471	474	479	484	490	491	494	497	501	503	505	505	509	510	511	511	512
Dunwoodie	75	83	89	99	104	108	112	117	122	125	129	132	134	136	139	142	144	145	144	146
NY City	22,596	23,248	25,575	24,666	24,448	23,818	24,017	24,487	24,174	23,948	24,432	24,152	24,695	25,051	24,790	24,963	25,464	25,745	26,323	26,779
Long Island	8,149	8,435	8,084	8,264	8,130	7,999	8,053	8,078	8,080	8,225	8,384	8,373	8,476	8,554	8,744	8,814	8,901	9,000	9,154	9,320
NYCA Total	124,032	128,356	135,384	136,214	136,710	135,574	136,918	136,532	137,407	137,747	139,458	138,616	140,127	140,129	141,274	142,286	143,740	144,095	145,944	147,035

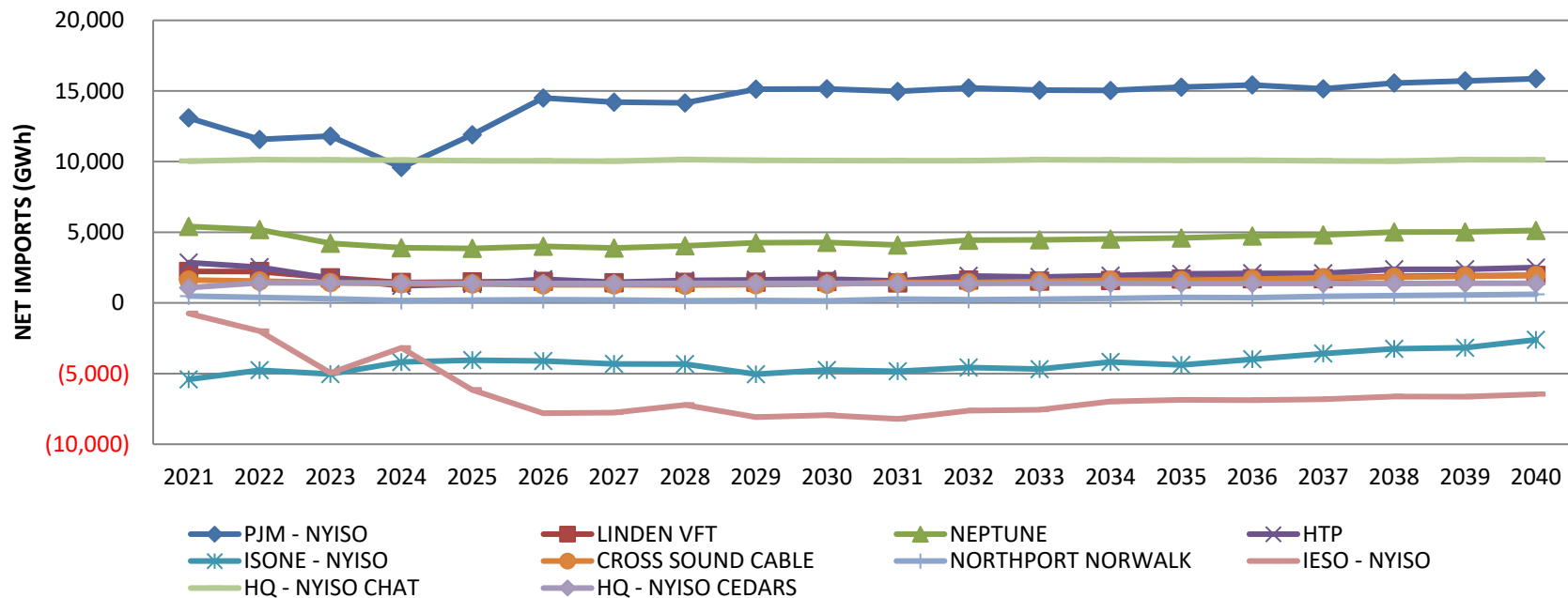
Projected Generation by Zone (GWh)



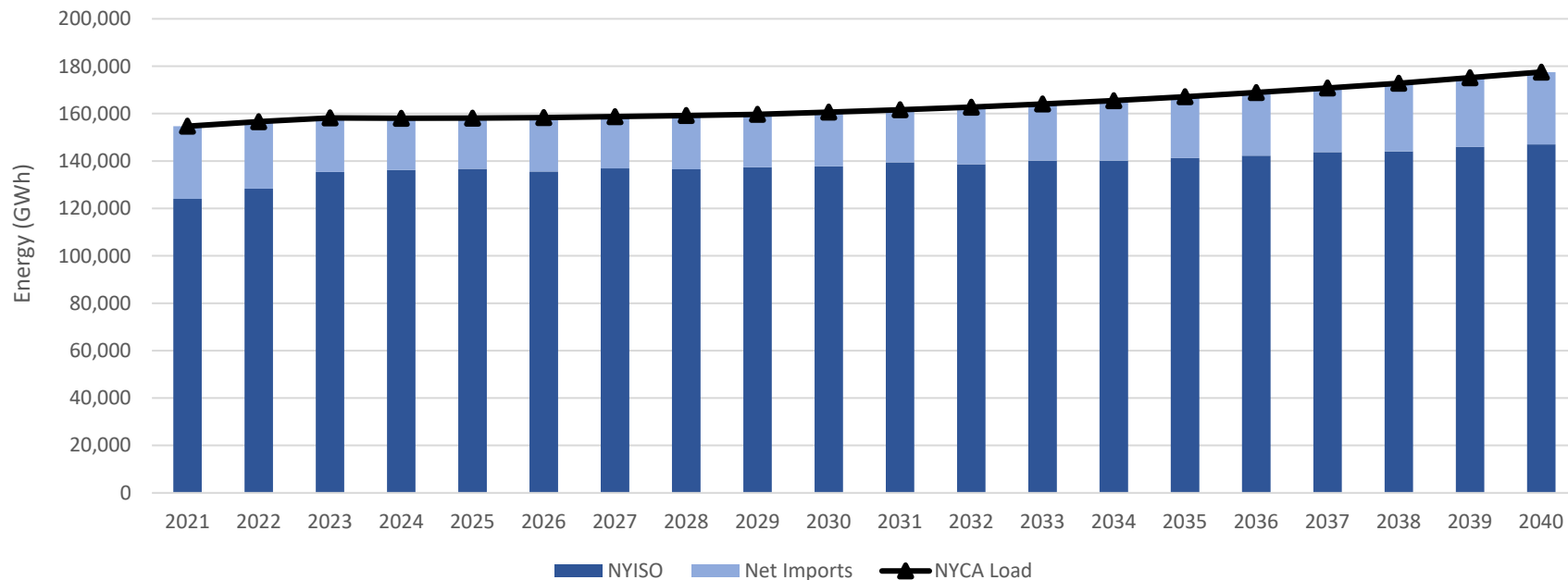
Projected Net Imports (GWh)

NET IMPORTS (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
PJM - NYISO	13,092	11,570	11,802	9,586	11,898	14,502	14,204	14,154	15,122	15,145	14,969	15,215	15,054	15,034	15,268	15,422	15,150	15,558	15,709	15,868
LINDEN VFT	2,229	2,223	1,779	1,446	1,485	1,523	1,424	1,459	1,463	1,516	1,414	1,617	1,538	1,585	1,690	1,713	1,715	1,879	1,920	1,950
NEPTUNE	5,411	5,185	4,220	3,905	3,859	4,004	3,885	4,040	4,258	4,283	4,097	4,438	4,466	4,522	4,595	4,737	4,811	5,016	5,021	5,130
HTP	2,858	2,528	1,738	1,209	1,340	1,677	1,460	1,591	1,636	1,685	1,560	1,913	1,830	1,929	2,058	2,093	2,091	2,382	2,381	2,505
ISONE - NYISO	(5,413)	(4,761)	(5,031)	(4,181)	(4,051)	(4,110)	(4,319)	(4,325)	(5,043)	(4,746)	(4,836)	(4,569)	(4,681)	(4,179)	(4,391)	(3,985)	(3,585)	(3,249)	(3,171)	(2,608)
CROSS SOUND CABLE	1,621	1,551	1,435	1,353	1,339	1,281	1,279	1,261	1,292	1,323	1,450	1,439	1,516	1,599	1,599	1,680	1,789	1,816	1,883	1,951
NORTHPORT NORWALK	483	394	299	162	203	227	207	158	172	146	275	231	258	314	390	363	466	512	564	613
IESO - NYISO	(746)	(1,994)	(4,952)	(3,185)	(6,156)	(7,808)	(7,762)	(7,217)	(8,086)	(7,944)	(8,213)	(7,621)	(7,561)	(6,980)	(6,862)	(6,879)	(6,814)	(6,622)	(6,639)	(6,464)
HQ - NYISO CHAT	10,034	10,132	10,116	10,109	10,067	10,053	10,034	10,148	10,092	10,076	10,067	10,066	10,132	10,116	10,092	10,089	10,053	10,034	10,132	10,131
HQ - NYISO CEDARS	1,081	1,422	1,412	1,402	1,389	1,379	1,371	1,390	1,382	1,379	1,377	1,374	1,387	1,386	1,384	1,377	1,376	1,370	1,388	1,384
TOTAL	30,650	28,251	22,817	21,805	21,373	22,728	21,784	22,658	22,290	22,863	22,159	24,102	23,939	25,328	25,823	26,611	27,051	28,696	29,188	30,459

Projected Net Imports (GWh)



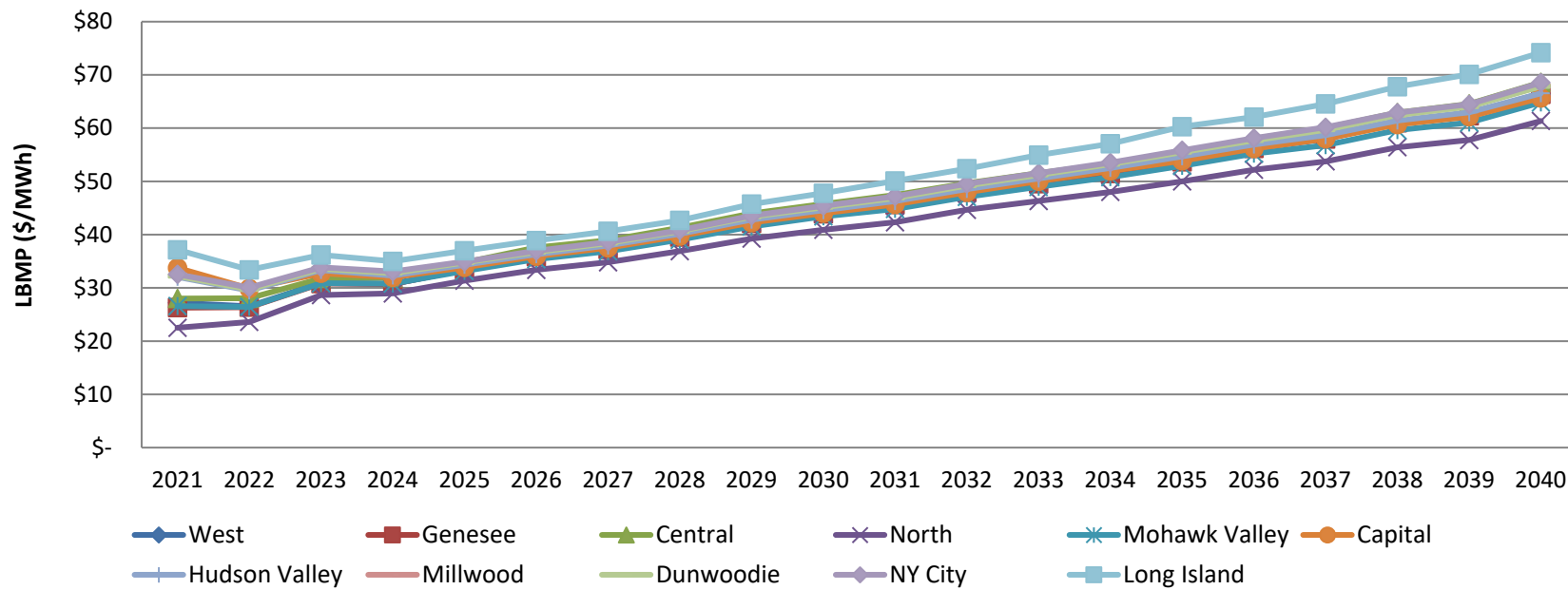
Projected NYCA Generation and Net Imports (GWh)



Projected LBMP (\$/MWh)

LBMP (\$/MWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	27.20	26.53	30.94	30.70	33.41	35.97	37.39	39.64	42.30	44.18	45.97	48.17	49.85	51.66	53.83	56.50	58.22	61.27	62.64	66.54
Genesee	26.29	26.37	30.81	30.73	33.39	35.85	37.23	39.54	42.12	43.91	45.66	47.98	49.58	51.46	53.68	56.18	57.96	61.00	62.33	66.35
Central	28.01	28.05	31.77	31.91	34.77	37.59	38.94	41.30	43.99	45.76	47.44	49.67	51.54	53.27	55.45	58.01	60.03	62.92	64.54	68.59
North	22.51	23.60	28.64	28.96	31.35	33.38	34.82	36.90	39.25	40.91	42.32	44.65	46.32	48.01	49.99	52.18	53.76	56.40	57.77	61.35
Mohawk Valley	26.58	26.43	30.86	30.81	33.16	35.38	36.87	39.03	41.53	43.42	44.81	47.09	48.97	50.80	52.91	55.19	56.79	59.61	61.05	64.81
Capital	33.75	29.88	32.74	31.99	33.85	35.95	37.52	39.72	42.26	44.02	45.67	47.95	50.02	51.95	53.86	56.18	58.01	60.68	62.15	65.67
Hudson Valley	32.06	29.50	33.34	32.31	34.33	36.32	37.95	40.15	42.80	44.57	46.28	48.56	50.54	52.52	54.70	56.91	58.68	61.41	62.95	66.55
Millwood	32.39	29.82	33.66	32.80	34.80	36.80	38.46	40.71	43.43	45.21	46.96	49.28	51.29	53.31	55.56	57.78	59.77	62.55	64.14	67.92
Dunwoodie	32.22	29.72	33.58	32.78	34.76	36.73	38.39	40.63	43.35	45.12	46.88	49.20	51.20	53.22	55.48	57.68	59.69	62.45	64.03	67.83
NY City	32.53	30.06	33.84	33.06	34.92	36.95	38.63	40.81	43.56	45.39	47.18	49.55	51.55	53.53	55.84	58.11	60.17	62.90	64.47	68.54
Long Island	37.15	33.39	36.19	34.98	36.98	38.90	40.62	42.68	45.73	47.77	50.08	52.38	54.94	57.06	60.27	62.08	64.55	67.78	70.10	74.17
Average LBMP (\$/MWh)	30.06	28.49	32.40	31.91	34.16	36.35	37.89	40.10	42.76	44.57	46.30	48.59	50.53	52.44	54.69	56.98	58.87	61.72	63.29	67.12

