

2015 CARIS 1 Base Case Results: Final

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KCC



Updates from June 11th ESPWG

- ◆ **Dunkirk refueling**
 - *Dunkirk 2, 75 MW(9/1/2016)*
 - *Dunkirk 3, 180 MW(9/1/2016)*
 - *Dunkirk 4, 180 MW(9/1/2016)*

- ◆ **ABC-JK 1000MW wheel overload charge was reverted to value utilized in prior studies**
 - *Higher value was utilized for benchmark year (2013) to limit flows/model transformer outage*
 - *Soft limit is from 900MW to 1100MW*
 - *Hard limit is from 600MW to 1200MW*

- ◆ **Reduced coal fuel costs**

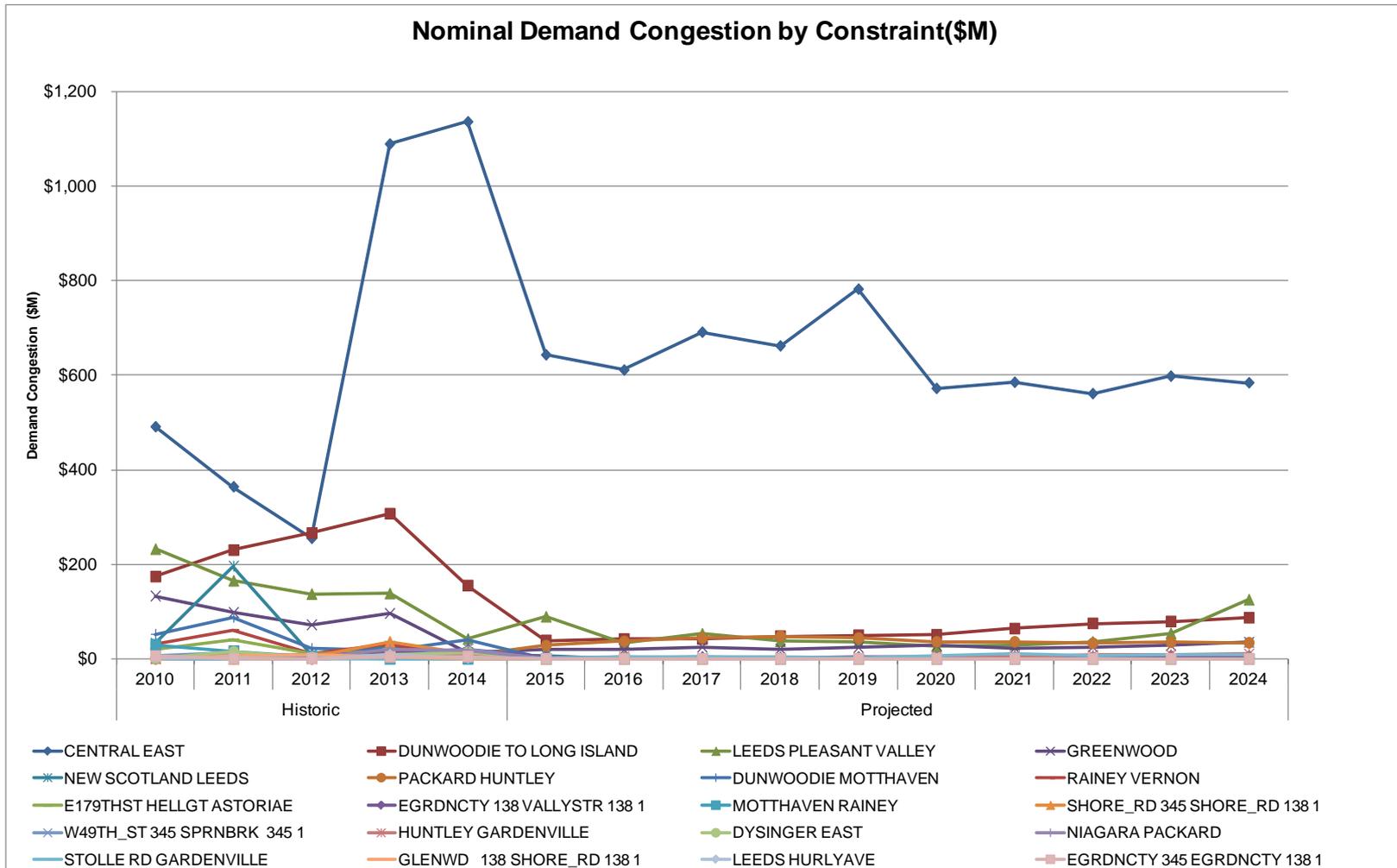
Nominal Demand Congestion by Constraint (\$M)

Constraint Group (Nominal \$M)	Historic					Projected									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
CENTRAL EAST	\$491	\$364	\$255	\$1,089	\$1,136	\$643	\$611	\$691	\$662	\$782	\$572	\$585	\$561	\$598	\$584
DUNWOODIE T O LONG ISLAND	\$174	\$230	\$266	\$307	\$155	\$39	\$42	\$42	\$48	\$50	\$51	\$64	\$75	\$79	\$87
LEEDS PLEASANT VALLEY	\$232	\$165	\$137	\$138	\$42	\$89	\$33	\$53	\$37	\$35	\$26	\$30	\$36	\$54	\$125
GREENWOOD	\$133	\$98	\$72	\$96	\$13	\$19	\$19	\$25	\$21	\$24	\$28	\$23	\$25	\$28	\$35
NEW SCOTLAND LEEDS	\$33	\$196	\$9	\$27	\$9	\$7	\$1	\$1	\$0	\$0	\$0	\$0	\$1	\$1	\$0
PACKARD HUNTLEY	-	-	-	\$5	\$7	\$28	\$37	\$44	\$48	\$44	\$36	\$36	\$33	\$35	\$34
DUNWOODIE MOTTHAVEN	\$52	\$88	\$22	\$18	\$40	-	-	-	-	-	-	-	-	-	-
RAINEY VERNON	\$32	\$60	\$10	\$31	\$1	\$1	\$1	\$1	\$2	\$2	\$2	\$3	\$2	\$3	\$2
E179THST HELLGT ASTORIAE	\$20	\$40	\$11	\$16	\$3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
EGRDNCTY 138 VALLYSTR 138 1	\$3	\$7	\$8	\$14	\$20	\$4	\$3	\$4	\$3	\$4	\$4	\$5	\$4	\$7	\$6
MOTTHAVEN RAINEY	\$30	\$16	\$5	-	-	-	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
SHORE_RD 345 SHORE_RD 138 1	\$2	-	\$4	\$36	\$12	-	-	-	-	-	-	-	-	-	-
W49TH_ST 345 SPRNBRK 345 1	\$7	\$14	\$1	\$4	\$21	-	-	-	-	-	-	-	-	-	-
HUNTLEY GARDENVILLE	-	-	-	\$8	\$6	\$1	\$4	\$1	\$2	\$3	\$5	\$5	\$8	\$9	\$10
DYSINGER EAST	\$1	\$15	\$3	\$8	\$14	\$0	\$0	-	-	\$0	\$0	\$0	-	\$0	-
NIAGARA PACKARD	-	-	\$3	\$21	\$18	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
STOLLE RD GARDENVILLE	-	-	-	-	-	\$3	\$4	\$5	\$5	\$3	\$6	\$11	\$7	\$9	\$9
GLENWD 138 SHORE_RD 138 1	-	\$6	\$8	\$4	-	-	-	-	-	-	-	-	-	-	-
LEEDS HURLYAVE	\$3	\$2	-	\$9	\$2	-	-	-	-	-	-	-	-	-	-
EGRDNCTY 345 EGRDNCTY 138 1	\$6	\$0	\$1	\$4	\$5	-	-	-	-	-	-	-	-	-	-

Observations

- ◆ **Southeast NY continues to be major location for congestion (e.g., Central East, UPNY-SENY, Long Island interfaces)**
- ◆ **Western NY congestion (e.g., Packard-Huntley, Niagara Packard) becoming more pronounced in historic and forecasted periods**

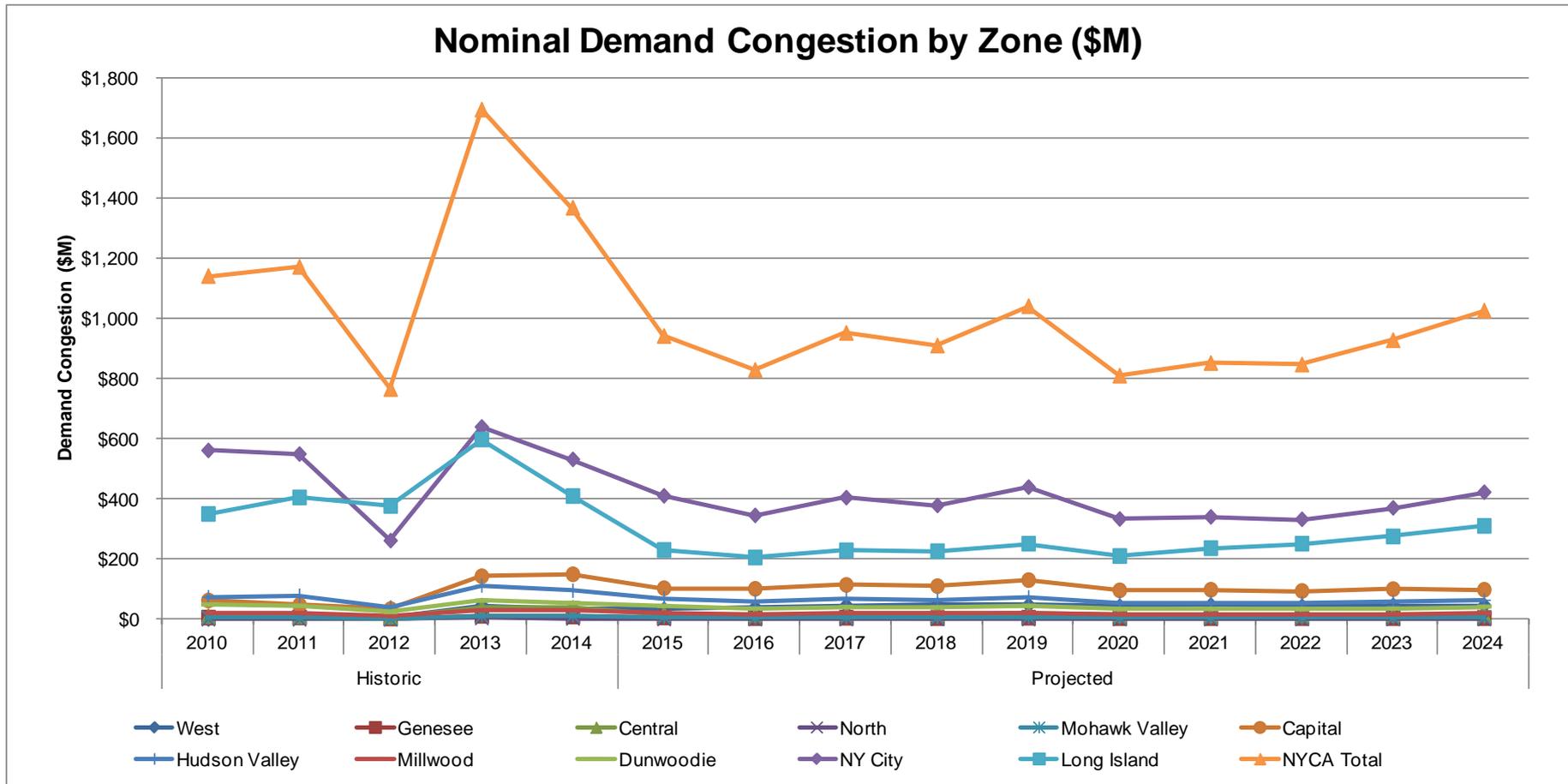
Nominal Demand Congestion (\$M)



