Assumptions Matrix for 2021-2040 System & Resource Outlook

Final Draft for Discussion at June 8th, 2022 ESPWG

Parameter	Reference Case Model		
	Base Case	Contract Case	Policy Case
NYCA System Model			
Assumption Lock Down Date	11/1/2021	12/1/2021	4/1/2022
Peak Load	Based on 2021 Load & Capacity Data Report ("Gold Book") Baseline Forecast of Non-Coincident Peak Demand, including impacts of statewide Energy Efficiency programs	Based on 2021 Load & Capacity Data Report ("Gold Book") Baseline Forecast of Non-Coincident Peak Demand, including impacts of statewide Energy Efficiency programs	Peak load forecast consistent with scenario S1 and S2 capacity expansion load forecast model
Energy Forecast	Energy Forecast based on 2021 Load & Capacity Data Report ("Gold Book") Baseline Forecast of Annual Energy, including impacts of statewide Energy Efficiency programs	Energy Forecast based on 2021 Load & Capacity Data Report ("Gold Book") Baseline Forecast of Annual Energy, including impacts of statewide Energy Efficiency programs	Energy forecast consistent with scenario S1 and S2 capacity expansion load forecast model
Capacity Expansion Load Shape Model	2002 Load Shape	2002 Load Shape	2002 Load Shape and additional modifications for policy
Load Uncertainty Model	Only base level forecast utilized; the impact of energy or peak forecasts may be utilized in scenarios	Only base level forecast utilized; the impact of energy or peak forecasts may be utilized in scenarios	Only base level forecast utilized; the impact of energy or peak forecasts may be utilized in scenarios
Generating Unit Capacities	Updated to reflect 2021 Gold Book winter and summer DMNC values	Updated to reflect 2021 Gold Book winter and summer DMNC values	Updated to reflect 2021 Gold Book winter and summer DMNC values

New Resources	Updated as per 2021 Gold Book (Application of inclusion rules identified in Reliability Planning Process Manual, Section 3.2 and NYISO procedures)	Updated as per 2021 Gold Book (Application of inclusion rules identified in Reliability Planning Process Manual, Section 3.2 and NYISO procedures) Generation projects with financial contracts, including state sponsored programs, included.	Updated as per 2021 Gold Book (Application of inclusion rules identified in Reliability Planning Process Manual, Section 3.2 and NYISO procedures) Generation projects with financial contracts, including state sponsored programs, included. Generation resources to support achievement of state and potential federal policies included per capacity expansion model and consistent with capacity expansion scenario S1 and S2 results.
Wind Resource Modeling	Units and capacities updated as per 2021 Gold Book. Existing wind resources are modeled based on unit capacities and actual 2019 shapes. New units modeled based on proximate existing units.	Units and capacities updated as per 2021 Gold Book. Existing wind resources are modeled based on unit capacities and actual 2019 shapes. New units modeled based on proximate existing units or using calculated shapes.	Units and capacities updated as per 2021 Gold Book. Existing wind resources are modeled based on unit capacities and actual 2019 shapes. New units modeled based on proximate existing units or using calculated shapes. For capacity expansion wind resources, zonal to nodal placements done on buses from Interconnection Queue. Resource shapes were obtained based on NREL simulated data at the zonal level.
Solar Resource Modeling	Units and capacities updated as per 2021 Gold Book. Existing solar resources are modeled based on unit capacities and actual 2019 shapes. New units modeled based on proximate existing units.	Units and capacities updated as per 2021 Gold Book. Existing solar resources are modeled based on unit capacities and actual 2019 shapes. New units modeled based on proximate existing units or using calculated shapes.	For capacity expansion solar resources, zonal to nodal placements done on buses from Interconnection Queue. Resource shapes were obtained based on NREL simulated data at the zonal level.
Offshore Wind Resource Modeling	n/a	The hourly shapes for OSW generators are based on NREL data; contracted projects are based on clustered site level data and candidates for generation expansion are based on zonal data.	The hourly shapes for OSW generators are based on NREL data; contracted projects are based on clustered site level data and candidates for generation expansion are based on zonal data.