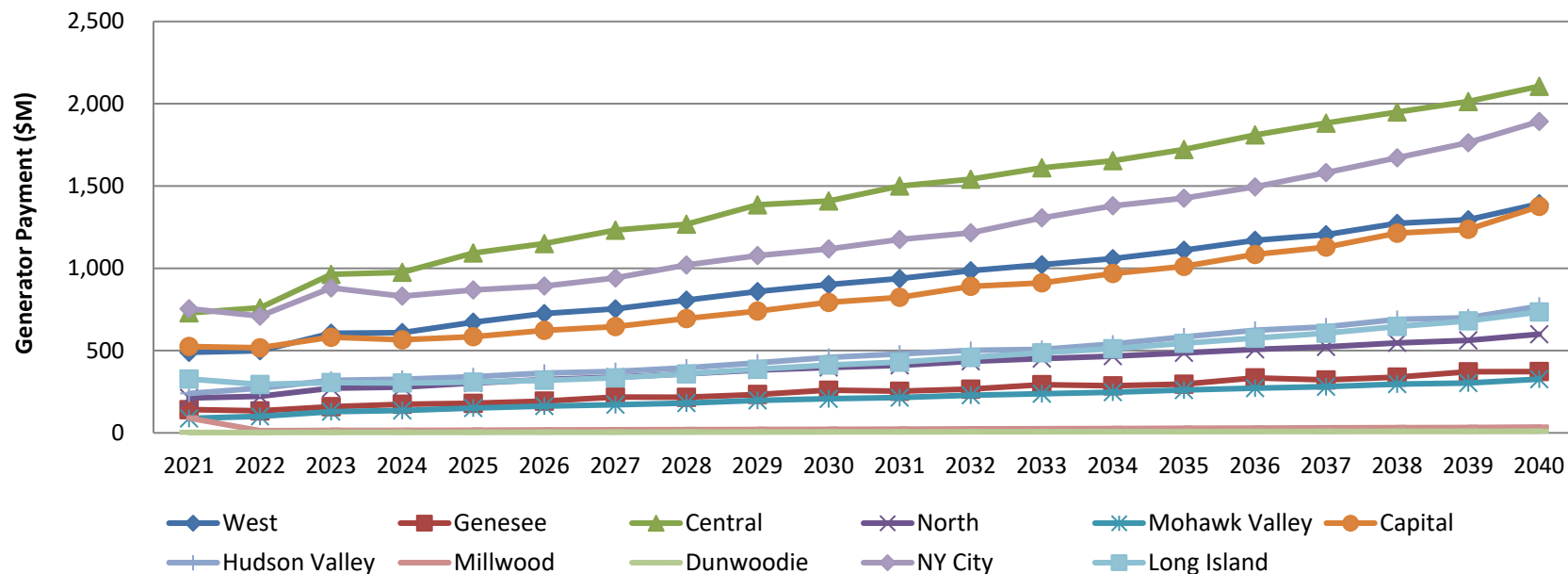
Projected LBMP (\$/MWh)



Projected Generator Payment (\$M)

Generator Payment (\$M)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	490	499	606	609	673	725	754	806	859	901	938	985	1,022	1,059	1,110	1,170	1,204	1,273	1,295	1,392
Genesee	141	134	159	174	180	193	217	217	233	260	253	266	293	286	296	334	322	339	372	373
Central	729	760	963	976	1,093	1,150	1,232	1,268	1,386	1,409	1,500	1,542	1,611	1,654	1,722	1,810	1,882	1,950	2,013	2,106
North	212	222	272	278	303	324	339	359	382	398	411	435	452	466	487	508	522	547	562	599
Mohawk Valley	88	101	129	136	151	163	171	182	198	208	215	229	238	247	261	272	281	297	303	327
Capital	525	517	581	566	585	623	646	695	740	793	824	891	911	968	1,012	1,084	1,129	1,214	1,237	1,376
Hudson Valley	240	272	319	326	342	363	374	395	426	459	479	502	507	541	584	624	645	690	700	770
Millwood	90	13	15	15	16	18	19	20	21	22	23	24	25	27	28	29	31	32	33	35
Dunwoodie	3	3	3	3	4	4	4	5	5	6	6	7	7	7	8	8	9	9	10	10
NY City	754	710	881	831	868	892	941	1,020	1,078	1,118	1,175	1,216	1,306	1,380	1,426	1,495	1,581	1,672	1,763	1,893
Long Island	328	294	306	303	309	320	335	358	387	412	430	458	487	511	545	576	606	647	681	735
NYCA Total	3,601	3,526	4,235	4,218	4,523	4,776	5,032	5,325	5,715	5,985	6,253	6,555	6,860	7,146	7,478	7,910	8,212	8,669	8,969	9,616

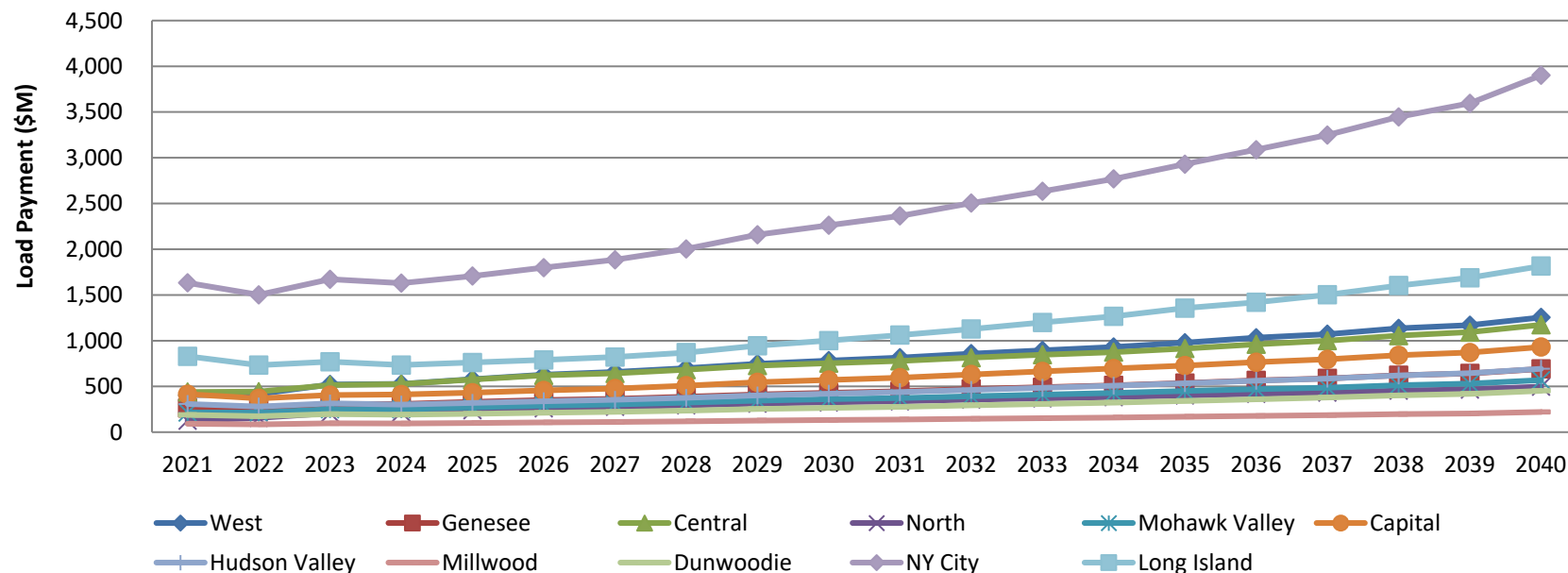
Projected Generator Payment (\$M)



Projected Load Payment (\$M)

Load Payment (\$M)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	403	417	522	527	579	629	658	700	748	782	815	859	894	931	978	1,033	1,072	1,135	1,170	1,255
Genesee	265	264	308	309	331	352	364	387	413	430	447	472	491	512	538	566	588	623	643	692
Central	439	444	514	526	575	622	643	683	728	755	779	815	847	875	915	961	1,001	1,056	1,094	1,174
North	125	157	208	216	240	261	277	294	313	326	338	357	370	384	401	420	433	455	467	498
Mohawk Valley	215	214	251	251	272	290	304	323	345	361	373	393	411	429	450	471	487	514	531	569
Capital	415	370	406	412	432	457	477	509	545	570	596	630	665	696	728	765	797	841	871	932
Hudson Valley	309	280	315	302	320	338	354	376	402	421	438	462	485	508	535	562	585	620	645	694
Millwood	92	85	96	95	100	106	112	119	127	133	138	146	153	160	169	178	186	197	205	221
Dunwoodie	189	174	197	192	201	212	222	236	253	265	277	293	308	324	342	360	379	402	419	452
NY City	1,633	1,501	1,672	1,630	1,708	1,799	1,884	2,004	2,158	2,262	2,364	2,505	2,634	2,769	2,930	3,088	3,249	3,446	3,595	3,902
Long Island	829	733	771	734	762	790	821	870	945	1,001	1,062	1,127	1,199	1,266	1,356	1,420	1,502	1,603	1,688	1,817
NYCA Total	4,915	4,641	5,260	5,194	5,519	5,855	6,117	6,500	6,978	7,307	7,628	8,060	8,457	8,854	9,341	9,823	10,277	10,892	11,328	12,203

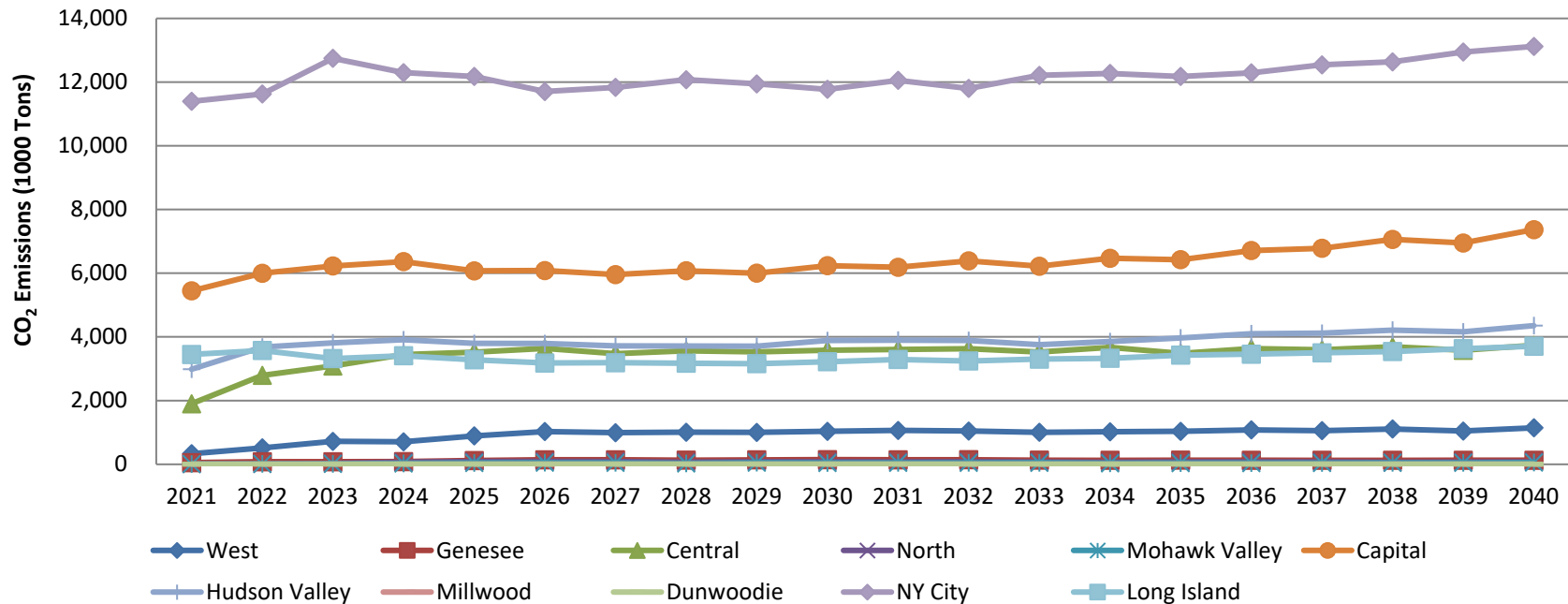
Projected Load Payment (\$M)



Projected CO2 Emissions (1000 Tons)

CO ₂ Emissions (1000 Tons)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	331	514	719	705	892	1,029	993	1,006	1,002	1,035	1,064	1,044	1,004	1,022	1,035	1,079	1,057	1,107	1,045	1,146
Genesee	51	80	80	86	118	141	141	129	139	146	141	144	129	126	130	126	126	126	127	128
Central	1,900	2,792	3,087	3,443	3,521	3,640	3,475	3,563	3,531	3,582	3,606	3,626	3,525	3,669	3,483	3,635	3,594	3,687	3,580	3,735
North	8	11	27	66	85	90	87	69	81	79	75	81	73	60	74	78	76	61	70	79
Mohawk Valley	8	11	13	27	42	49	45	28	50	42	44	45	47	33	39	38	39	45	45	55
Capital	5,444	5,998	6,225	6,363	6,073	6,082	5,955	6,075	6,001	6,236	6,185	6,385	6,219	6,468	6,423	6,711	6,781	7,061	6,949	7,367
Hudson Valley	2,986	3,680	3,812	3,908	3,797	3,790	3,715	3,712	3,709	3,886	3,898	3,887	3,756	3,852	3,968	4,100	4,116	4,213	4,158	4,353
Millwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dunwoodie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NY City	11,395	11,627	12,745	12,297	12,175	11,703	11,832	12,075	11,944	11,771	12,053	11,799	12,211	12,270	12,176	12,290	12,542	12,634	12,943	13,119
Long Island	3,449	3,573	3,319	3,409	3,281	3,180	3,189	3,174	3,158	3,219	3,290	3,244	3,302	3,327	3,427	3,457	3,500	3,541	3,629	3,707
NYCA Total	25,571	28,286	30,027	30,302	29,986	29,704	29,432	29,832	29,615	29,996	30,357	30,255	30,266	30,828	30,753	31,513	31,830	32,475	32,545	33,688

