Assumptions Matrix for 2021-2040 System & Resource Outlook

Draft for Discussion at April 1, 2022 ESPWG

New York ISO

Preliminary Assumptions in Capacity Expansion Model for Policy Reference Case

Existing Generation	Consistent with Policy Case production cost simulation database, noting that the model simulates optimal retirement decisions which may differ from production cost database.
Existing Generation FOM Costs	Fixed O&M costs for existing generators assumed per 2018 documentation for EPA Platform. Chapter 4: Generating Resources
Existing Generation Properties	Firm capacity (i.e., UCAP) values based on 2016-2020 historic values, as used in 2020 RNA base case.
Energy Demand & Profile	Energy Forecast based on 2021 Load & Capacity Data Report ("Gold Book") CLCPA Case Forecast of Annual Energy, with modifications to account for the following: • 10 GW BTM-PV by 2030 CLCPA target, • Removal of impact from energy storage resources, and • Smoothed annual electrification forecasts through 2040, maintaining the original forecast for 2040. **Outlook CLCPA Case Annual Energy Forecast - GWh** **Outlook CLCPA Case Peak Forecasts - MW** Each year is represented by 17 load blocks. For each year, 16 of the load blocks are represented by slicing hours of the year by season (Spring, Summer, Fall, Winter) and time of day (overnight, morning, afternoon, evening) and one load block per year represents a period of peak load hours. The seasonal/time of day blocks are based on 2018 NREL ReEDS documentation and the peak load hours are based on the input hourly load data.

Year	Base Shape	BTM PV	EV	Electrification	Annual Energy
2021	149,637	-3,577	612	5,022	151,694
2022	147,128	-4,461	878	6,088	149,633
2023	144,774	-5,478	1,176	7,094	147,566
2024	142,723	-6,487	1,543	8,096	145,875
2025	139,863	-7,483	1,922	10,402	144,704
2026	138,459	-8,433	2,430	12,731	145,187
2027	137,196	-9,318	3,111	15,131	146,120
2028	136,515	-10,066	3,878	17,587	147,914
2029	135,185	-10,684	4,674	20,076	149,251
2030	133,856	-11,068	5,488	22,633	150,909
2031	133,122	-11,325	6,373	25,368	153,538
2032	132,810	-11,526	7,313	28,491	157,088
2033	131,801	-11,694	8,230	33,199	161,536
2034	131,239	-11,846	9,249	38,171	166,813
2035	130,775	-11,983	10,322	43,452	172,566
2036	130,766	-12,100	11,415	48,963	179,044
2037	130,000	-12,204	12,577	54,954	185,327
2038	129,646	-12,300	13,795	61,440	192,581
2039	129,322	-12,378	15,048	68,243	200,235
2040	129,178	-12,454	16,361	75,594	208,679

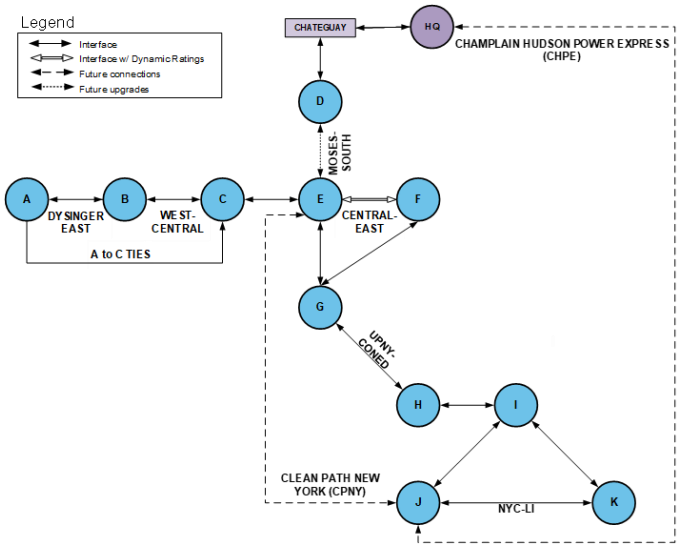
Year	Summer Peak	Winter Peak
2021	32,111	25,303
2022	31,978	25,428
2023	31,785	25,631
2024	31,590	25,788
2025	31,679	26,491
2026	32,056	27,258
2027	32,541	28,343
2028	33,155	29,410
2029	33,820	30,527
2030	34,416	31,717
2031	35,200	33,095
2032	36,091	34,503
2033	37,318	36,802
2034	38,644	39,206
2035	40,033	41,681
2036	41,429	44,288
2037	43,058	47,130
2038	44,738	50,350
2039	46,479	53,641
2040	48,253	57,144

Existing Transmission

Nodal to zonal reduction performed by PLEXOS to create a pipe-and-bubble equivalent model, where intra-zonal lines are collapsed.

Voltage and stability limited interface limits consistent with Policy Case production cost simulation database. Thermally limited pipe limits set to sum of thermal normal ratings of each interface line (N-0 normal limit).

Applicable N-X contingencies modeled explicitly in production cost simulation.



Years	Interface/Interzonal Pipes	+ Limit (MW)	- Limit (MW)	Source
All	DYSINGER EAST	2,700	*	2020 ATR
All	A to C Ties	550	0	2021 CRP limit
All	WEST-CENTRAL	1,475	*	2020 ATR
2021-2024	MOSES-SOUTH	3,050	-1,500	1/2015 Ops study stability limit [1]
2025-2040	MOSES-SOUTH	4,050	-1,500	Tier 4 contract [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	DUNWOODI-NYC	*	*	
All	DUNWOODI-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]

New Generation Types

Updated to include units with financial contracts, including state sponsored programs, per firm builds as noted in large-scale renewable projects reported by NYSERDA. Specific generation added to the Contract Case was assumed firm build in the Policy Case.