Nominal Demand Congestion by Zone (\$M)

Zonal Demand Congestion (\$M)	Historic					Projected									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	\$1	\$5	\$6	\$45	\$36	\$33	\$39	\$46	\$48	\$47	\$43	\$47	\$43	\$46	\$46
Genesee	\$6	\$6	\$3	\$11	\$9	\$6	\$4	\$5	\$4	\$5	\$4	\$4	\$4	\$4	\$4
Central	\$11	\$10	\$8	\$38	\$38	\$18	\$15	\$17	\$17	\$20	\$14	\$14	\$14	\$15	\$15
North	\$1	\$0	\$0	\$5	\$3	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1
Mohawk Valley	\$5	\$5	\$3	\$11	\$12	\$7	\$5	\$6	\$6	\$7	\$5	\$5	\$5	\$5	\$6
Capital	\$62	\$47	\$34	\$143	\$149	\$103	\$101	\$114	\$110	\$130	\$96	\$98	\$94	\$100	\$98
Hudson Valley	\$73	\$78	\$39	\$112	\$95	\$69	\$58	\$67	\$63	\$73	\$53	\$55	\$53	\$57	\$63
Millwood	\$23	\$20	\$10	\$30	\$30	\$22	\$18	\$21	\$19	\$23	\$17	\$17	\$17	\$18	\$20
Dunwoodie	\$49	\$45	\$24	\$62	\$55	\$44	\$36	\$41	\$39	\$45	\$33	\$34	\$33	\$36	\$42
NY City	\$561	\$549	\$261	\$639	\$531	\$410	\$345	\$404	\$378	\$439	\$333	\$340	\$332	\$370	\$422
Long Island	\$350	\$405	\$377	\$597	\$409	\$230	\$205	\$229	\$226	\$251	\$210	\$236	\$251	\$275	\$310
NYCA Total	\$1,140	\$1,170	\$765	\$1,693	\$1,367	\$941	\$828	\$951	\$909	\$1,040	\$809	\$851	\$846	\$927	\$1,025

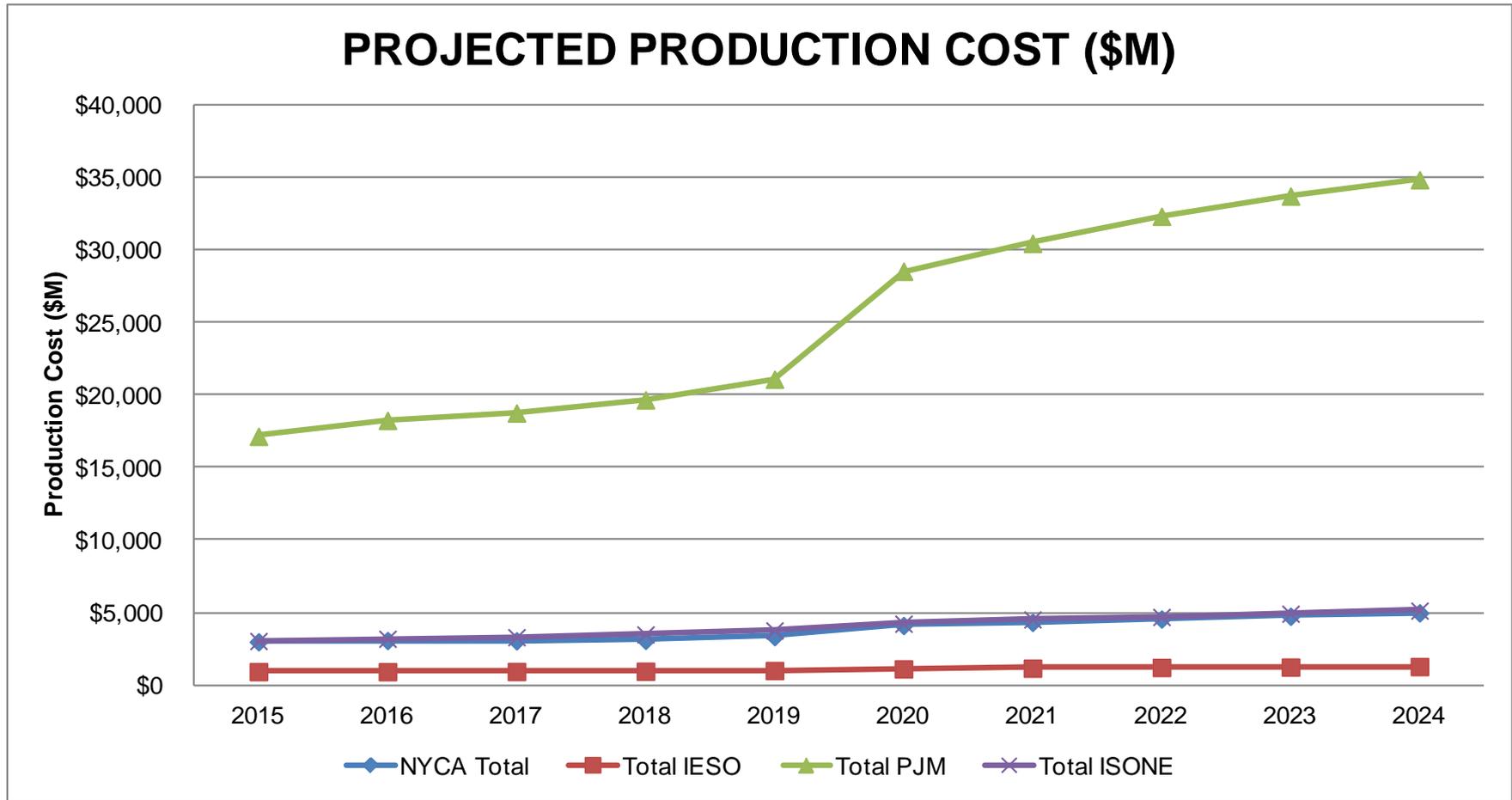
Nominal Demand Congestion by Zone (\$M)



Projected Production Costs (\$M)

Production Cost (\$M)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	\$189	\$202	\$205	\$212	\$267	\$393	\$414	\$446	\$468	\$478
Genesee	\$42	\$39	\$40	\$44	\$42	\$50	\$52	\$52	\$53	\$59
Central	\$432	\$428	\$415	\$405	\$437	\$514	\$558	\$568	\$592	\$615
North	\$31	\$27	\$25	\$26	\$26	\$39	\$41	\$45	\$39	\$50
Mohawk Valley	\$26	\$29	\$25	\$28	\$29	\$39	\$38	\$41	\$37	\$42
Capital	\$579	\$591	\$597	\$604	\$627	\$813	\$830	\$898	\$924	\$963
Hudson Valley	\$26	\$26	\$23	\$21	\$21	\$35	\$40	\$37	\$44	\$44
Millwood	\$108	\$111	\$115	\$117	\$119	\$124	\$126	\$130	\$132	\$136
Dunwoodie	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
NY City	\$1,113	\$1,168	\$1,165	\$1,184	\$1,294	\$1,510	\$1,599	\$1,683	\$1,759	\$1,856
Long Island	\$454	\$467	\$458	\$462	\$494	\$604	\$639	\$668	\$710	\$749
NYCA Total	\$3,001	\$3,088	\$3,068	\$3,102	\$3,355	\$4,121	\$4,335	\$4,568	\$4,757	\$4,993
NYCA Imports	\$899	\$1,023	\$1,068	\$1,176	\$1,298	\$1,358	\$1,444	\$1,518	\$1,594	\$1,684
NYCA Exports	\$374	\$380	\$413	\$415	\$477	\$495	\$523	\$516	\$583	\$580
NYCA + Imports - Exports	\$3,526	\$3,731	\$3,723	\$3,863	\$4,177	\$4,984	\$5,256	\$5,570	\$5,768	\$6,097
Total IESO	\$946	\$942	\$953	\$971	\$1,020	\$1,135	\$1,183	\$1,232	\$1,256	\$1,293
Total PJM	\$17,156	\$18,254	\$18,759	\$19,665	\$21,088	\$28,527	\$30,451	\$32,315	\$33,705	\$34,832
Total ISONE	\$3,056	\$3,208	\$3,319	\$3,510	\$3,786	\$4,248	\$4,542	\$4,713	\$4,935	\$5,148
Total System	\$24,159	\$25,493	\$26,100	\$27,248	\$29,250	\$38,032	\$40,511	\$42,828	\$44,653	\$46,266

Projected Production Costs (\$M)



Historic Load and Generation(GWh)

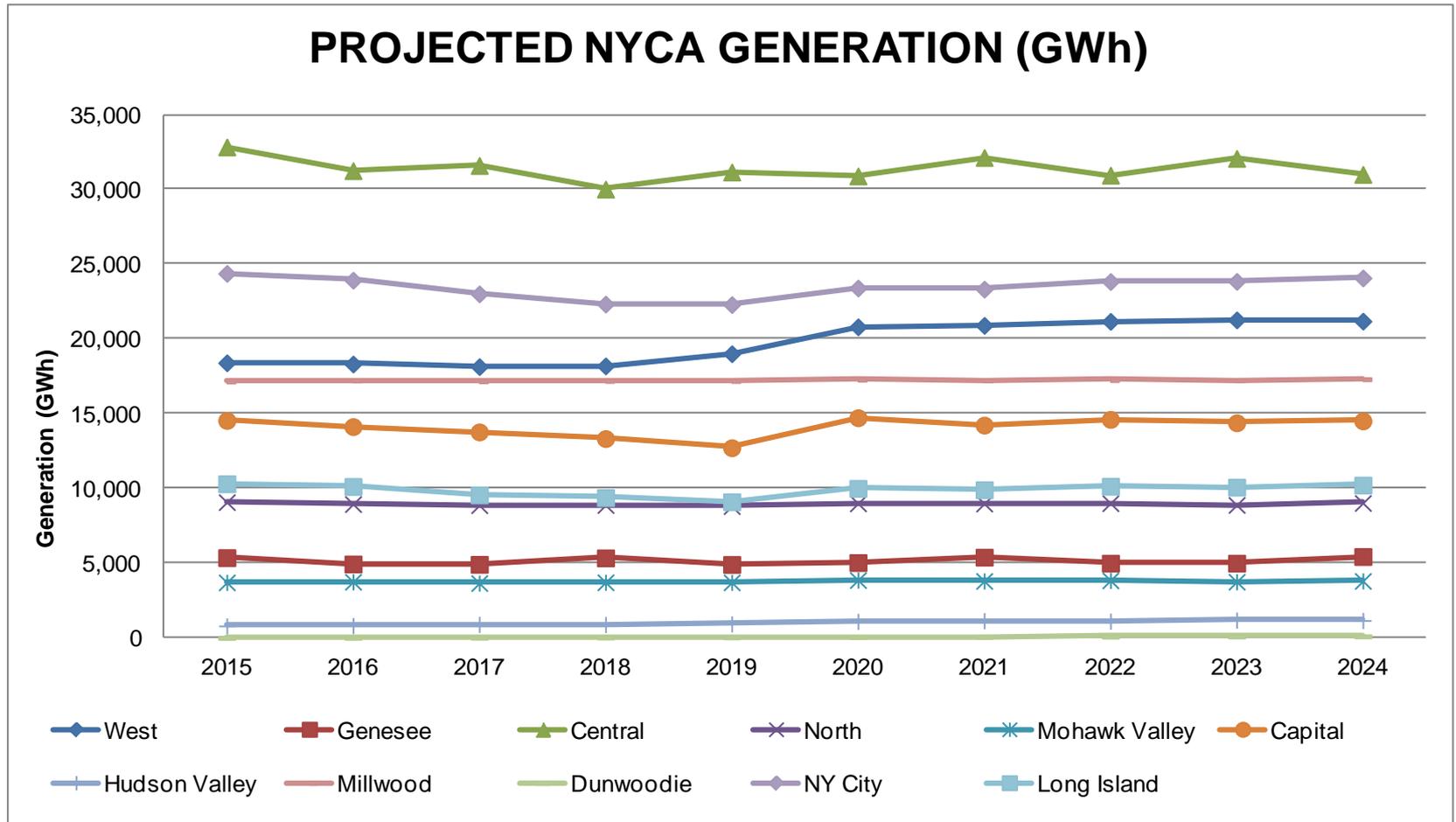
YEAR	NYCA Actual GWh	
	Load	Generation
2010	163,505	139,357
2011	163,330	139,965
2012	162,842	138,921
2013	163,514	137,187
2014	160,024	143,738