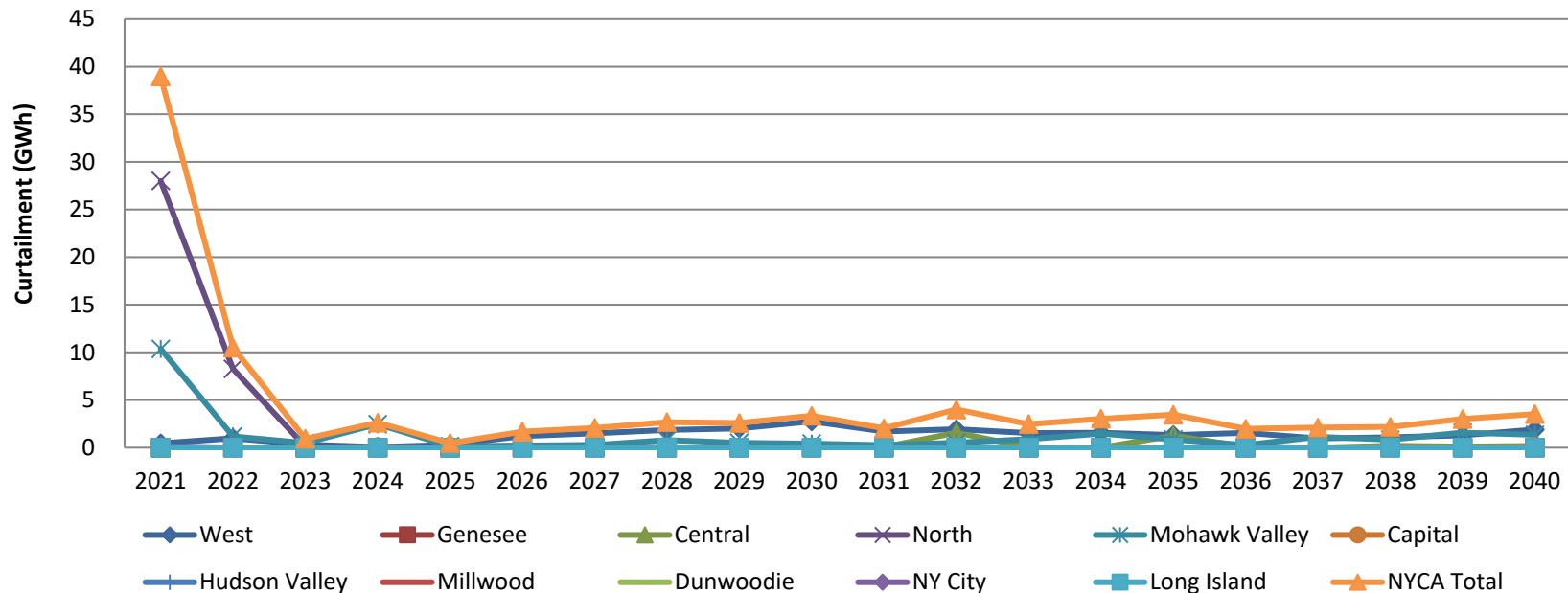
Projected CO2 Emissions (1000 Tons)



Projected Zonal Curtailment (GWh)

Curtailment (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	0.45	0.99	0.33	0.06	0.30	1.21	1.50	1.86	2.02	2.75	1.70	1.93	1.54	1.56	1.33	1.56	0.98	1.09	1.29	1.89
Genesee	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Central	0.00	0.04	0.00	0.05	0.00	0.19	0.27	0.02	0.06	0.16	0.07	1.57	0.03	0.00	1.25	0.10	0.00	0.20	0.12	0.19
North	28.01	8.26	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mohawk Valley	10.36	1.18	0.48	2.46	0.15	0.23	0.28	0.80	0.51	0.43	0.26	0.51	0.90	1.47	0.86	0.28	1.13	0.84	1.58	1.35
Capital	0.00	0.02	0.01	0.05	0.02	0.04	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.02	0.09
Hudson Valley	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Millwood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dunwoodie	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NY City	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00
Long Island	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NYCA Total	38.96	10.49	0.92	2.63	0.48	1.67	2.07	2.68	2.59	3.35	2.03	4.01	2.47	3.03	3.46	1.98	2.11	2.18	3.01	3.52

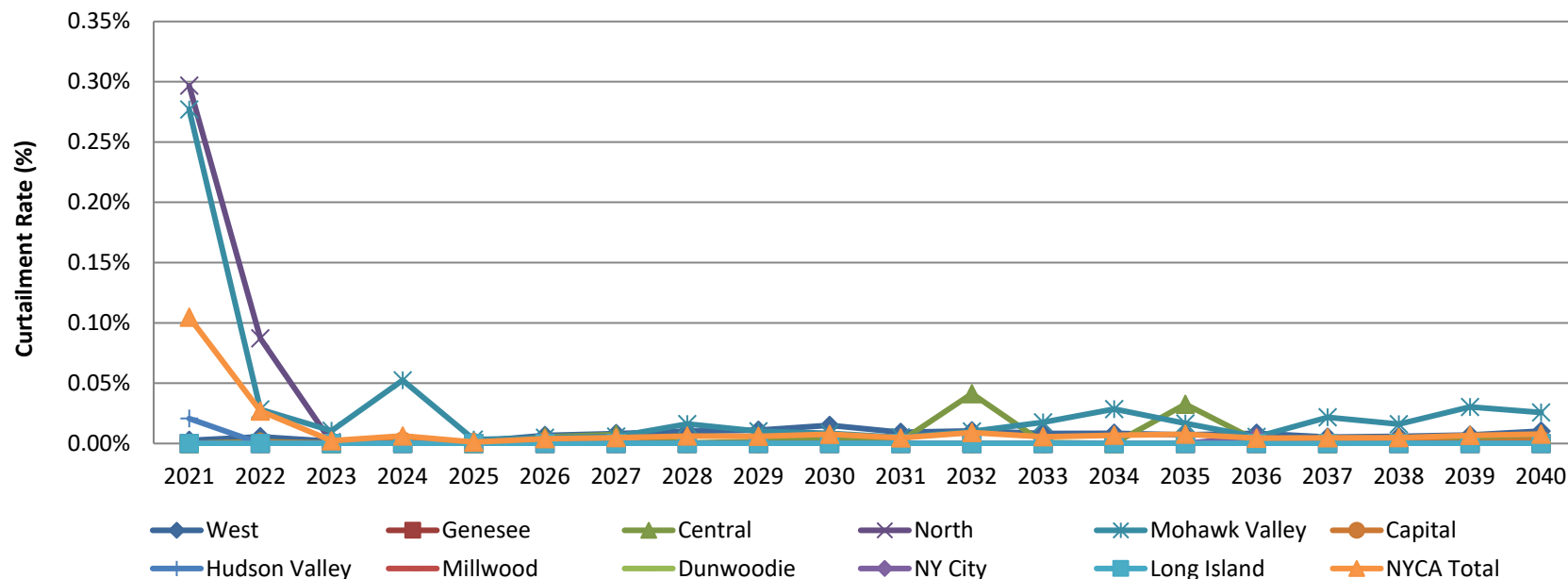
Projected Zonal Curtailment (GWh)



Projected Zonal Curtailment Rate (%)

Curtailment Rate (%)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	0.00%	0.01%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Genesee	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Central	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.03%	0.00%	0.00%	0.01%	0.00%	0.00%
North	0.30%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mohawk Valley	0.28%	0.03%	0.01%	0.05%	0.00%	0.00%	0.01%	0.02%	0.01%	0.01%	0.01%	0.01%	0.02%	0.03%	0.02%	0.01%	0.02%	0.02%	0.03%	0.03%
Capital	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hudson Valley	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Millwood	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dunwoodie	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NY City	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%
Long Island	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
NYCA Total	0.10%	0.03%	0.00%	0.01%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.00%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.01%	0.01%

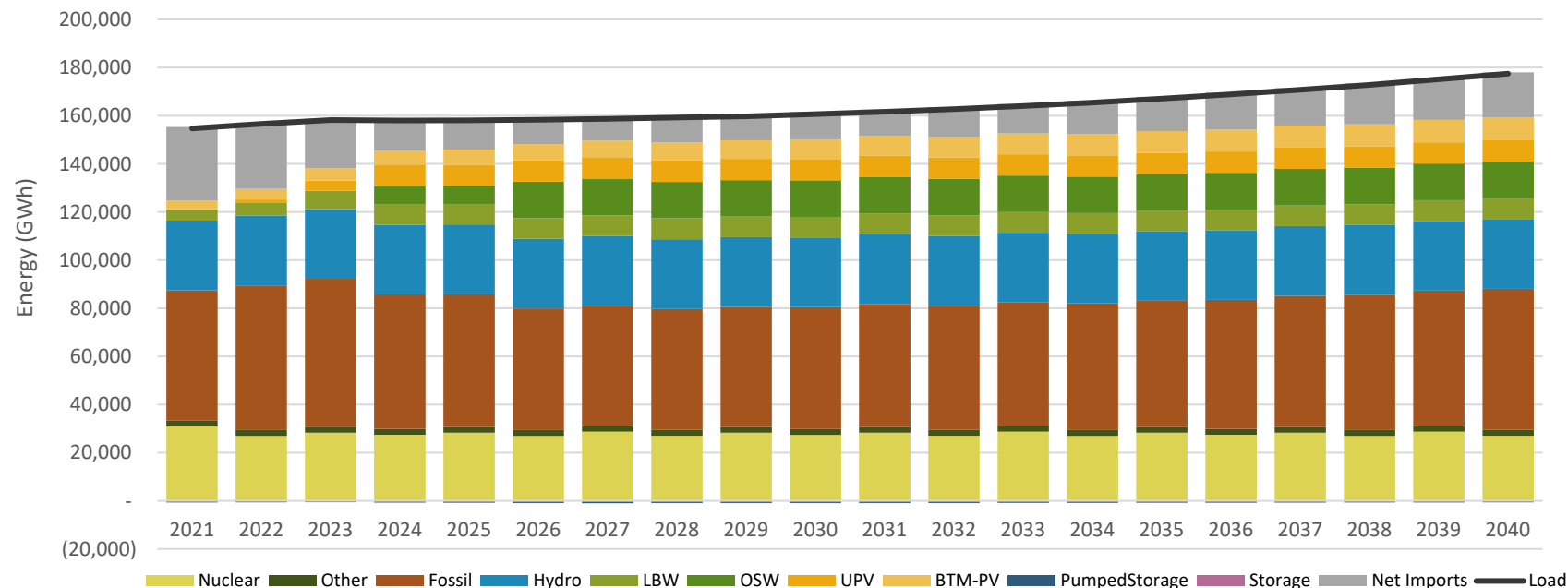
Projected Zonal Curtailment Rate (%)



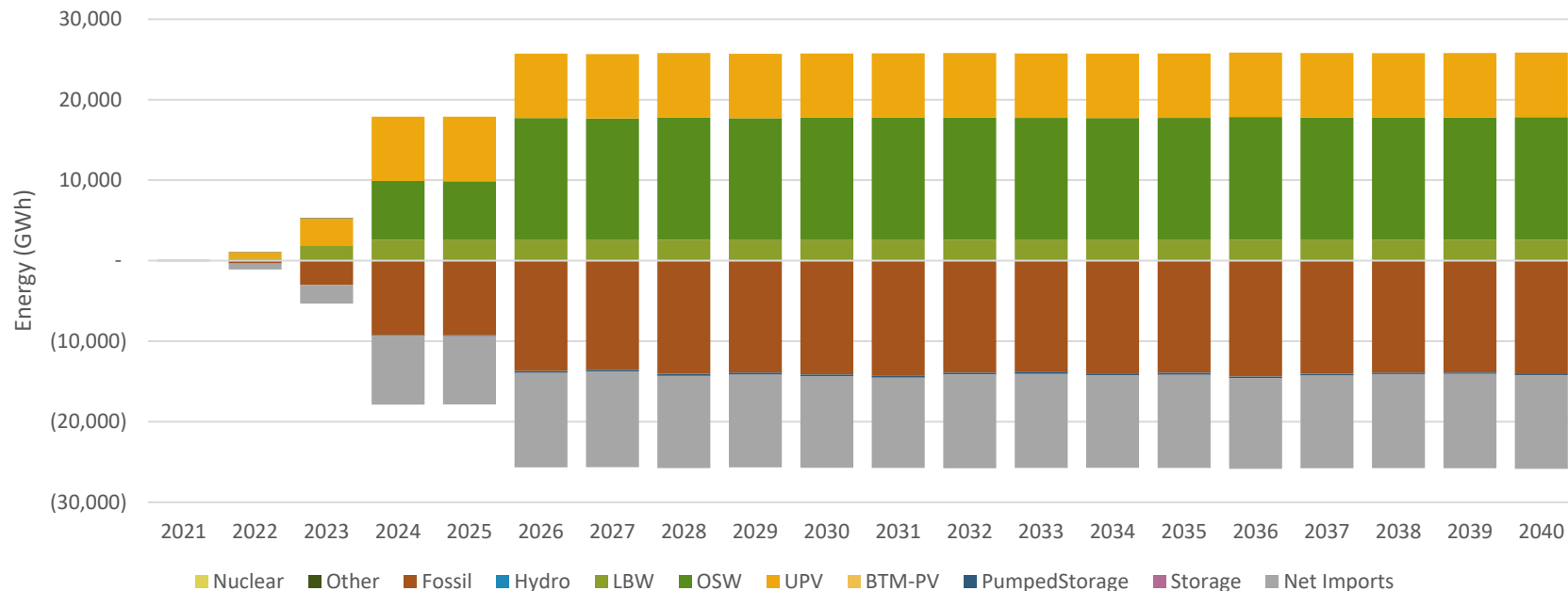
Appendix B:

Detailed Metrics Reported for the Contract Case

Projected NYCA Generation and Net Imports (GWh)