Updated to include units to support achievement of state and federal policies, per 2021 EIA Energy Outlook. Capacity expansion is limited to the NYCA, where each zone assumes one candidate generator per technology.

Generation types from 2021 EIA Energy Outlook Table 3 assumed in model:

land based wind

offshore wind

utility PV

4-hour battery storage

In addition to the generator types noted above, Dispatchable Emission Free Resource (DEFR) has been added as a candidate technology type for years 2030 and beyond, with additional details below.

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New Generation Costs

Overnight (capital) costs, fixed O&M, and variable O&M costs assumed per 2021 EIA Energy Outlook.

Overnight costs, fixed O&M and variable O&M costs for Dispatchable Emission Free Resource (DEFR) options will represent a range of costs and are still under consideration. Preliminary costs for the Dispatchable Emission Free Resource (DEFR) options are:

Candidate Capacity Expansion Technology	Capital Cost ($/kW)	Variable O&M Costs ($/MWh)	Fuel Cost ($/mmBtu)	Heat Rate (mmBtu/MWh)
High Operating/Low Capital	1,000	16	40	6.37
Medium Operating/Medium Capital	4,500	9	23	6.37
Low Operating/High Capital	8,000	2	5	6.37

Regional multipliers assumed for candidate generators by zone are based on the 2021 EIA Energy Outlook and the Climate Action Council Integration Analysis Assumptions (Accessed Assumptions at https://climate.ny.gov/Climate-Resources December 10, 2021). Regional multipliers assumed for candidate battery storage units are based on the 2021 EIA Energy Outlook and 2021-2025 Demand Curve Reset.

Candidate Technology	Base Capital	Zonal Multiplier for Capital Costs										
		A	B	C	D	E	F	G	H	I	J	K
Utility PV	1,248	1.05	1.04	1.04	1.01	1.01	1.04	1.20	-	-	-	1.39
Land based wind	1,846	0.98	0.96	1.02	1.06	1.03	1.06	1.14	-	-	-	-
Offshore wind	4,362	-	-	-	-	-	-	-	-	-	1.01	1.01
4-hour battery storage	1,165	1.00	1.00	1.00	1.00	1.00	1.01	1.02	1.02	1.02	1.28	1.10

Technological optimism factors applied to capital costs per NREL 2020-ATB-data.

Candidate Technology	Technology Optimism Factors by Year				
	2020	2025	2030	2035	2040
Utility PV	1	0.81	0.62	0.59	0.56
Land based wind	1	0.90	0.79	0.75	0.71
Offshore wind	1	0.81	0.70	0.63	0.59
4-hour battery storage	1	0.69	0.56	0.53	0.49

New Generation Properties	Unit heat rates per 2021 EIA Energy Outlook. The heat rates for the Dispatchable Emission Free Resource (DEFR) option are consistent with the combined cycle technology option in the 2021 EIA Energy Outlook. The Dispatchable Emission Free Resource (DEFR) technologies are modeled as flexible resources with parameters consistent with the combined cycle technology option in the 2021 EIA Energy Outlook. Linear capacity expansion by technology-zone. Maximum allowable capacities are enforced for applicable generator types based on 2040 limitations, per Appendix G: Annex 1: Inputs and Assumptions of the Climate Action Council Draft Scoping Plan. The firm capacity (i.e., UCAP) values for the Dispatchable Emission Free Resource (DEFR) option are consistent with the combined cycle technology option, based on default derating factor value from the NERC GADS database. Firm capacity values for Land based wind, offshore wind, utility PV, and battery storage units are modeled as having a declining capacity value as a function of that generator type's installed capacity. These values are based on the 2020 Grid in Evolution Study.
New Transmission	Transmission expansion not enabled in PLEXOS as a modeling option. New policy-based transmission projects included: -NYPA Northern New York Priority Transmission Project -Champlain Hudson Power Express -Clean Path New York
Capacity Reserve Margin	Capacity reserve margins (IRM and LCRs) for 2021-2022 Capability Year translated to UCAP equivalent for model years, per NYISO ICAP to UCAP translation. The minimum capacity reserve margin for the G-J Locality assumes a 10% reduction in its requirement due to future impacts from AC Transmission. Minimum UCAP requirements by capacity zone are as follows: • NYCA: 110.11% summer, 110.56% winter • Zones G-J: 84.43% summer, 83.69% winter model years 2021-2023, 74.43% summer, 73.69% winter model years 2024-2040 • Zone J: 78.14% summer, 78.31% winter • Zone K: 97.85% summer, 95.48% winter
Policy Targets and Other Model Constraints	CLCPA targets and other state policy mandates modeled include: • 6 GW BTM-PV by 2025 • 70% renewable energy by 2030 • 3 GW energy storage by 2030 • 10 GW BTM-PV by 2030 • 9 GW offshore wind by 2035 • 100% emission free by 2040 As noted above, maximum allowable capacities are enforced for applicable generator types by zone based on 2040 limitations, per Appendix G: Annex 1: Inputs and Assumptions of the Climate Action Council Draft Scoping Plan.

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