Projected NYCA Generation by Zone (GWh)

Generation (GWh)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	18,401	18,318	18,144	18,192	19,008	20,807	20,904	21,172	21,271	21,187
Genesee	5,369	4,944	4,919	5,352	4,912	5,037	5,399	4,996	4,997	5,442
Central	32,836	31,253	31,599	30,018	31,162	30,900	32,134	30,950	32,074	31,003
North	9,078	8,952	8,876	8,886	8,812	8,997	8,984	9,010	8,892	9,024
Mohawk Valley	3,712	3,752	3,666	3,719	3,714	3,867	3,809	3,847	3,756	3,809
Capital	14,544	14,133	13,778	13,333	12,720	14,725	14,232	14,615	14,388	14,515
Hudson Valley	799	826	903	895	934	1,102	1,147	1,117	1,187	1,163
Millwood	17,149	17,220	17,167	17,190	17,188	17,272	17,226	17,248	17,243	17,303
Dunwoodie	4	10	17	28	40	53	75	89	98	103
NY City	24,378	23,925	23,010	22,327	22,293	23,403	23,327	23,836	23,847	24,075
Long Island	10,308	10,128	9,565	9,388	9,104	10,002	9,909	10,141	10,081	10,223
NYCA Total	136,580	133,461	131,642	129,326	129,886	136,166	137,146	137,021	137,833	137,847
Total IESO	157,344	157,626	156,015	155,925	155,789	156,289	156,489	156,489	156,430	156,796
Total PJM	815,213	831,713	840,865	851,030	856,865	858,561	864,076	871,708	879,464	889,122
Total ISONE	109,104	109,613	109,427	109,888	109,024	110,539	109,978	110,475	110,105	110,679
Total HQ *	24,576	24,638	24,674	24,622	24,585	24,643	24,581	24,691	24,674	24,659
Total System	1,242,818	1,257,051	1,262,624	1,270,791	1,276,149	1,286,198	1,292,270	1,300,384	1,308,505	1,319,103

* Only interchange flow is modeled.

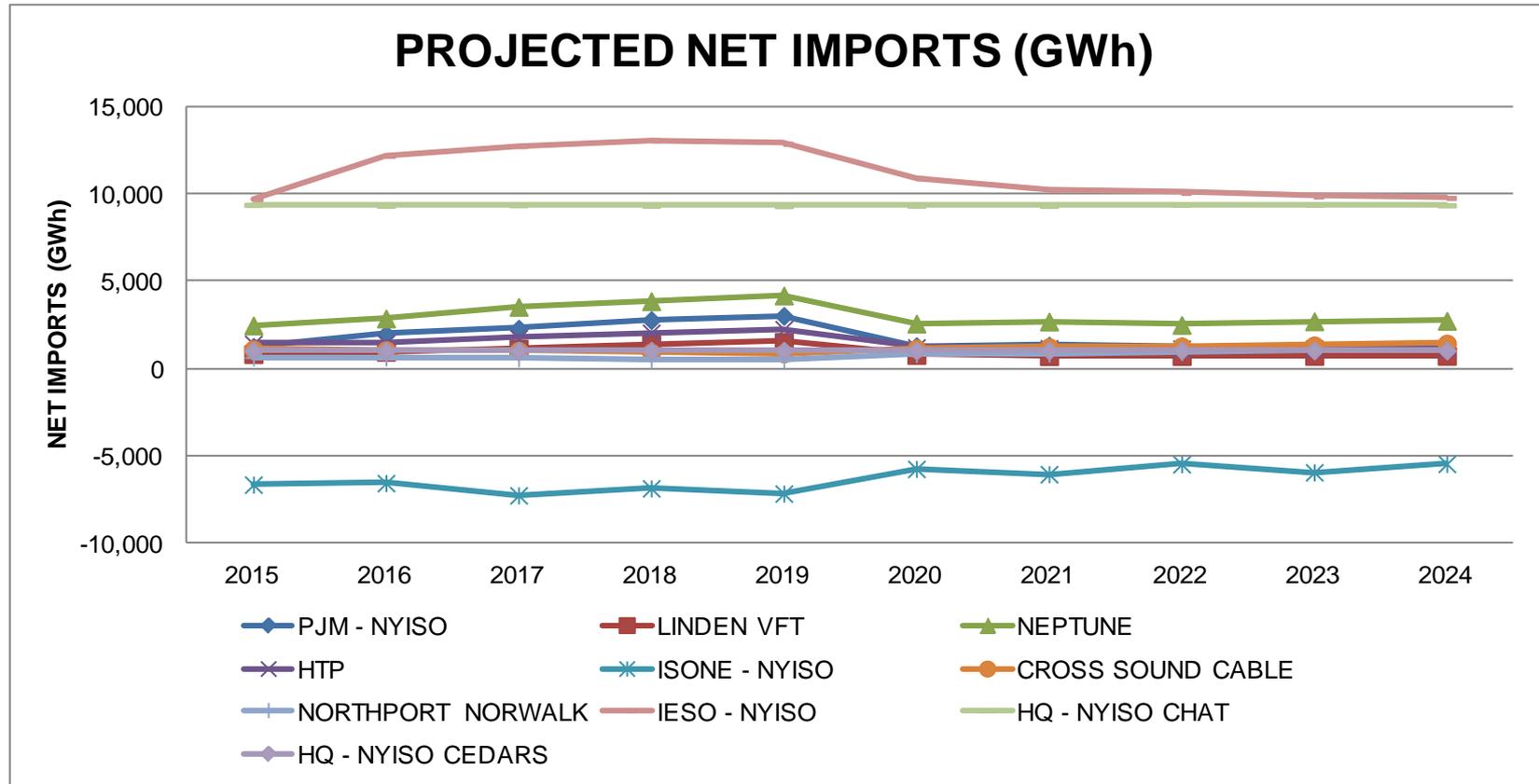
Projected Generation by Zone (GWh)



Projected NYCA Net Imports (GWh)

NET IMPORTS (GWh)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PJM - NYISO	1,260	1,984	2,303	2,794	3,034	1,303	1,334	1,299	1,183	1,212
LINDEN VFT	854	980	1,162	1,410	1,547	802	731	741	748	750
NEPTUNE	2,488	2,882	3,550	3,872	4,199	2,594	2,711	2,517	2,724	2,752
HTP	1,434	1,478	1,762	2,068	2,273	1,231	1,186	1,160	1,166	1,165
ISONE - NYISO	-6,614	-6,528	-7,227	-6,827	-7,126	-5,716	-6,017	-5,445	-5,911	-5,428
CROSS SOUND CABLE	1,126	1,076	1,034	937	887	1,166	1,248	1,291	1,351	1,454
NORTHPORT NORWALK	654	667	610	560	539	866	883	975	1,054	1,048
IESO - NYISO	9,682	12,198	12,752	13,077	12,879	10,904	10,243	10,074	9,864	9,782
HQ - NYISO CHAT	9,384	9,336	9,368	9,339	9,314	9,343	9,328	9,393	9,390	9,358
HQ - NYISO CEDARS	1,047	1,046	1,052	1,044	1,045	1,052	1,051	1,062	1,059	1,051
TOTAL	21,315	25,120	26,367	28,274	28,592	23,546	22,697	23,067	22,628	23,144

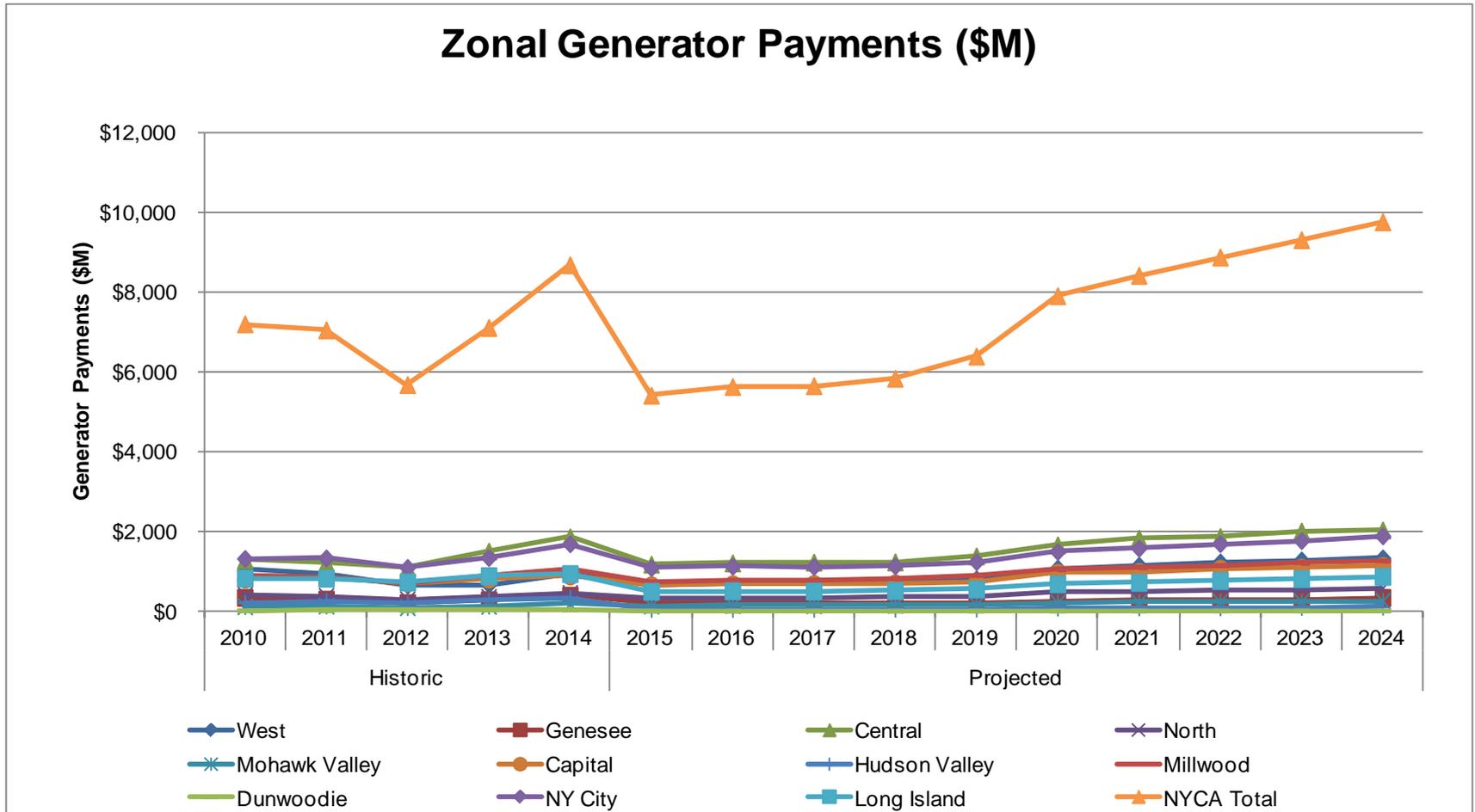
Projected NYCA Net Imports (GWh)