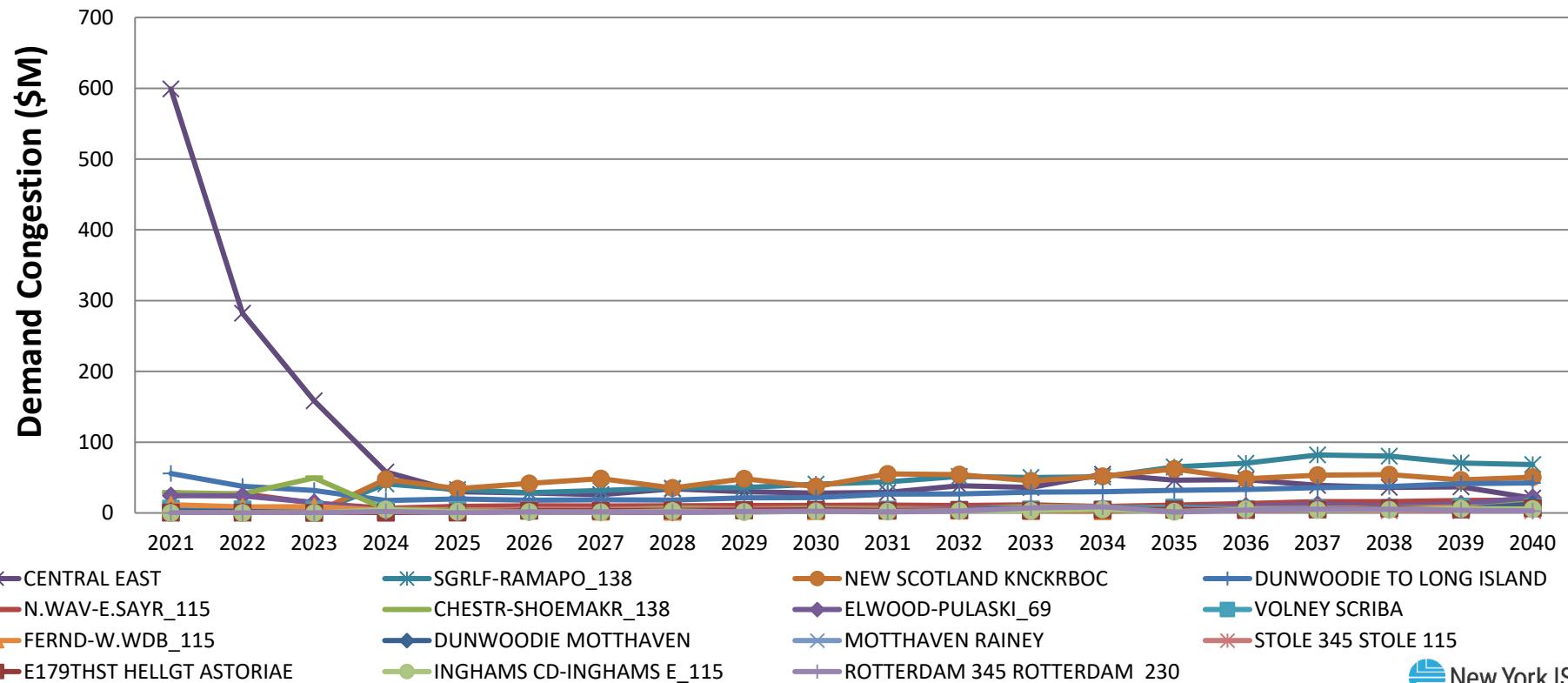
(Contract – Base) Delta NYCA Generation and Net Imports (GWh)



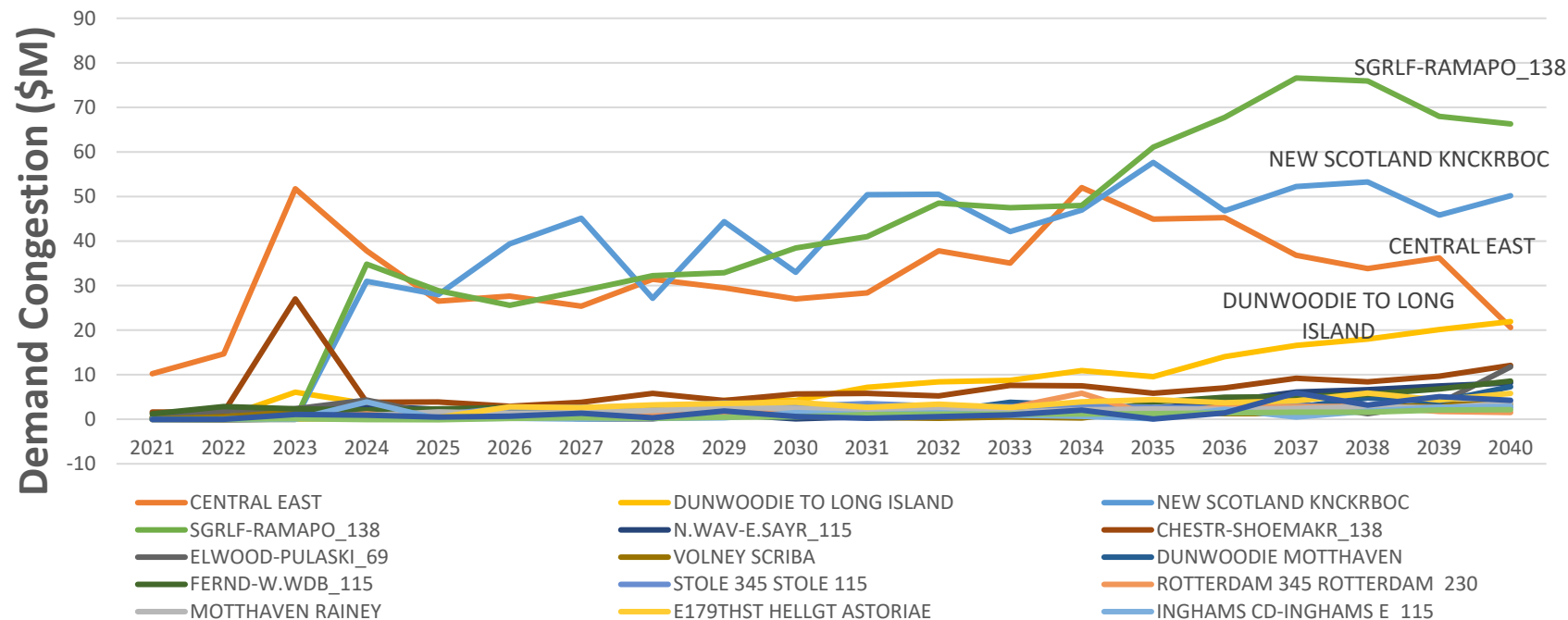
Projected Demand Congestion by Constraint (\$M)

Demand Congestion (\$M)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
CENTRAL EAST	599	282	158	58	30	28	26	34	30	28	29	39	36	55	46	47	39	36	37	21
SGRLF-RAMAPO_138	0	0	0	41	33	29	32	35	36	41	44	52	50	51	65	70	82	80	71	68
NEW SCOTLAND KNCKRBOC	0	0	0	48	34	42	49	35	48	37	55	54	45	52	62	48	53	54	47	51
DUNWOODIE TO LONG ISLAND	56	38	32	18	20	18	18	18	21	22	27	27	29	30	32	33	36	37	41	42
N.WAV-E.SAYR_115	24	27	14	7	9	10	10	10	11	11	11	10	12	9	11	13	16	16	18	18
CHESTR-SHOEMAKR_138	29	27	50	5	4	3	4	7	6	7	6	6	9	8	8	8	10	10	11	14
ELWOOD-PULASKI_69	25	24	15	2	3	1	1	1	2	2	5	7	7	8	7	10	12	10	13	22
VOLNEY SCRIBA	6	5	5	3	4	4	3	3	4	4	5	5	5	5	8	6	6	7	9	9
FERND-W.WDB_115	12	9	9	4	4	4	2	2	4	2	4	3	3	2	4	6	6	7	8	9
DUNWOODIE MOTTHAVEN	3	2	0	1	3	3	3	2	3	3	3	4	6	4	3	4	5	6	5	13
MOTTHAVEN RAINEY	0	0	0	1	2	3	3	3	4	5	5	4	4	4	5	5	6	5	6	5
STOLE 345 STOLE 115	0	0	1	1	3	5	5	5	6	5	5	4	4	4	4	3	4	3	3	3
E179THST HELLGST ASTORIAE	1	1	0	0	1	3	3	3	4	4	3	4	3	4	5	4	5	6	5	7
INGHAMS CD-INGHAMS E_115	0	0	0	5	2	1	1	3	1	2	2	3	3	5	2	5	4	5	6	6
ROTTERDAM 345 ROTTERDAM 230	0	0	0	2	0	1	1	1	2	2	2	3	7	9	1	4	5	5	4	3
Total	775	435	330	238	235	312	332	327	409	425	466	444	434	448	459	457	482	473	461	457
NYCA Total	804	436	316	253	208	178	194	179	213	192	224	229	239	271	289	282	305	298	310	334

Projected Demand Congestion by Constraint (\$M)



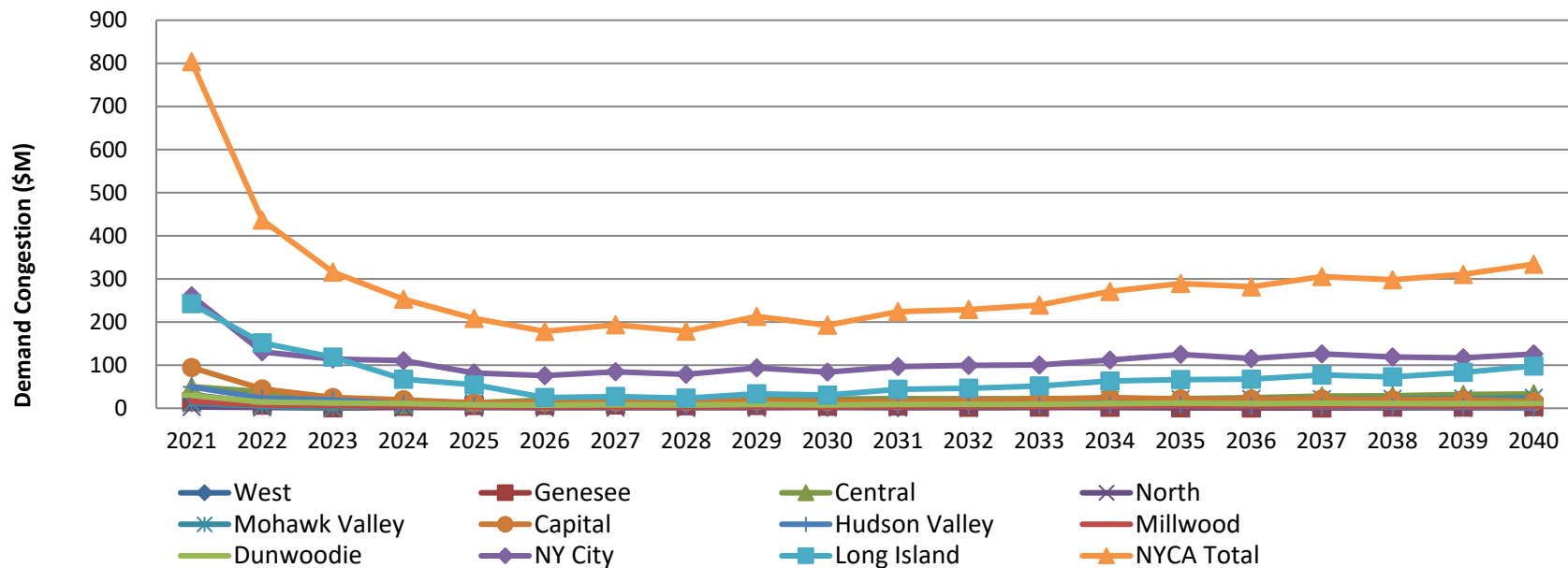
Demand Congestion by Constraint, Delta from Base Case (\$M)



Projected Demand Congestion by Zone (\$M)

Demand Congestion (\$M)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	32	12	2	6	10	9	9	5	6	2	2	3	3	4	6	11	11	15	15	17
Genesee	15	7	1	4	6	7	7	6	7	5	5	2	3	2	1	1	1	3	3	4
Central	50	38	17	9	13	19	17	19	20	21	22	22	22	21	22	24	28	29	32	33
North	3	2	0	2	1	1	1	1	1	2	2	1	1	2	1	1	1	1	1	1
Mohawk Valley	11	5	0	9	12	12	14	14	16	17	17	18	19	19	21	22	21	22	22	24
Capital	94	45	25	19	13	13	15	15	17	16	17	18	21	25	22	21	21	20	20	15
Hudson Valley	49	23	19	10	7	7	7	6	7	5	6	6	5	8	8	5	4	2	3	0
Millwood	16	7	6	5	3	3	3	3	4	3	4	4	4	5	5	5	5	5	5	5
Dunwoodie	30	14	12	11	8	7	8	7	9	7	9	9	9	11	12	11	12	11	11	11
NY City	261	131	114	110	82	76	85	79	94	84	97	99	100	112	125	115	126	119	117	126
Long Island	242	152	119	67	54	25	27	23	33	31	44	46	52	63	66	67	77	73	83	98

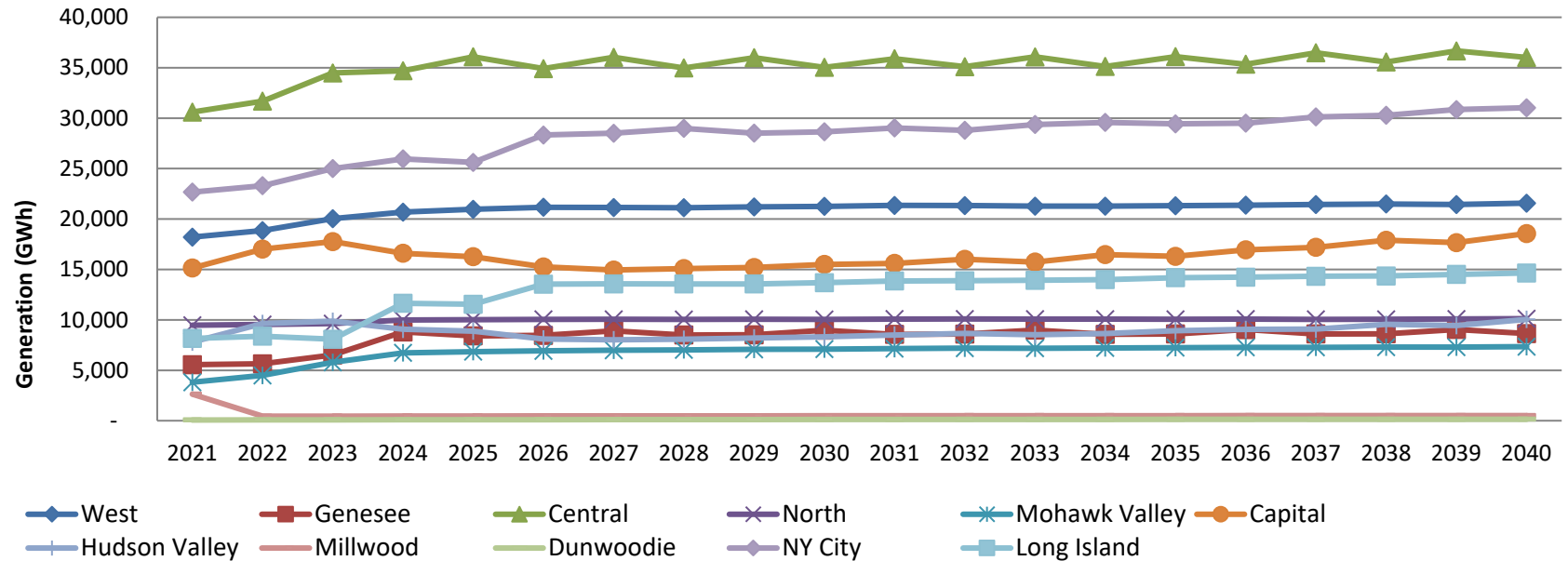
Projected Demand Congestion by Zone (\$M)



Projected Generation by Zone (GWh)

Generation (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	18,202	18,854	20,039	20,683	20,964	21,162	21,143	21,121	21,198	21,250	21,352	21,334	21,271	21,273	21,322	21,369	21,434	21,492	21,436	21,573
Genesee	5,555	5,647	6,519	8,806	8,414	8,466	8,916	8,505	8,527	8,971	8,562	8,595	8,991	8,570	8,603	9,037	8,603	8,621	9,046	8,642
Central	30,602	31,685	34,483	34,697	36,084	34,912	36,035	34,981	35,995	35,036	35,893	35,105	36,080	35,123	36,098	35,350	36,486	35,565	36,667	36,020
North	9,465	9,539	9,634	9,994	10,020	10,049	10,062	10,042	10,056	10,044	10,078	10,091	10,071	10,074	10,060	10,079	10,051	10,062	10,086	10,119
Mohawk Valley	3,813	4,492	5,795	6,728	6,845	6,929	6,987	7,023	7,079	7,103	7,149	7,199	7,190	7,220	7,251	7,276	7,279	7,302	7,302	7,340
Capital	15,145	17,015	17,764	16,602	16,264	15,254	14,944	15,084	15,198	15,494	15,598	16,005	15,731	16,470	16,298	16,945	17,196	17,899	17,661	18,559
Hudson Valley	7,804	9,641	9,865	9,067	8,885	8,100	8,033	8,081	8,205	8,324	8,505	8,666	8,522	8,646	8,933	9,055	9,085	9,560	9,442	10,054
Millwood	2,638	454	461	471	474	479	484	490	491	494	497	501	503	505	505	509	510	511	511	512
Dunwoodie	75	83	89	99	104	108	112	117	122	125	129	132	134	136	139	142	144	145	144	146
NY City	22,667	23,304	25,004	25,958	25,614	28,329	28,505	28,987	28,511	28,648	29,028	28,794	29,370	29,575	29,437	29,502	30,121	30,283	30,855	31,032
Long Island	8,159	8,382	8,078	11,647	11,547	13,542	13,568	13,567	13,560	13,692	13,861	13,878	13,927	13,990	14,183	14,238	14,326	14,356	14,507	14,646
NYCA Total	124,125	129,095	137,730	144,751	145,216	147,330	148,787	147,998	148,941	149,180	150,652	150,299	151,789	151,582	152,829	153,503	155,235	155,795	157,656	158,642
Total IESO	154,692	151,957	144,433	151,091	145,806	145,405	146,541	149,129	151,995	154,088	153,676	154,509	154,587	155,339	155,505	155,517	155,465	155,649	155,653	155,888
Total PJM	807,901	812,128	822,016	817,170	825,260	830,766	831,946	836,705	838,946	840,403	840,517	841,443	841,294	841,773	842,564	843,519	843,789	845,017	845,571	846,268
Total ISONE	104,560	106,989	107,105	106,809	107,282	106,730	107,977	110,195	111,057	113,856	113,997	114,020	114,304	114,849	114,661	115,337	115,631	115,844	116,335	116,640
Total HQ *	25,204	25,650	25,614	25,640	25,544	25,517	25,491	25,671	25,565	25,545	25,527	25,568	25,614	25,594	25,570	25,595	25,519	25,498	25,619	25,651
Total System	1,216,482	1,225,819	1,236,899	1,245,460	1,249,109	1,255,749	1,260,741	1,269,698	1,276,504	1,283,072	1,284,369	1,285,839	1,287,588	1,289,137	1,291,128	1,293,470	1,295,640	1,297,805	1,300,835	1,303,089

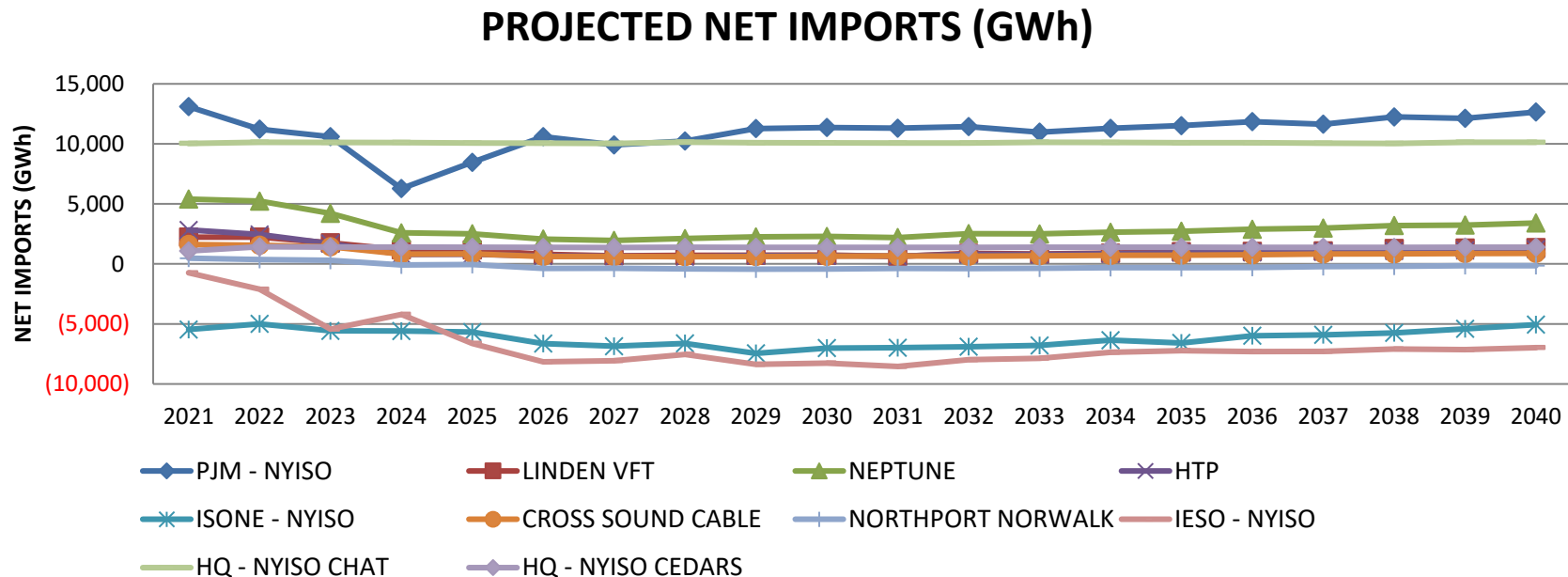
Projected NYCA Generation (GWh)



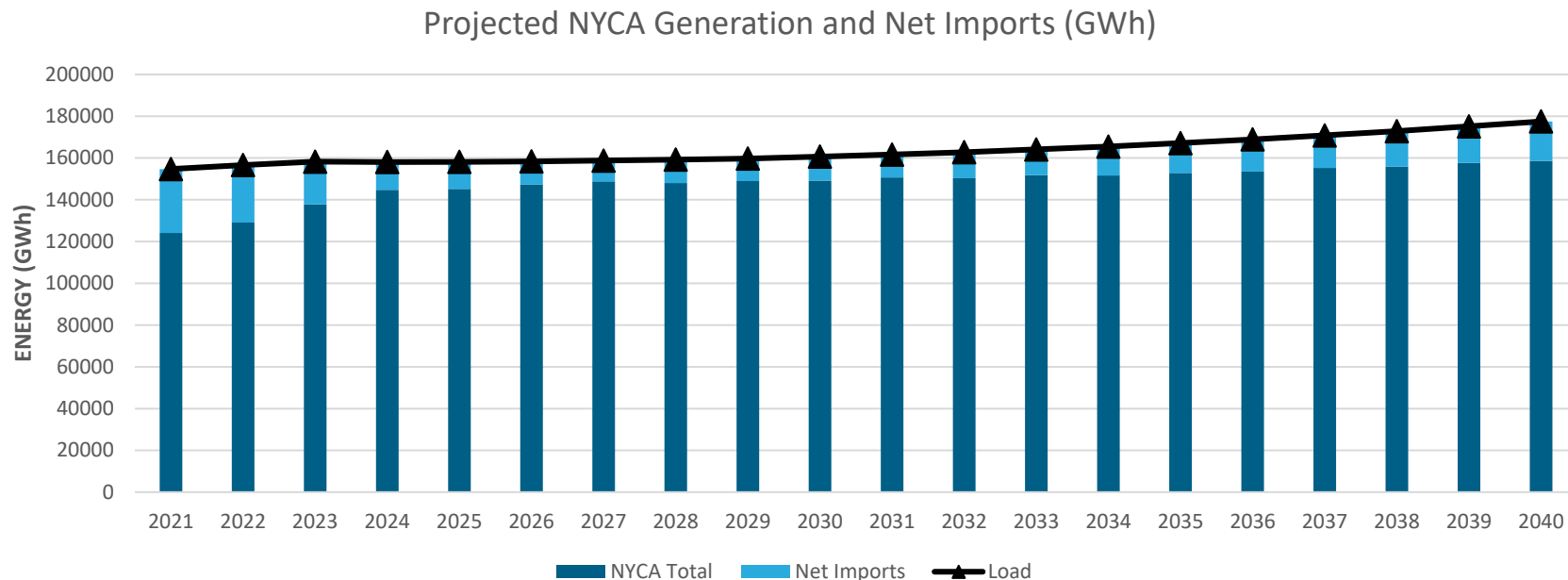
Projected Net Imports (GWh)

NET IMPORTS (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
PJM - NYISO	13,102	11,226	10,601	6,279	8,463	10,598	9,913	10,238	11,273	11,365	11,307	11,435	10,973	11,292	11,516	11,849	11,639	12,243	12,126	12,650
LINDEN VFT	2,229	2,232	1,758	1,182	1,174	798	679	708	722	735	628	879	831	897	1,024	1,048	1,087	1,279	1,318	1,352
NEPTUNE	5,402	5,231	4,212	2,589	2,507	2,068	1,959	2,114	2,254	2,286	2,193	2,517	2,504	2,637	2,723	2,889	2,983	3,197	3,232	3,408
HTP	2,829	2,448	1,691	791	805	660	646	597	697	680	654	799	783	861	929	953	1,008	1,081	1,115	1,217
ISONE - NYISO	(5,465)	(4,994)	(5,579)	(5,589)	(5,677)	(6,638)	(6,853)	(6,626)	(7,452)	(7,013)	(6,982)	(6,901)	(6,795)	(6,353)	(6,585)	(5,983)	(5,910)	(5,746)	(5,408)	(5,056)
CROSS SOUND CABLE	1,618	1,557	1,429	816	839	617	624	605	617	635	663	635	676	713	726	762	831	837	866	876
NORTHPORT NORWALK	471	368	296	(91)	(52)	(372)	(369)	(415)	(434)	(427)	(381)	(395)	(358)	(314)	(317)	(297)	(227)	(200)	(147)	(148)
IESO - NYISO	(742)	(2,107)	(5,440)	(4,203)	(6,622)	(8,149)	(8,065)	(7,538)	(8,373)	(8,261)	(8,545)	(7,980)	(7,862)	(7,361)	(7,227)	(7,304)	(7,290)	(7,094)	(7,142)	(6,974)
HQ - NYISO CHAT	10,034	10,132	10,116	10,109	10,067	10,053	10,034	10,148	10,092	10,076	10,067	10,066	10,132	10,116	10,092	10,089	10,053	10,034	10,132	10,131
HQ - NYISO CEDARS	1,081	1,422	1,407	1,402	1,389	1,376	1,367	1,389	1,381	1,381	1,372	1,373	1,386	1,388	1,386	1,381	1,377	1,375	1,392	1,390
TOTAL	30,557	27,515	20,491	13,285	12,894	11,012	9,935	11,220	10,778	11,457	10,976	12,428	12,270	13,875	14,268	15,388	15,552	17,004	17,483	18,846