Zonal Generator Payments (\$M)

Generator Payment (\$M)	Historic					Projected									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	\$1,035	\$949	\$644	\$663	\$924	\$627	\$666	\$666	\$708	\$798	\$1,070	\$1,140	\$1,222	\$1,272	\$1,324
Genesee	\$335	\$292	\$203	\$275	\$388	\$180	\$178	\$179	\$206	\$204	\$256	\$290	\$285	\$295	\$335
Central	\$1,280	\$1,199	\$1,076	\$1,495	\$1,854	\$1,168	\$1,201	\$1,218	\$1,225	\$1,375	\$1,654	\$1,821	\$1,860	\$2,000	\$2,026
North	\$407	\$373	\$288	\$348	\$447	\$309	\$328	\$326	\$347	\$375	\$470	\$496	\$528	\$540	\$575
Mohawk Valley	\$110	\$128	\$89	\$122	\$181	\$130	\$141	\$137	\$150	\$162	\$208	\$217	\$232	\$235	\$251
Capital	\$789	\$833	\$702	\$793	\$873	\$651	\$677	\$685	\$702	\$741	\$963	\$984	\$1,065	\$1,094	\$1,138
Hudson Valley	\$207	\$249	\$179	\$269	\$326	\$40	\$41	\$45	\$47	\$52	\$74	\$82	\$83	\$92	\$97
Millwood	\$887	\$863	\$666	\$892	\$1,033	\$730	\$769	\$779	\$810	\$895	\$1,038	\$1,089	\$1,143	\$1,201	\$1,257
Dunwoodie	\$11	\$13	\$14	\$32	\$34	\$0	\$0	\$1	\$1	\$2	\$3	\$5	\$6	\$7	\$8
NY City	\$1,312	\$1,325	\$1,086	\$1,332	\$1,679	\$1,079	\$1,115	\$1,109	\$1,125	\$1,232	\$1,485	\$1,568	\$1,682	\$1,759	\$1,878
Long Island	\$821	\$817	\$720	\$879	\$932	\$488	\$502	\$495	\$507	\$544	\$675	\$713	\$758	\$805	\$862
NYCA Total	\$7,193	\$7,040	\$5,670	\$7,101	\$8,670	\$5,402	\$5,620	\$5,640	\$5,827	\$6,382	\$7,896	\$8,406	\$8,864	\$9,301	\$9,750

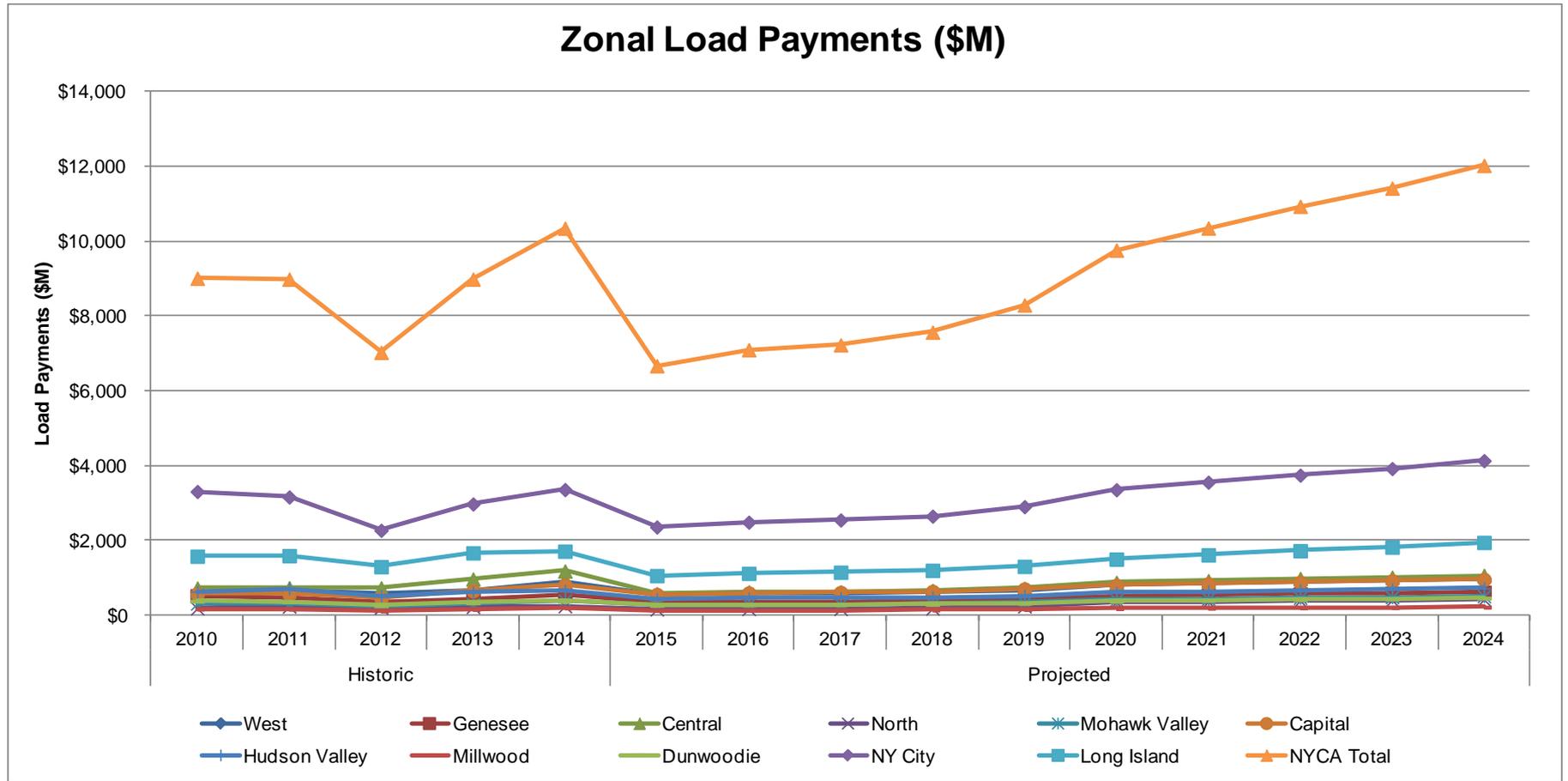
Zonal Generator Payments (\$M)



Zonal Load Payments (\$M)

Load Payment (\$M)	Historic					Projected									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	\$628	\$661	\$593	\$675	\$873	\$533	\$587	\$593	\$627	\$671	\$813	\$859	\$902	\$937	\$981
Genesee	\$520	\$483	\$350	\$415	\$545	\$342	\$366	\$366	\$387	\$418	\$510	\$536	\$567	\$587	\$613
Central	\$726	\$735	\$732	\$967	\$1,183	\$577	\$625	\$628	\$667	\$722	\$877	\$925	\$980	\$1,016	\$1,065
North	\$183	\$233	\$200	\$223	\$243	\$156	\$169	\$169	\$180	\$238	\$345	\$365	\$387	\$402	\$421
Mohawk Valley	\$313	\$307	\$238	\$300	\$395	\$268	\$289	\$291	\$310	\$337	\$412	\$437	\$465	\$484	\$510
Capital	\$578	\$572	\$459	\$654	\$808	\$554	\$594	\$608	\$636	\$701	\$797	\$841	\$881	\$918	\$956
Hudson Valley	\$630	\$716	\$515	\$619	\$656	\$427	\$449	\$458	\$477	\$520	\$601	\$633	\$664	\$690	\$722
Millwood	\$168	\$164	\$114	\$156	\$195	\$127	\$133	\$136	\$141	\$154	\$178	\$188	\$198	\$206	\$216
Dunwoodie	\$376	\$358	\$256	\$333	\$375	\$265	\$277	\$283	\$294	\$322	\$373	\$395	\$416	\$435	\$458
NY City	\$3,307	\$3,160	\$2,270	\$2,973	\$3,358	\$2,359	\$2,487	\$2,546	\$2,648	\$2,901	\$3,354	\$3,556	\$3,744	\$3,920	\$4,132
Long Island	\$1,578	\$1,593	\$1,298	\$1,667	\$1,712	\$1,058	\$1,120	\$1,149	\$1,199	\$1,306	\$1,500	\$1,614	\$1,724	\$1,822	\$1,946
NYCA Total	\$9,008	\$8,982	\$7,026	\$8,983	\$10,343	\$6,668	\$7,097	\$7,226	\$7,566	\$8,292	\$9,759	\$10,350	\$10,929	\$11,415	\$12,021

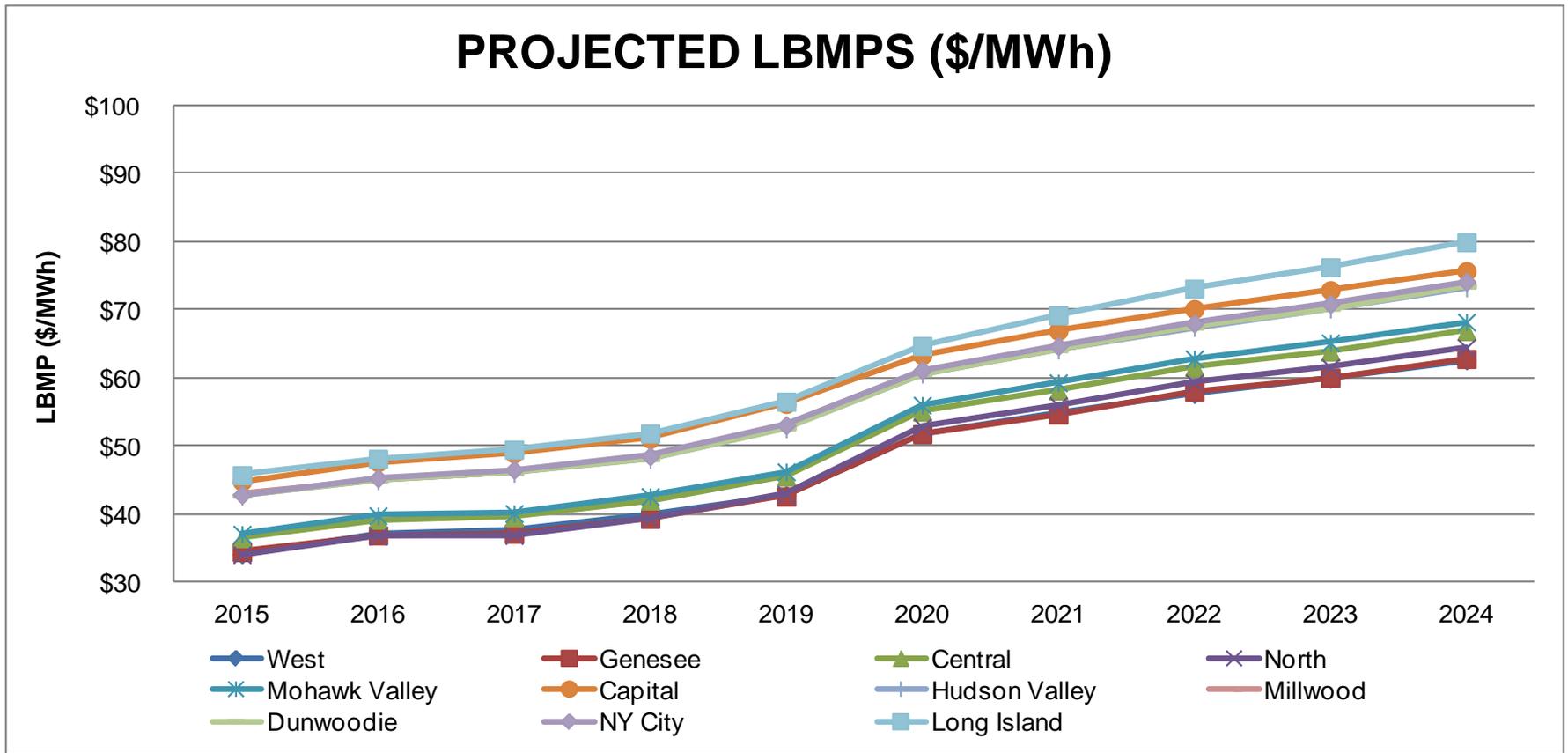
Zonal Load Payments (\$M)