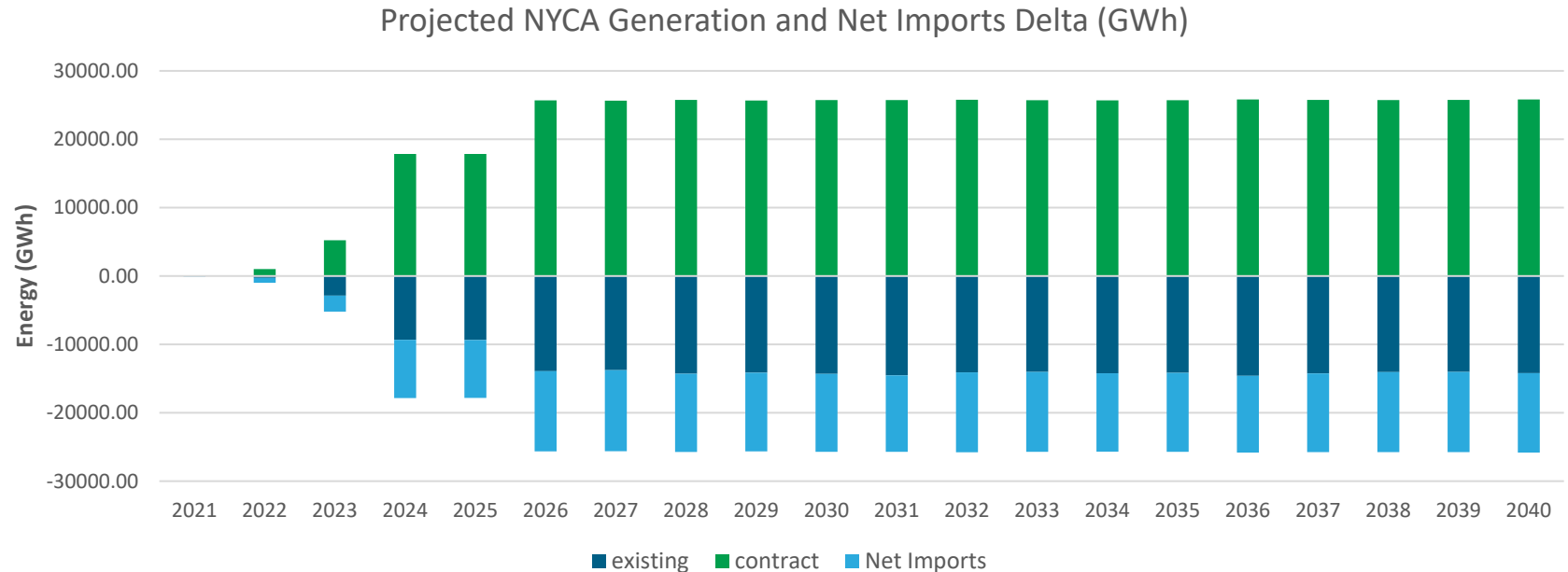
Projected Net Imports (GWh)



Projected NYCA Generation and Net Imports



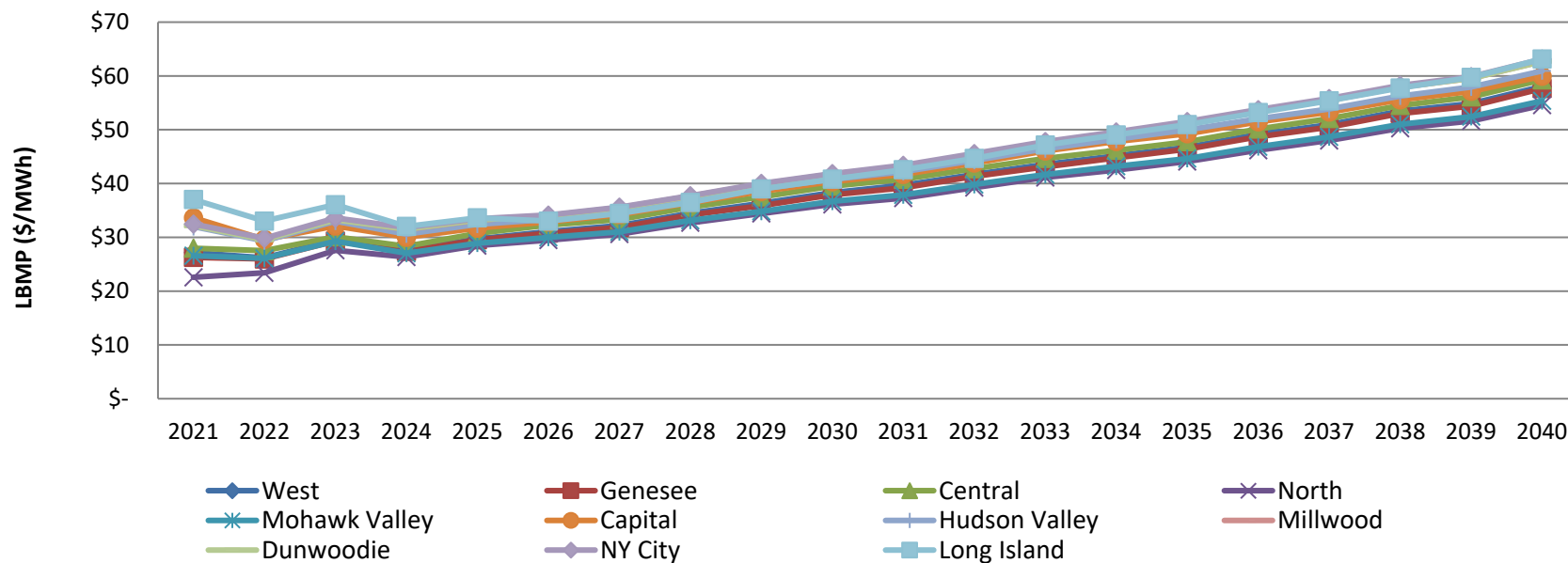
NYCA Generation and Net Imports, Delta from Base Case



Projected LBMP (\$/MWh)

LBMP (\$/MWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	27.17	26.19	29.53	27.52	29.70	31.08	32.21	34.48	36.33	38.32	39.69	41.71	43.57	45.17	46.76	49.16	50.94	53.46	54.85	58.04
Genesee	26.27	25.98	29.31	27.39	29.54	30.78	31.83	34.15	35.90	37.90	39.21	41.34	43.10	44.77	46.40	48.69	50.48	53.03	54.40	57.67
Central	27.98	27.51	30.09	28.34	30.75	32.28	33.32	35.62	37.50	39.51	40.79	42.75	44.67	46.18	47.77	50.13	52.08	54.51	56.10	59.27
North	22.56	23.40	27.58	26.34	28.46	29.49	30.60	32.70	34.44	36.13	37.28	39.25	41.13	42.52	44.09	46.19	48.00	50.28	51.63	54.56
Mohawk Valley	26.58	26.09	29.28	27.04	28.90	29.99	31.03	33.15	34.83	36.71	37.89	39.82	41.68	43.21	44.64	46.83	48.67	51.01	52.44	55.38
Capital	33.64	29.61	32.10	30.01	31.71	32.86	34.21	36.41	38.53	40.34	41.68	43.81	46.05	47.82	49.24	51.46	53.27	55.55	57.13	59.93
Hudson Valley	31.99	29.33	33.00	30.60	32.43	33.34	34.71	36.83	39.00	40.76	42.21	44.29	46.44	48.23	49.96	52.03	53.85	56.25	57.93	60.94
Millwood	32.32	29.63	33.34	31.47	33.20	34.04	35.48	37.66	39.91	41.73	43.22	45.40	47.58	49.42	51.32	53.47	55.48	57.91	59.56	62.71
Dunwoodie	32.15	29.54	33.29	31.51	33.22	34.01	35.45	37.61	39.86	41.69	43.18	45.37	47.54	49.38	51.30	53.44	55.48	57.90	59.53	62.68
NY City	32.46	29.82	33.58	31.84	33.46	34.14	35.61	37.73	40.03	41.85	43.39	45.57	47.80	49.61	51.53	53.73	55.81	58.23	59.88	63.15
Long Island	37.04	33.02	36.07	32.03	33.62	33.03	34.43	36.48	38.99	40.81	42.57	44.67	47.15	49.04	50.96	53.19	55.39	57.77	59.73	63.16
Average LBMP (\$/MWh)	30.02	28.19	31.56	29.46	31.36	32.28	33.53	35.71	37.76	39.61	41.01	43.09	45.16	46.85	48.54	50.76	52.68	55.08	56.65	59.77

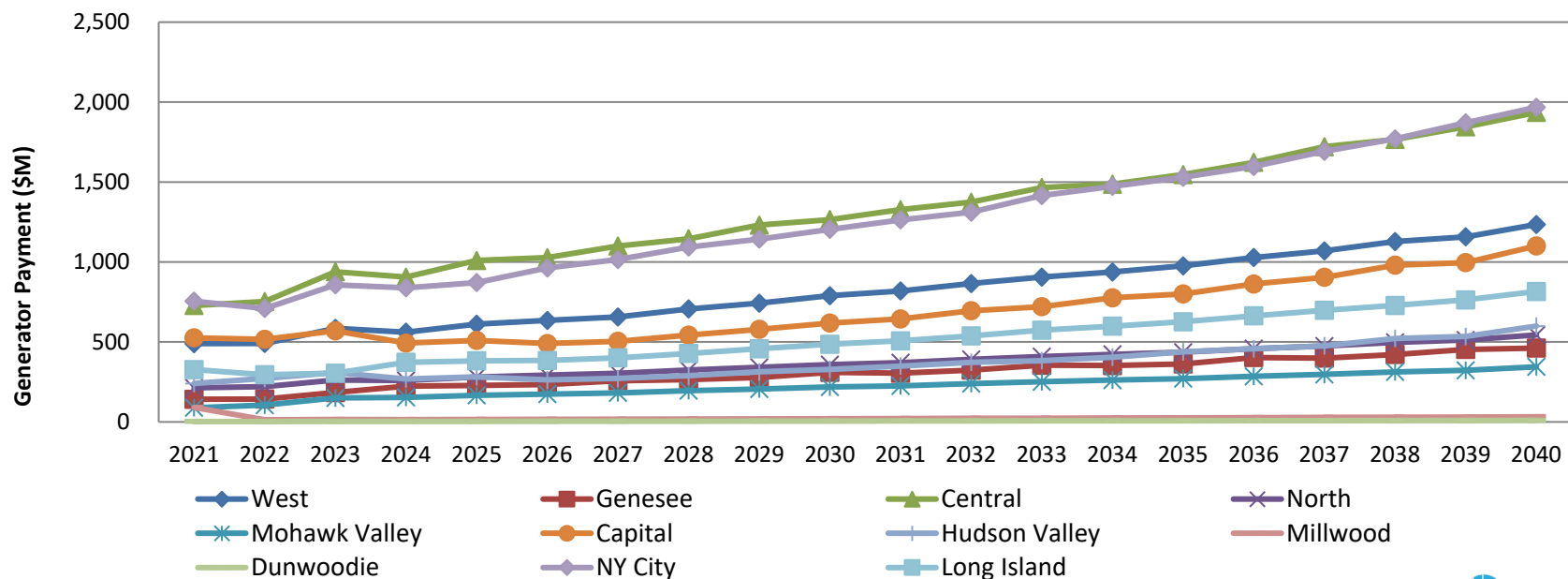
Projected LBMP (\$/MWh)



Projected Generator Payments (\$M)

Generator Payment (\$M)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	489	491	585	561	611	635	656	706	743	790	819	865	906	938	976	1,028	1,070	1,128	1,157	1,234
Genesee	142	143	184	223	228	233	257	264	278	310	305	324	354	353	362	403	399	421	453	461
Central	728	753	939	906	1,009	1,027	1,100	1,145	1,231	1,265	1,328	1,374	1,466	1,487	1,547	1,623	1,721	1,767	1,845	1,935
North	213	220	262	259	281	292	304	324	341	358	370	391	409	422	436	458	474	497	512	544
Mohawk Valley	89	105	150	153	166	174	181	195	206	218	225	240	251	262	271	285	297	313	322	344
Capital	526	516	570	493	509	490	504	543	579	618	644	695	720	776	800	863	904	980	996	1,101
Hudson Valley	240	272	308	269	282	263	272	289	313	328	349	373	383	405	438	457	476	522	534	599
Millwood	90	13	15	15	16	16	17	18	19	20	21	22	23	25	25	27	28	30	30	32
Dunwoodie	2	2	3	3	3	4	4	4	5	5	6	6	6	7	7	8	8	8	9	9
NY City	755	709	857	838	872	963	1,015	1,094	1,143	1,204	1,263	1,312	1,416	1,473	1,530	1,598	1,692	1,770	1,870	1,968
Long Island	327	295	305	373	382	384	401	428	457	486	507	538	574	599	626	663	698	728	763	816
NYCA Total	3601	3519	4177	4093	4359	4482	4711	5011	5315	5603	5838	6140	6508	6745	7019	7412	7768	8164	8493	9043

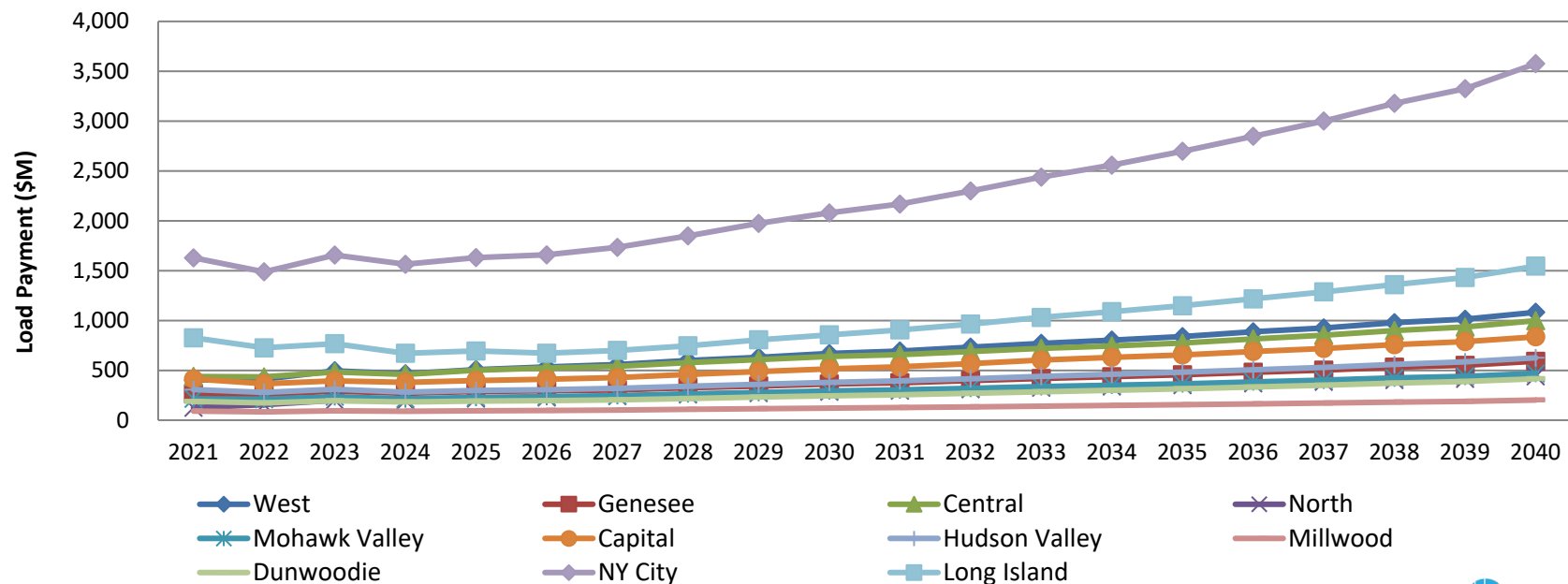
Projected Generator Payments (\$M)



Projected Load Payments (\$M)

Load Payment (\$M)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	403	411	496	466	508	535	558	599	631	669	694	733	771	804	839	887	925	978	1,013	1,083
Genesee	265	260	291	270	288	295	304	327	343	363	376	398	418	436	456	481	502	532	551	591
Central	439	435	484	460	501	525	541	579	608	640	658	689	721	745	774	816	853	900	935	999
North	126	156	200	196	217	229	242	259	273	287	296	312	327	338	352	369	384	403	415	441
Mohawk Valley	215	211	236	215	230	238	247	264	278	294	304	320	337	352	365	385	402	424	440	470
Capital	414	366	395	380	398	411	428	459	489	515	535	567	603	631	655	690	720	758	789	837
Hudson Valley	308	279	311	282	299	307	320	341	361	380	395	416	440	461	482	507	529	560	586	627
Millwood	92	85	95	90	95	98	103	109	116	122	127	134	142	148	156	164	172	182	190	203
Dunwoodie	189	173	195	184	192	196	205	218	232	244	255	270	286	300	316	333	351	372	389	416
NY City	1,629	1,488	1,657	1,564	1,631	1,659	1,734	1,849	1,974	2,080	2,168	2,299	2,439	2,558	2,698	2,847	3,001	3,178	3,325	3,576
Long Island	827	726	768	671	695	673	700	747	807	856	906	965	1,031	1,089	1,149	1,218	1,287	1,360	1,432	1,546
NYCA Total	4906	4591	5128	4780	5054	5165	5381	5752	6113	6451	6714	7105	7516	7863	8242	8697	9128	9648	10065	10788

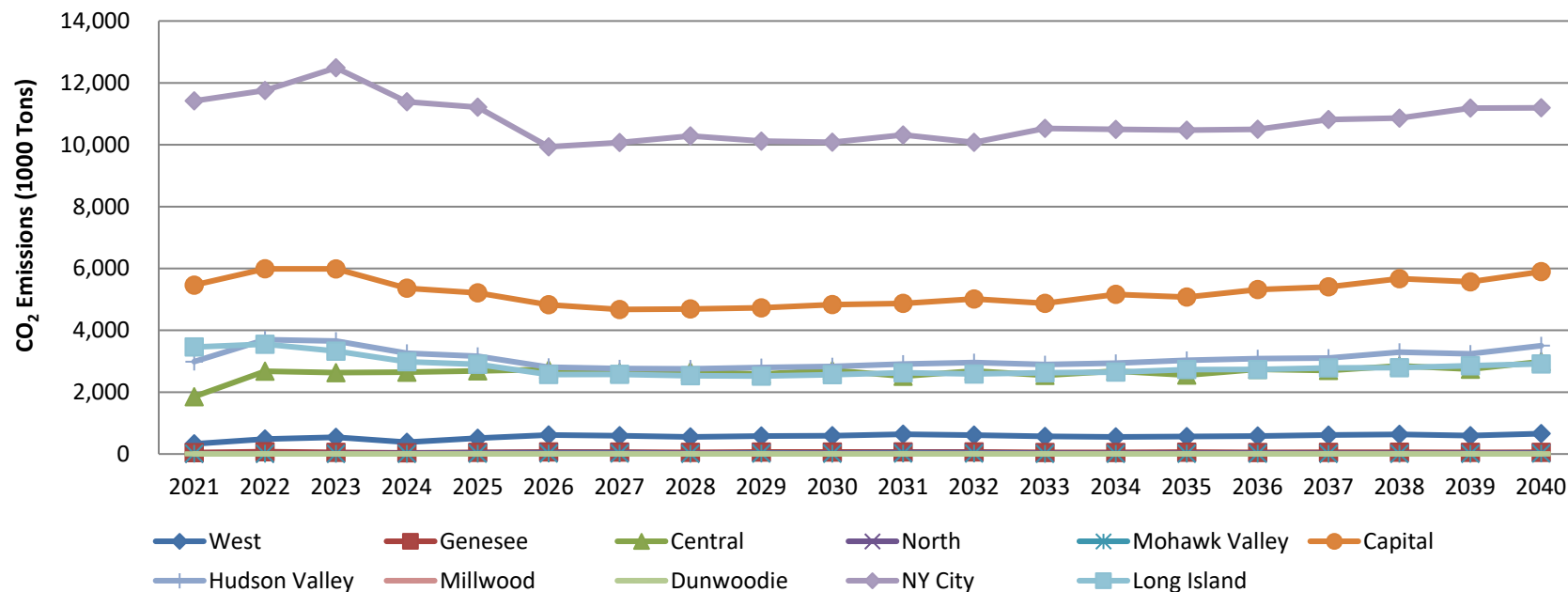
Projected Load Payments (\$M)



Projected CO2 Emissions (1000 Tons)

CO ₂ Emissions (1000 Tons)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	331	484	540	381	511	616	591	553	582	593	642	613	570	553	566	584	613	637	595	660
Genesee	46	75	54	37	53	68	63	52	65	64	67	67	51	50	59	50	54	59	53	56
Central	1,853	2,677	2,633	2,646	2,688	2,735	2,630	2,669	2,583	2,710	2,515	2,685	2,544	2,682	2,552	2,738	2,701	2,850	2,744	2,989
North	7	9	16	28	41	49	48	25	38	30	49	45	26	23	27	33	21	22	26	33
Mohawk Valley	9	8	4	5	8	14	13	5	17	8	17	13	6	6	9	9	6	7	8	14
Capital	5,462	5,988	5,986	5,363	5,211	4,826	4,675	4,690	4,726	4,832	4,871	5,015	4,873	5,162	5,075	5,317	5,406	5,671	5,569	5,897
Hudson Valley	2,987	3,696	3,654	3,261	3,163	2,809	2,764	2,757	2,799	2,830	2,912	2,960	2,894	2,939	3,032	3,087	3,106	3,296	3,238	3,503
Millwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dunwoodie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NY City	11,420	11,758	12,489	11,390	11,216	9,933	10,074	10,285	10,118	10,083	10,319	10,077	10,529	10,498	10,473	10,501	10,816	10,861	11,185	11,195
Long Island	3,462	3,551	3,327	2,985	2,901	2,572	2,577	2,533	2,521	2,565	2,628	2,587	2,628	2,649	2,731	2,734	2,785	2,792	2,856	2,913
NYCA Total	25,577	28,248	28,703	26,096	25,791	23,622	23,434	23,570	23,450	23,715	24,020	24,061	24,122	24,562	24,524	25,054	25,509	26,195	26,274	27,261

Projected CO2 Emissions (1000 Tons)



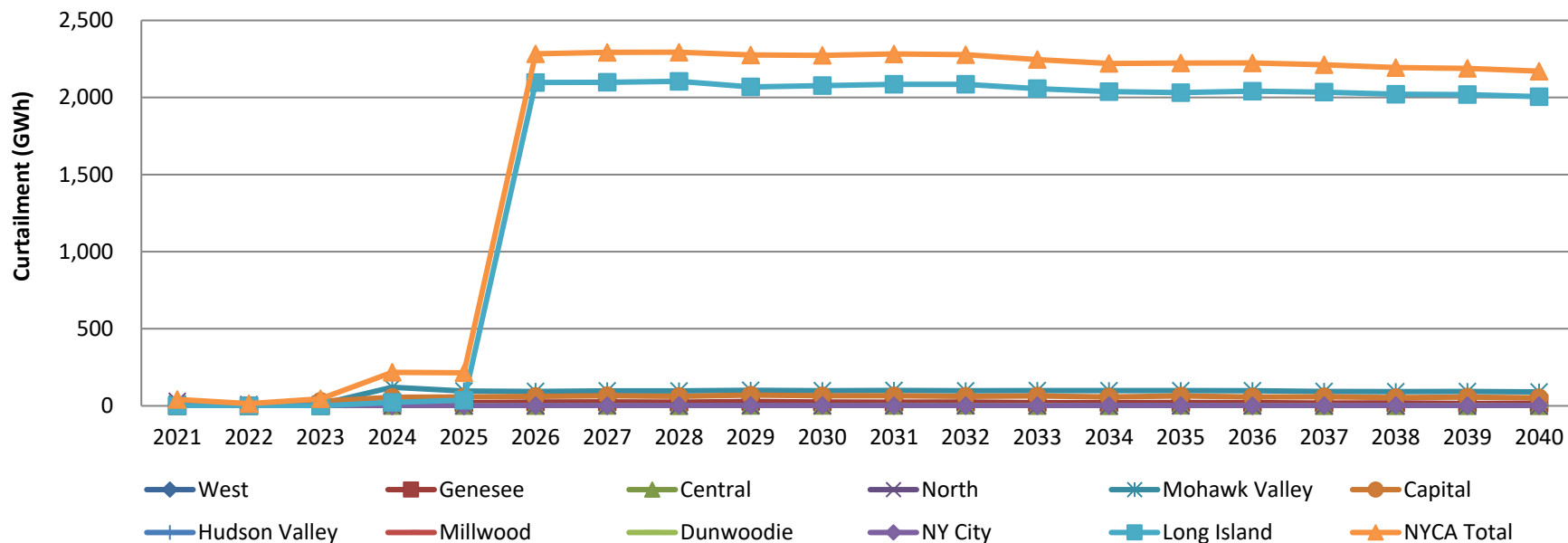
Delta CO2 Emissions (1000 Tons)

CO ₂ Emissions (1000 Tons)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	(1)	(30)	(179)	(324)	(381)	(413)	(402)	(453)	(420)	(442)	(422)	(432)	(434)	(468)	(469)	(496)	(444)	(470)	(449)	(485)
Genesee	(5)	(5)	(26)	(48)	(65)	(72)	(78)	(77)	(73)	(82)	(74)	(77)	(79)	(76)	(71)	(76)	(71)	(67)	(74)	(72)
Central	(46)	(115)	(454)	(797)	(834)	(905)	(844)	(895)	(948)	(872)	(1,091)	(941)	(980)	(987)	(931)	(896)	(893)	(837)	(836)	(746)
North	(1)	(2)	(12)	(37)	(44)	(42)	(39)	(44)	(43)	(49)	(26)	(35)	(47)	(37)	(48)	(46)	(55)	(40)	(45)	(45)
Mohawk Valley	1	(2)	(9)	(22)	(34)	(36)	(33)	(23)	(34)	(34)	(27)	(32)	(41)	(27)	(30)	(28)	(33)	(38)	(38)	(41)
Capital	18	(10)	(239)	(1,000)	(862)	(1,256)	(1,280)	(1,385)	(1,274)	(1,404)	(1,314)	(1,370)	(1,346)	(1,306)	(1,347)	(1,393)	(1,375)	(1,390)	(1,380)	(1,470)
Hudson Valley	1	16	(157)	(647)	(634)	(981)	(951)	(955)	(910)	(1,056)	(986)	(928)	(861)	(913)	(935)	(1,012)	(1,010)	(917)	(919)	(850)
Millwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dunwoodie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NY City	25	131	(256)	(907)	(960)	(1,770)	(1,759)	(1,790)	(1,826)	(1,688)	(1,734)	(1,722)	(1,682)	(1,772)	(1,703)	(1,788)	(1,726)	(1,772)	(1,757)	(1,924)
Long Island	13	(22)	8	(423)	(381)	(609)	(612)	(641)	(637)	(654)	(662)	(656)	(674)	(679)	(696)	(724)	(716)	(749)	(773)	(794)
NYCA Total	5	(38)	(1,324)	(4,206)	(4,195)	(6,082)	(5,998)	(6,262)	(6,165)	(6,281)	(6,338)	(6,193)	(6,145)	(6,266)	(6,229)	(6,459)	(6,320)	(6,280)	(6,271)	(6,428)

Projected Zonal Curtailment (GWh)

Curtailment (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	0	1	0	0	1	2	2	2	2	3	3	2	2	2	1	2	2	2	1	2
Genesee	0	0	2	17	20	25	25	24	28	25	24	24	21	21	22	21	19	19	16	17
Central	0	0	0	1	1	2	2	1	2	3	3	3	1	1	3	2	1	1	1	1
North	29	8	0	0	1	0	1	0	1	1	1	1	0	0	0	0	1	0	0	0
Mohawk Valley	12	4	11	120	96	93	97	97	101	98	100	98	99	99	99	98	94	92	93	90
Capital	0	0	30	56	58	61	65	61	70	65	65	61	64	58	64	58	59	54	57	52
Hudson Valley	0	1	2	1	1	0	0	1	1	1	1	1	1	1	1	1	2	1	1	1
Millwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dunwoodie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NY City	0	0	0	0	0	2	1	2	2	2	1	2	1	2	2	1	1	3	0	2
Long Island	0	0	0	22	37	2,097	2,098	2,105	2,068	2,077	2,085	2,085	2,057	2,038	2,031	2,041	2,035	2,021	2,019	2,005
NYCA Total	41	14	46	217	215	2,283	2,293	2,293	2,276	2,273	2,282	2,277	2,246	2,220	2,223	2,224	2,212	2,194	2,189	2,170