Projected LBMPs (\$/MWh)

LBMP (\$/MWh)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	\$ 34.19	\$ 37.25	\$ 37.81	\$ 40.02	\$ 42.88	\$ 51.79	\$ 54.91	\$ 57.71	\$ 59.96	\$ 62.65
Genesee	\$ 34.52	\$ 36.97	\$ 37.21	\$ 39.39	\$ 42.66	\$ 51.82	\$ 54.70	\$ 58.04	\$ 60.11	\$ 62.85
Central	\$ 36.55	\$ 39.25	\$ 39.62	\$ 42.08	\$ 45.59	\$ 55.10	\$ 58.22	\$ 61.68	\$ 63.93	\$ 66.93
North	\$ 34.13	\$ 36.84	\$ 36.94	\$ 39.33	\$ 42.97	\$ 52.86	\$ 56.01	\$ 59.34	\$ 61.59	\$ 64.50
Mohawk Valley	\$ 37.14	\$ 39.85	\$ 40.17	\$ 42.66	\$ 46.29	\$ 56.06	\$ 59.35	\$ 62.86	\$ 65.21	\$ 68.26
Capital	\$ 44.89	\$ 47.71	\$ 48.99	\$ 51.14	\$ 56.25	\$ 63.40	\$ 66.98	\$ 70.17	\$ 72.93	\$ 75.73
Hudson Valley	\$ 42.67	\$ 44.94	\$ 46.04	\$ 48.07	\$ 52.57	\$ 60.59	\$ 64.11	\$ 67.42	\$ 70.14	\$ 73.24
Millwood	\$ 42.96	\$ 45.14	\$ 46.31	\$ 48.31	\$ 52.83	\$ 60.79	\$ 64.32	\$ 67.63	\$ 70.40	\$ 73.64
Dunwoodie	\$ 42.81	\$ 44.99	\$ 46.15	\$ 48.15	\$ 52.65	\$ 60.63	\$ 64.15	\$ 67.47	\$ 70.23	\$ 73.47
NY City	\$ 42.93	\$ 45.35	\$ 46.58	\$ 48.58	\$ 53.12	\$ 61.19	\$ 64.74	\$ 68.05	\$ 70.90	\$ 74.18
Long Island	\$ 45.79	\$ 48.20	\$ 49.54	\$ 51.90	\$ 56.58	\$ 64.75	\$ 69.25	\$ 73.16	\$ 76.29	\$ 79.97

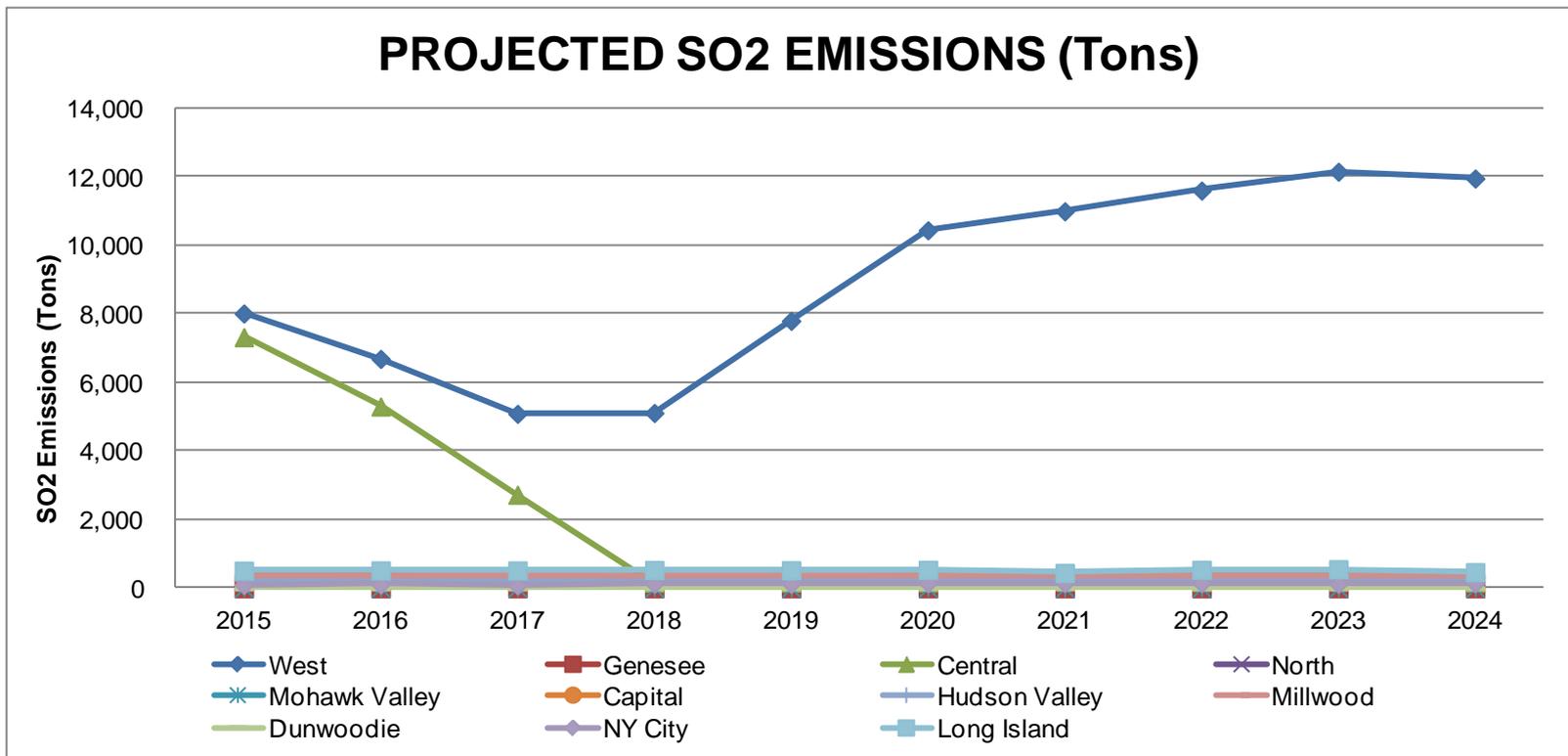
Projected LBMPs (\$/MWh)



Projected SO₂ Emissions (Tons)

SO ₂ Emissions (Tons)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	8,017	6,692	5,090	5,115	7,803	10,445	10,999	11,604	12,154	11,955
Genesee	0	0	0	0	0	0	0	0	0	0
Central	7,326	5,304	2,729	162	162	168	227	182	208	169
North	2	2	1	1	1	2	2	2	1	2
Mohawk Valley	9	9	9	9	9	9	9	9	9	9
Capital	334	334	333	332	330	335	333	334	334	334
Hudson Valley	228	211	226	227	212	224	251	244	217	254
Millwood	337	338	337	337	336	338	337	336	336	337
Dunwoodie	0	0	0	0	0	0	0	0	0	0
NY City	99	110	89	137	129	153	148	152	130	147
Long Island	514	521	520	532	526	539	447	540	555	468
NYCA Total	16,867	13,520	9,334	6,851	9,509	12,213	12,752	13,403	13,945	13,676

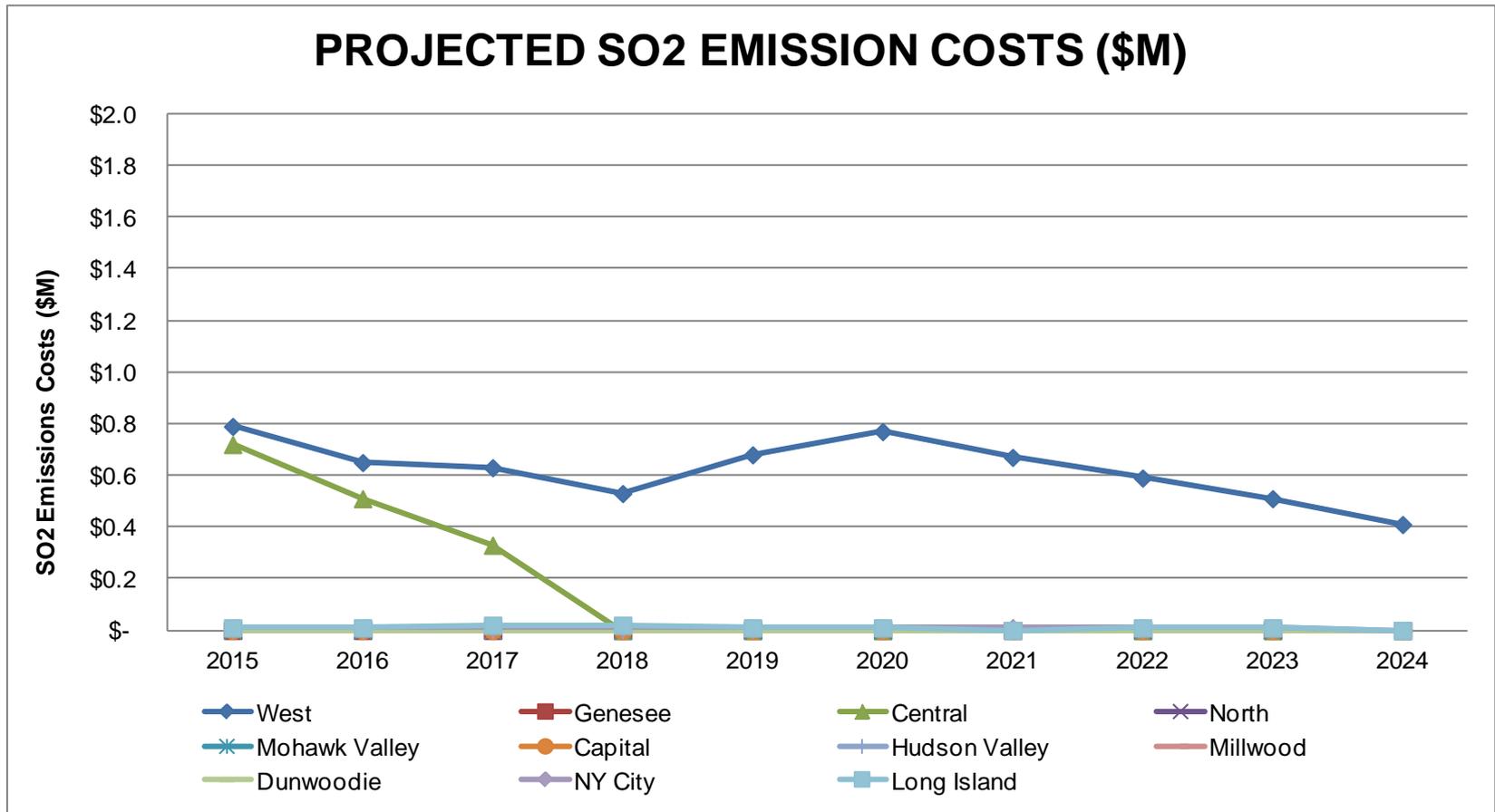
Projected SO₂ Emissions (Tons)



Projected SO₂ Emission Costs (\$M)

SO ₂ Emissions Costs (\$M)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	\$0.8	\$0.6	\$0.6	\$0.5	\$0.7	\$0.8	\$0.7	\$0.6	\$0.5	\$0.4
Genesee	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Central	\$0.7	\$0.5	\$0.3	\$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	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
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	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
NYCA Total	\$1.5	\$1.2	\$1.0	\$0.6	\$0.7	\$0.8	\$0.7	\$0.6	\$0.5	\$0.4

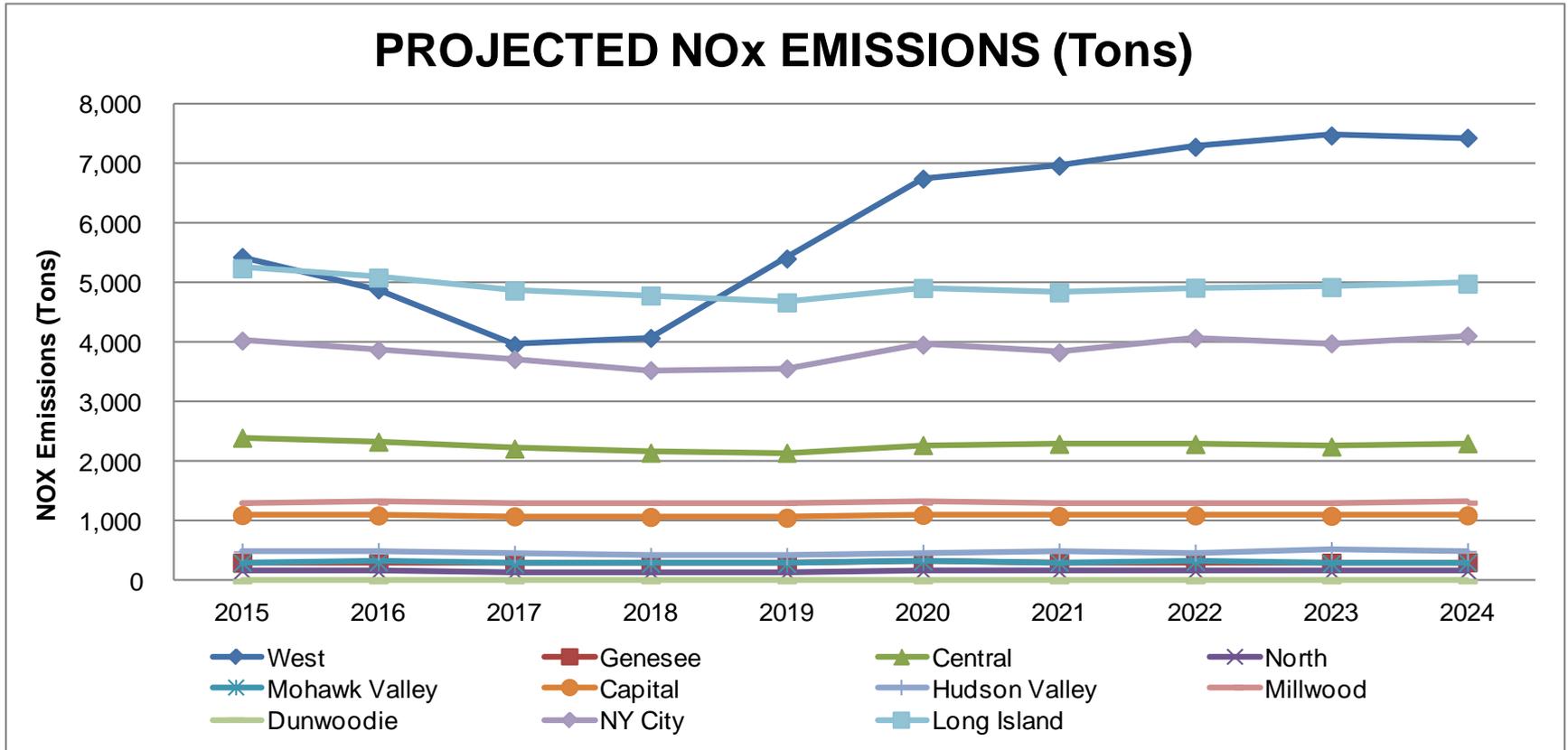
Projected SO₂ Emission Costs (\$M)



Projected NO_x Emissions (Tons)

NO _x Emissions (Tons)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	5,437	4,891	3,960	4,080	5,410	6,749	6,966	7,283	7,473	7,435
Genesee	310	301	294	299	290	321	310	308	311	318
Central	2,407	2,339	2,224	2,155	2,154	2,283	2,304	2,301	2,259	2,313
North	179	165	156	157	148	170	169	172	160	172
Mohawk Valley	311	322	293	298	293	334	317	328	299	312
Capital	1,109	1,103	1,089	1,079	1,065	1,112	1,094	1,104	1,097	1,104
Hudson Valley	495	503	458	422	421	476	497	480	520	502
Millwood	1,315	1,320	1,315	1,315	1,315	1,319	1,315	1,314	1,315	1,318
Dunwoodie	0	0	0	0	0	0	0	0	0	0
NY City	4,035	3,880	3,724	3,539	3,567	3,966	3,838	4,080	3,988	4,118
Long Island	5,246	5,091	4,874	4,790	4,675	4,916	4,843	4,920	4,931	4,990
NYCA Total	20,845	19,915	18,385	18,135	19,339	21,647	21,653	22,291	22,353	22,584

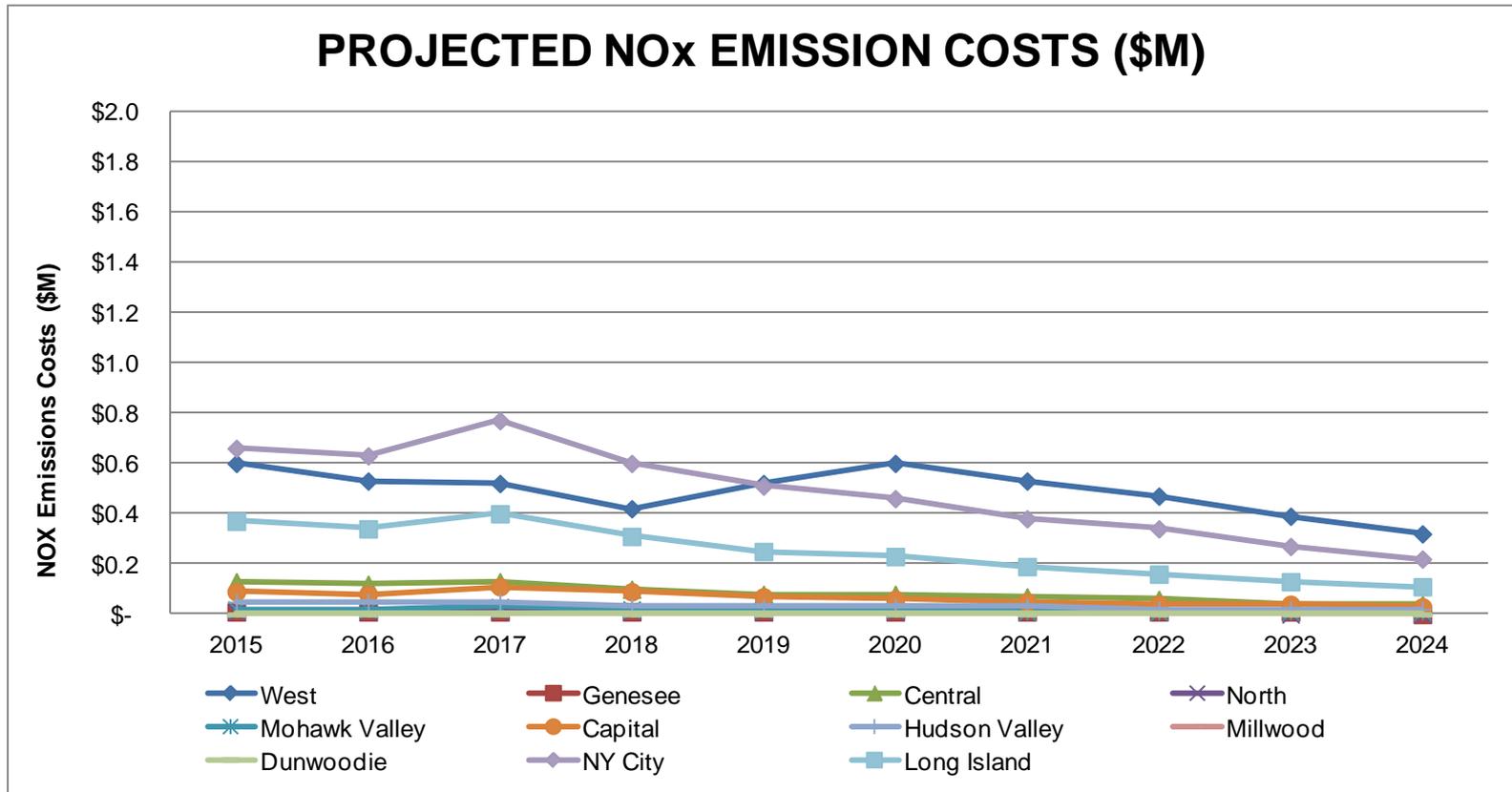
Projected NO_x Emissions (Tons)