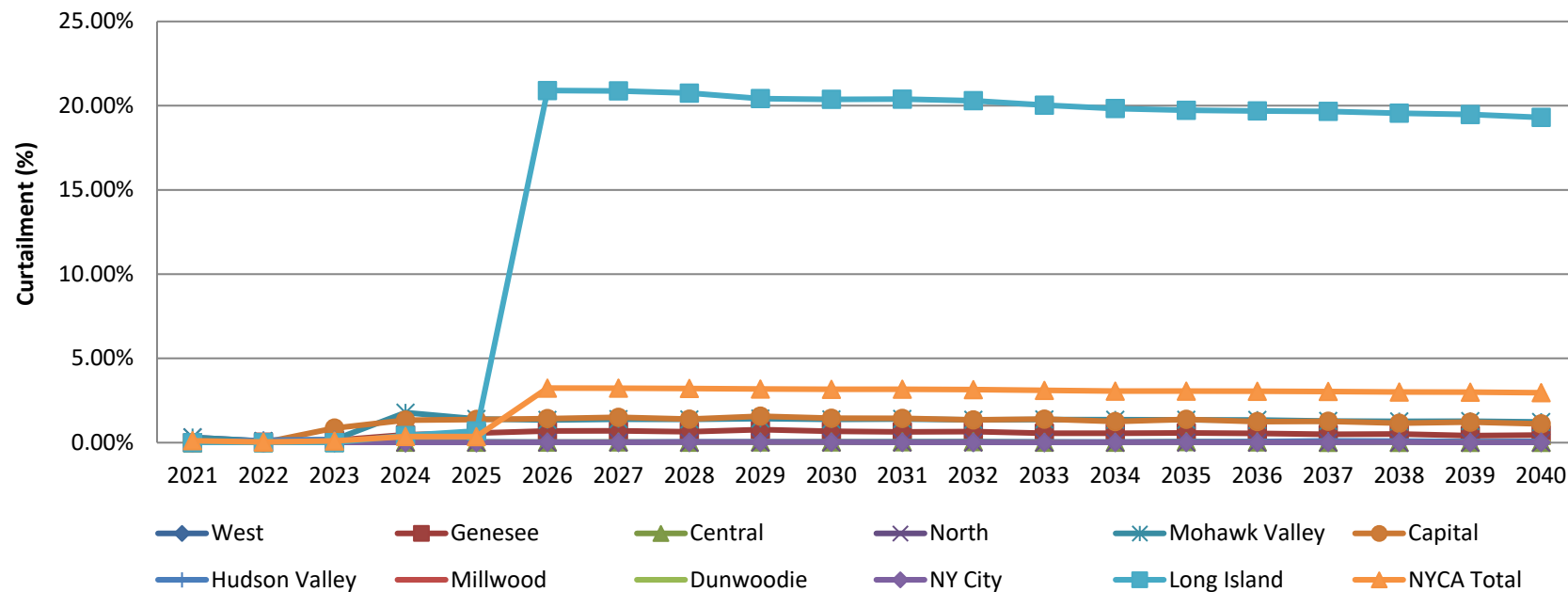
Projected Zonal Curtailment (GWh)



Projected Zonal Curtailment (%)

Curtailment (%)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Genesee	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	1%	0%	0%
Central	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
North	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mohawk Valley	0%	0%	0%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Capital	0%	0%	1%	1%	1%	1%	2%	1%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Hudson Valley	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Millwood	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dunwoodie	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
NY City	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Long Island	0%	0%	0%	0%	1%	21%	21%	21%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	19%	19%
NYCA Total	0%	0%	0%	0%	0%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

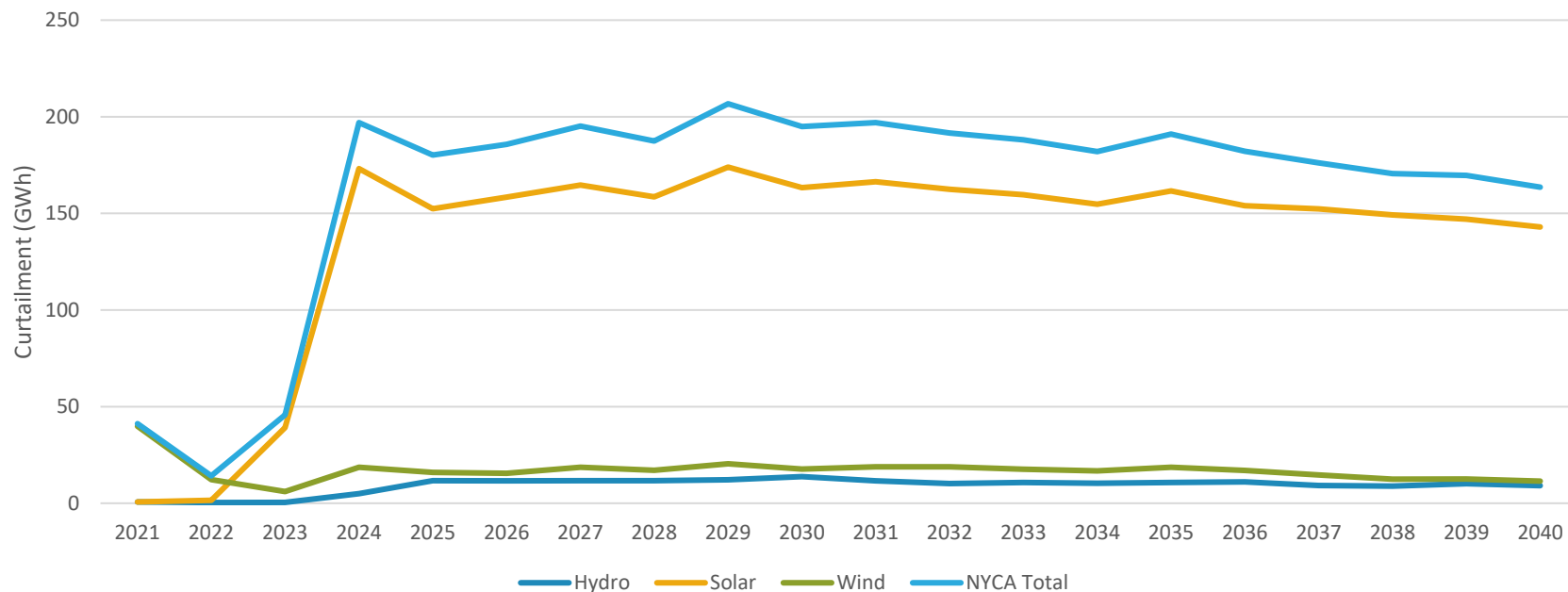
Projected Zonal Curtailment (%)



Projected Curtailment by Unit Type (GWh)

Curtailed Energy (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Hydro	1	0	0	5	12	12	12	12	12	14	12	10	11	10	11	11	9	9	10	9
Solar	1	2	39	173	152	158	165	159	174	163	166	162	160	155	162	154	152	149	147	143
Wind	40	12	6	19	16	16	19	17	20	18	19	19	18	17	19	17	15	12	13	11
NYCA Total	41	14	46	197	180	186	195	187	207	195	197	192	188	182	191	182	176	171	170	164

Projected Curtailment by Unit Type (GWh)



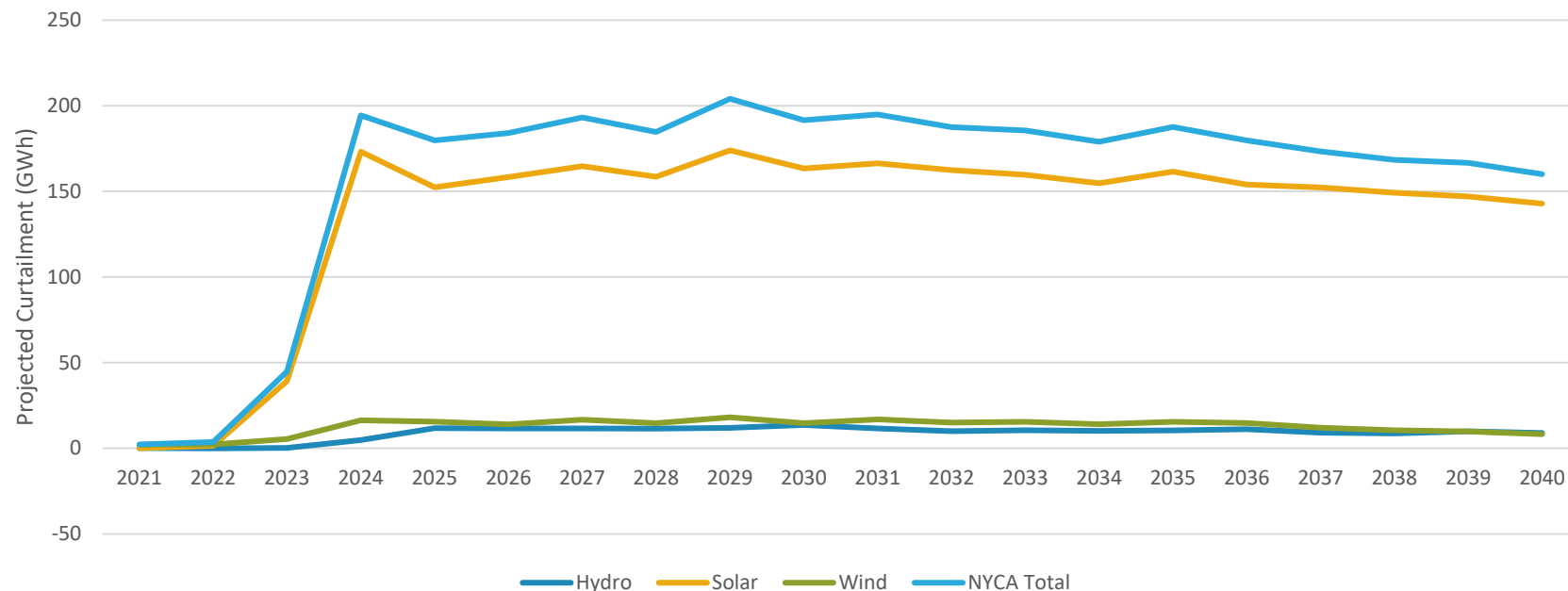
Projected Curtailment by Unit Type (%)

Curtailed Energy (%)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Hydro	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Solar	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Wind	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Projected Curtailment, Delta from Base Case (GWh)

Curtailed Energy (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Hydro	0	0	0	5	12	12	12	11	12	14	12	10	11	10	10	11	9	9	10	9
Solar	0	1	39	173	152	158	165	159	174	163	166	162	160	155	162	154	152	149	147	143
Wind	2	2	5	16	16	14	17	15	18	15	17	15	15	14	15	15	12	10	10	8
NYCA Total	2	4	45	194	180	184	193	185	204	192	195	188	186	179	188	180	173	168	167	160

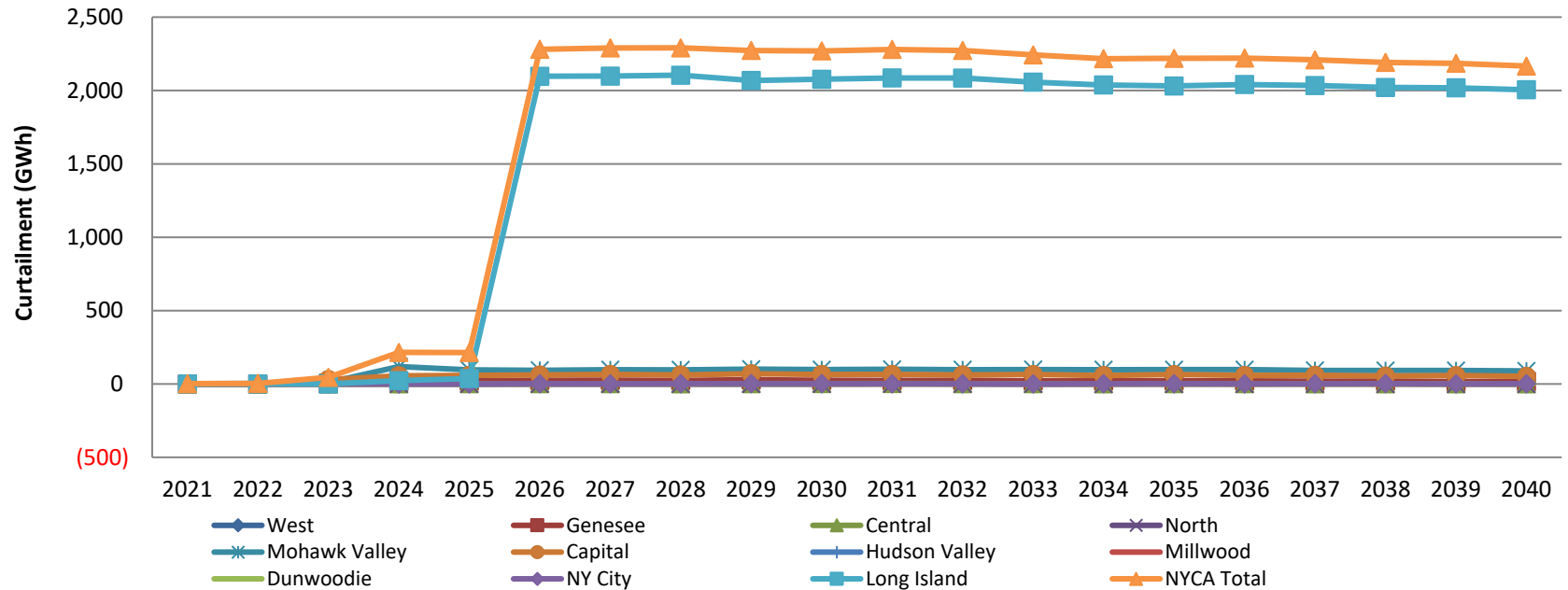
Projected Curtailment, Delta from Base Case (GWh)



Delta Zonal Curtailment (GWh)

Delta Zonal Curtailment (GWh)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West	(0)	(0)	0	0	0	1	1	0	0	(0)	1	(0)	0	0	0	(0)	0	1	0	(0)
Genesee	0	0	2	17	20	25	25	24	28	25	24	24	21	21	22	21	19	19	16	17
Central	0	(0)	0	1	1	2	2	1	2	2	3	2	1	1	2	2	1	1	1	1
North	1	(0)	0	0	1	0	1	0	1	1	1	1	0	0	0	0	1	0	0	0
Mohawk Valley	1	3	10	118	96	93	97	96	101	98	100	97	98	97	98	98	92	91	92	89
Capital	0	0	30	55	58	61	65	61	70	65	65	61	64	58	64	58	59	54	57	52
Hudson Valley	(0)	1	2	1	1	0	0	1	1	1	1	1	1	1	1	1	2	1	1	1
Millwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dunwoodie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NY City	0	0	0	0	0	2	1	3	2	2	1	2	1	2	2	1	1	3	0	2
Long Island	0	0	0	22	37	2,097	2,098	2,105	2,068	2,077	2,085	2,085	2,057	2,038	2,031	2,041	2,035	2,021	2,019	2,005
NYCA Total	2	4	45	215	214	2,281	2,291	2,291	2,273	2,270	2,280	2,273	2,243	2,217	2,220	2,221	2,209	2,191	2,186	2,167

Delta Zonal Curtailment (GWh)



Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system