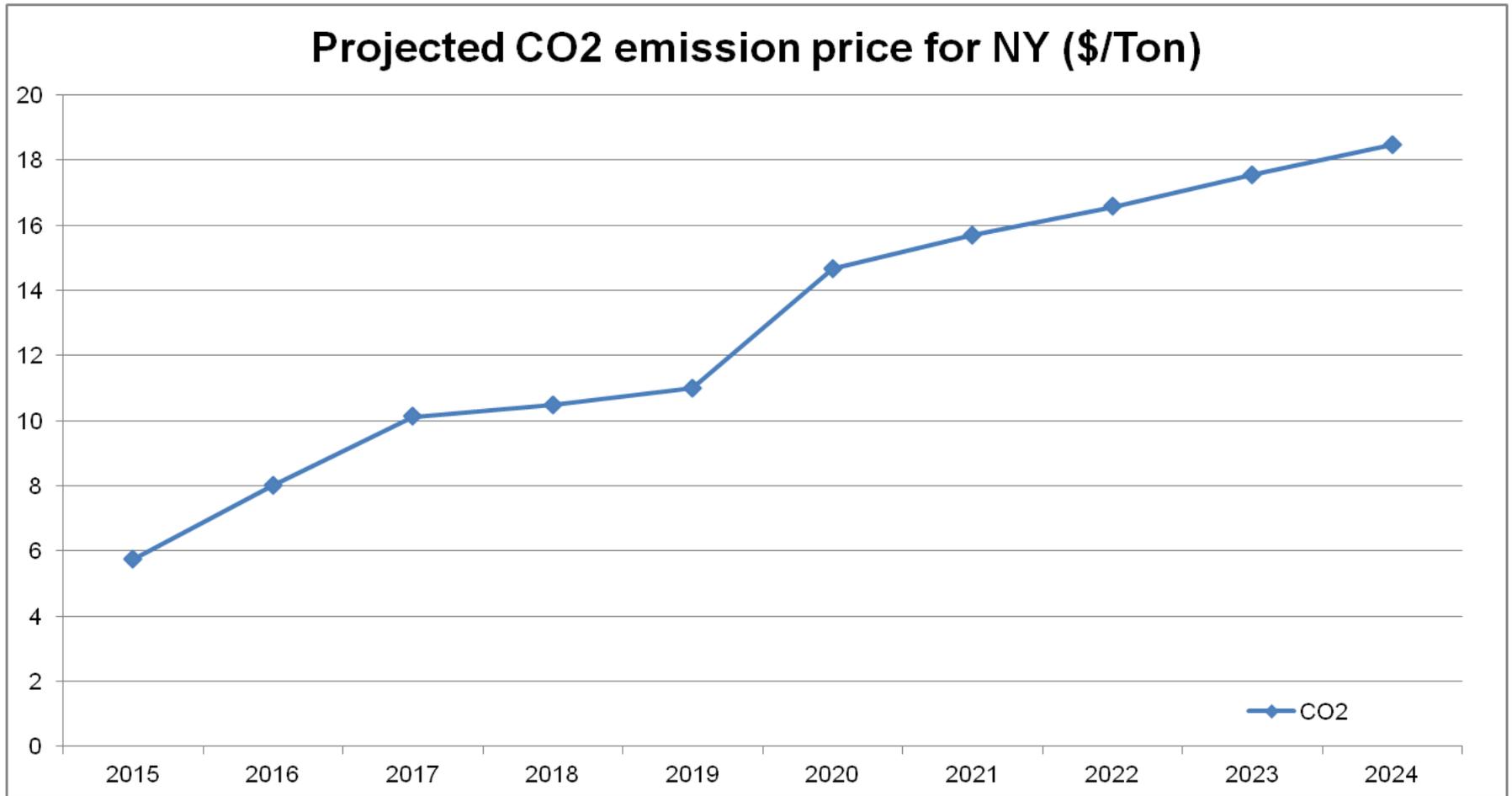
Projected NO_x Emission Costs (\$M)

NO _x Emissions Costs (\$M)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	\$0.6	\$0.5	\$0.5	\$0.4	\$0.5	\$0.6	\$0.5	\$0.5	\$0.4	\$0.3
Genesee	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Central	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$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	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Capital	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.0	\$0.0	\$0.0
Hudson Valley	\$0.1	\$0.1	\$0.1	\$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	\$0.7	\$0.6	\$0.8	\$0.6	\$0.5	\$0.5	\$0.4	\$0.3	\$0.3	\$0.2
Long Island	\$0.4	\$0.3	\$0.4	\$0.3	\$0.3	\$0.2	\$0.2	\$0.2	\$0.1	\$0.1
NYCA Total	\$1.9	\$1.8	\$2.0	\$1.6	\$1.5	\$1.5	\$1.3	\$1.1	\$0.9	\$0.7

Projected NO_x Emission Costs (\$M)



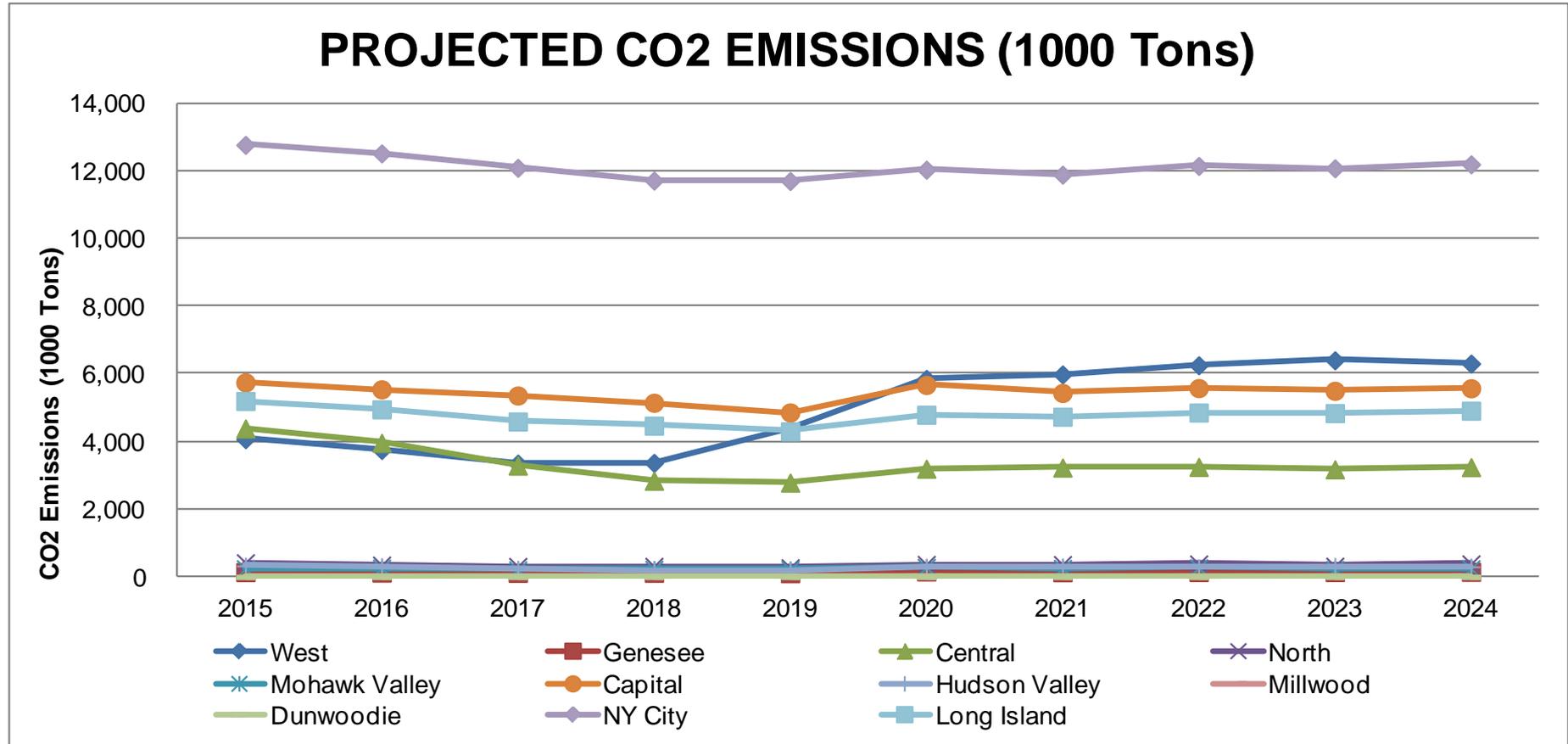
Emission Forecast



Projected CO₂ Emissions (1,000 Tons)

CO ₂ Emissions (1000 Tons)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	4,070	3,750	3,348	3,368	4,351	5,850	5,982	6,252	6,399	6,301
Genesee	142	127	119	122	109	160	138	145	144	151
Central	4,385	3,961	3,287	2,840	2,785	3,196	3,230	3,248	3,177	3,242
North	421	351	311	315	273	372	368	383	320	387
Mohawk Valley	245	261	209	226	214	283	255	271	222	244
Capital	5,746	5,541	5,359	5,145	4,859	5,670	5,434	5,578	5,498	5,573
Hudson Valley	324	310	234	190	187	288	301	274	317	298
Millwood	0	0	0	0	0	0	0	0	0	0
Dunwoodie	0	0	0	0	0	0	0	0	0	0
NY City	12,765	12,512	12,085	11,709	11,696	12,031	11,883	12,141	12,073	12,189
Long Island	5,198	4,951	4,591	4,469	4,301	4,792	4,732	4,856	4,839	4,910
NYCA Total	33,297	31,764	29,544	28,382	28,776	32,641	32,323	33,149	32,988	33,295

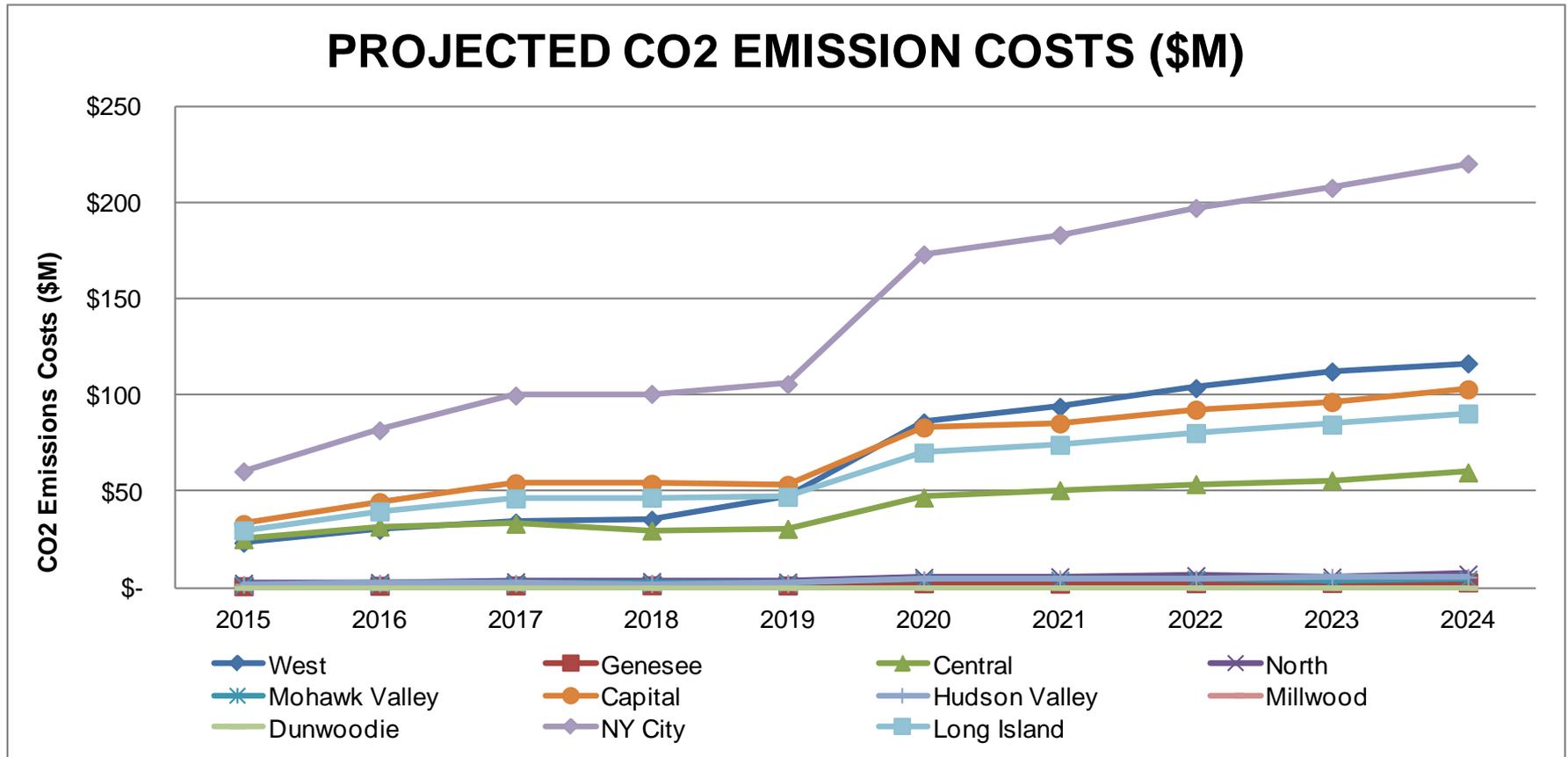
Projected CO₂ Emissions (1,000 Tons)



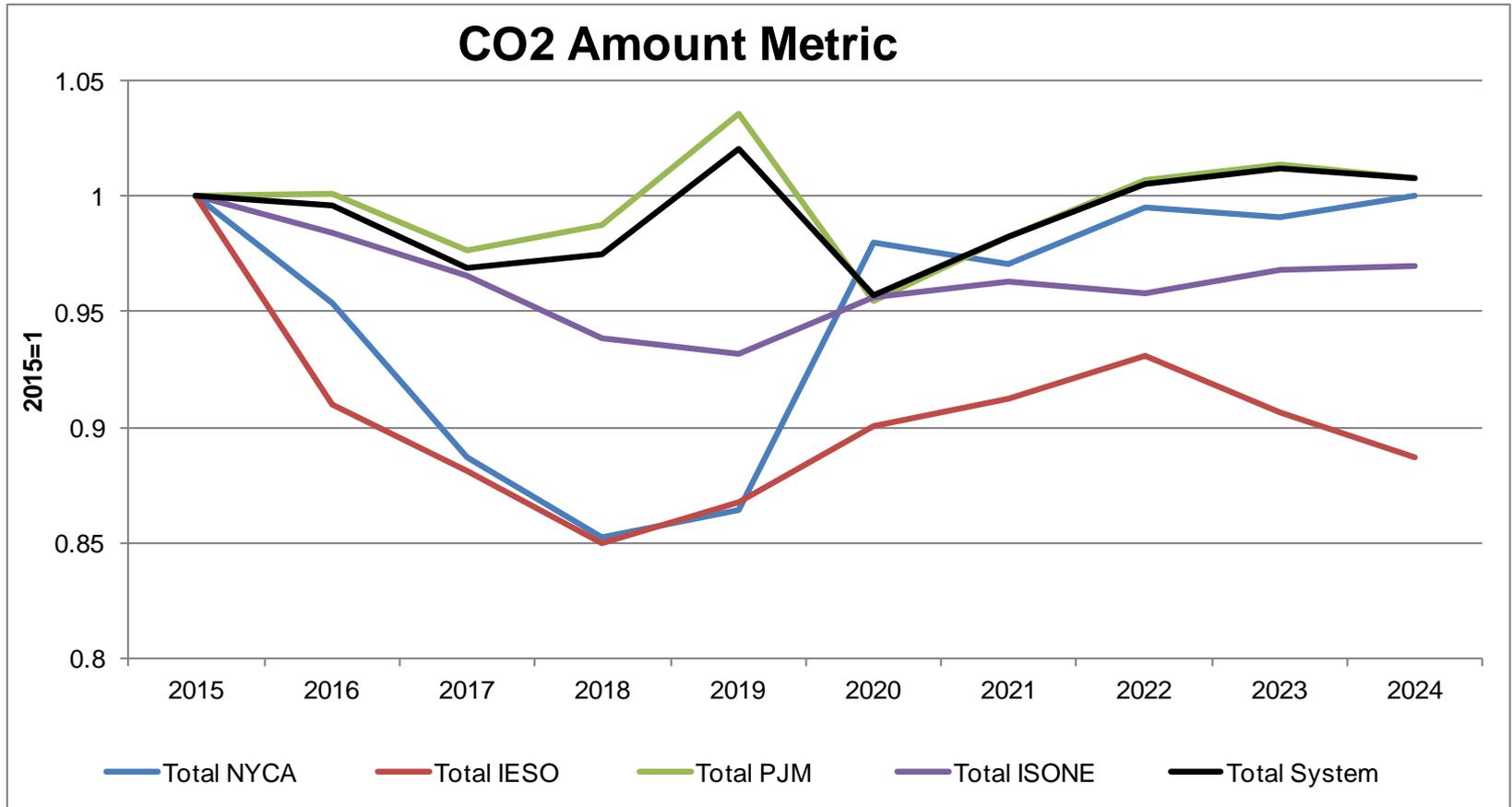
Projected CO₂ Emission Costs (\$M)

CO ₂ Emissions Costs (\$M)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
West	\$23.4	\$30.1	\$33.9	\$35.3	\$47.8	\$85.8	\$93.9	\$103.6	\$112.2	\$116.4
Genesee	\$0.8	\$1.0	\$1.2	\$1.3	\$1.2	\$2.3	\$2.2	\$2.4	\$2.5	\$2.8
Central	\$25.2	\$31.8	\$33.3	\$29.7	\$30.6	\$46.8	\$50.7	\$53.8	\$55.7	\$59.8
North	\$2.4	\$2.8	\$3.2	\$3.3	\$3.0	\$5.4	\$5.8	\$6.3	\$5.6	\$7.2
Mohawk Valley	\$1.4	\$2.1	\$2.1	\$2.4	\$2.3	\$4.2	\$4.0	\$4.5	\$3.9	\$4.5
Capital	\$33.0	\$44.4	\$54.2	\$53.9	\$53.4	\$83.2	\$85.3	\$92.4	\$96.4	\$103.0
Hudson Valley	\$1.9	\$2.5	\$2.4	\$2.0	\$2.1	\$4.2	\$4.7	\$4.5	\$5.6	\$5.5
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	\$60.4	\$81.7	\$99.7	\$100.6	\$105.7	\$173.0	\$183.1	\$197.1	\$207.5	\$220.1
Long Island	\$29.8	\$39.6	\$46.4	\$46.8	\$47.2	\$70.2	\$74.2	\$80.3	\$84.7	\$90.4
NYCA Total	\$178.3	\$236.0	\$276.3	\$275.3	\$293.3	\$475.2	\$503.8	\$545.0	\$574.1	\$609.8

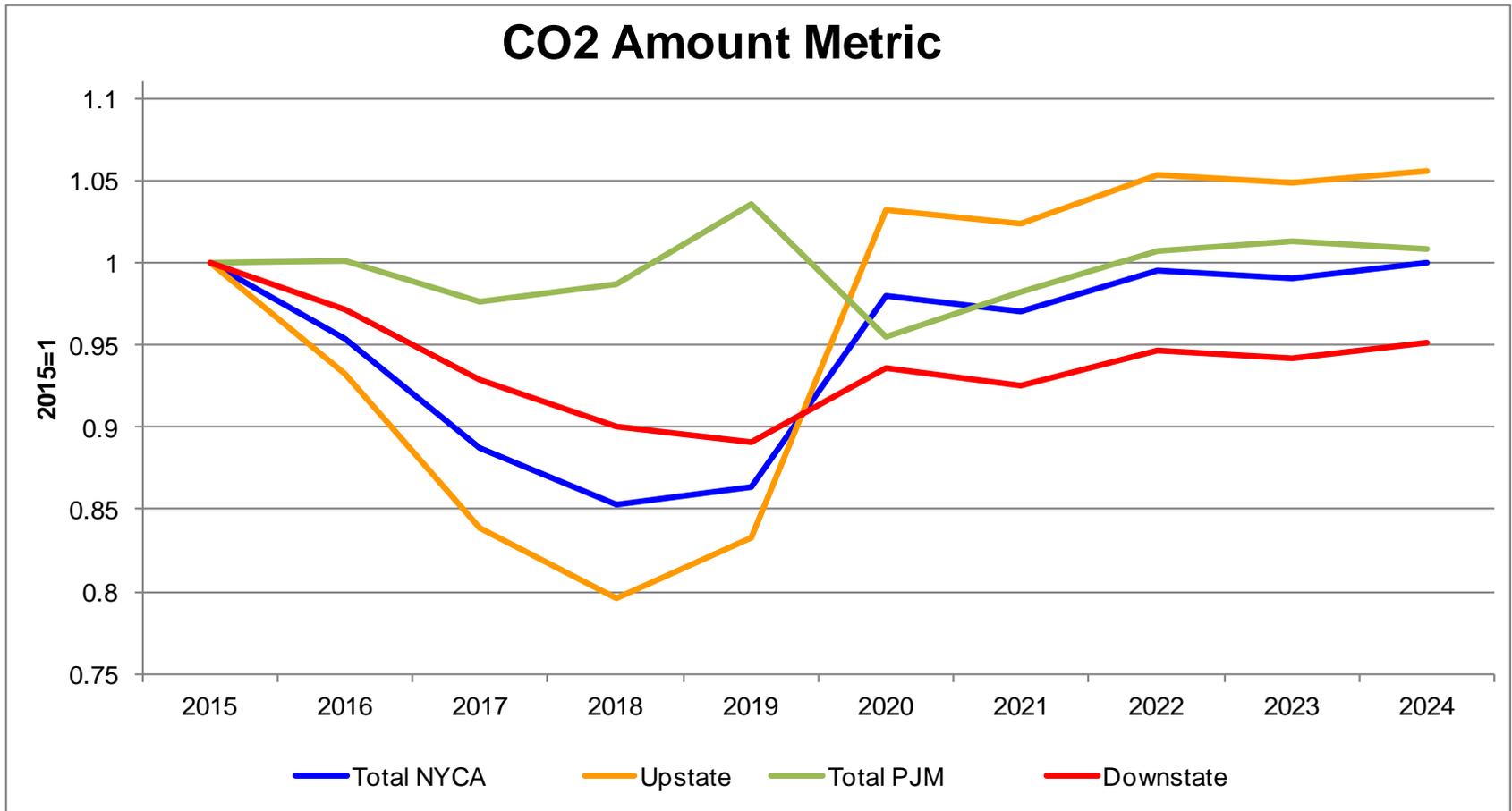
Projected CO₂ Emission Costs (\$M)



Projected CO₂ Emissions



Projected CO₂ Emissions



Next steps

- ◆ **Grouping and relaxation of constraints**
- ◆ **Designation of study interfaces**
- ◆ **Proposed generic solutions**
- ◆ **Presentation of scenario results**

The New York Independent System Operator (NYISO) is a not-for-profit corporation responsible for operating the state's bulk electricity grid, administering New York's competitive wholesale electricity markets, conducting comprehensive long-term planning for the state's electric power system, and advancing the technological infrastructure of the electric system serving the Empire State.



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