Renewable Energy Credits (REC) prices	REC prices modeled as negative bid adders for existing contracted generators.	REC prices modeled as negative bid adders for newly contracted and existing contracted generators.	REC prices modeled as negative bid adders for newly contracted and existing contracted generators. Future renewable generation REC prices modeled as average of fixed REC prices by technology type. • Solar Fixed REC Price = $20/MWh • Wind Fixed REC Price = $22/MWh ORECs modeled as an equivalent fixed REC for existing and future Offshore Wind projects. • Future OSW Fixed OREC Model = $49/MWh. Specific OSW Fixed ORECs for contracted projects calculated as presented in slide 17 of Feb 25th ESPWG presentation for 'System & Resource Outlook Update'. No REC price modeled for existing imports in Zone D from HQ. Tier 4 project modeled with contracted REC price of $17.50 for Champlain Hudson Power Express.
Non-NYPA Hydro Capacity Modeling	Updated as per 2021 Gold Book; unit output is modeled consistent with historic levels.	Updated as per 2021 Gold Book; unit output is modeled consistent with historic levels.	Updated as per 2021 Gold Book; unit output is modeled consistent with historic levels.
Special Case Resources	Not utilized in MAPS production cost modeling; may be incorporated in ICAP Metric calculation	Not utilized in MAPS production cost modeling; may be incorporated in ICAP Metric calculation	Not utilized in MAPS production cost modeling; may be incorporated in ICAP Metric calculation
EDRP Resources	N/A for production cost modeling	N/A for production cost modeling	N/A for production cost modeling
External Capacity – Purchases and Wheel-Through	Flows across schedulable and non-schedulable transmission lines are based on economics.	Flows across schedulable and non-schedulable transmission lines are based on economics.	Flows across schedulable and non-schedulable transmission lines are based on economics.

Facility Deactivation and Retirements	Updated as per 2021 Gold Book (Application of inclusion rules identified in Reliability Planning Process Manual, Section 3.2 and NYISO procedures)	Updated as per 2021 Gold Book (Application of inclusion rules identified in Reliability Planning Process Manual, Section 3.2 and NYISO procedures)	Updated as per 2021 Gold Book (Application of inclusion rules identified in Reliability Planning Process Manual, Section 3.2 and NYISO procedures) S1- Deactivations as per capacity expansion scenario S1 outputs S2- Deactivations as per capacity expansion scenario S2 outputs, age-based fossil retirements for applicable units assumed per Climate Action Council Appendix D (ST at 62 years and GT at 47 years of age)
Generator Outages	Scheduled to levelize reserves, as per the maintenance schedules in long term adequacy studies.	Scheduled to levelize reserves, as per the maintenance schedules in long term adequacy studies.	Scheduled to levelize reserves, as per the maintenance schedules in long term adequacy studies.
Gas Turbines Ambient Derate	Modeling utilizes summer and winter DMNC ratings for all units.	Modeling utilizes summer and winter DMNC ratings for all units.	Modeling utilizes summer and winter DMNC ratings for all units.
Environmental Modeling and Emission Allowance Price Forecasts	Allowance costs based on projected RGGI costs and New York Department of Environmental Conservation guidance. SO_2 and NOx Allowance Prices reflect CSAPR markets.	Allowance costs based on projected RGGI costs and New York Department of Environmental Conservation guidance. SO_2 and NOx Allowance Prices reflect CSAPR markets.	Allowance costs based on projected RGGI costs and New York Department of Environmental Conservation guidance. SO_2 and NOx Allowance Prices reflect CSAPR markets. Additional policy-based environmental programs may be modeled.
Commitment and Dispatch Options **Operating Reserves**	Each Balancing Authority commits separately Hurdle Rates are employed for commitment and dispatch... Operating Reserves as per NYCA requirements.	Each Balancing Authority commits separately Hurdle Rates are employed for commitment and dispatch... Operating Reserves as per NYCA requirements.	Each Balancing Authority commits separately Hurdle Rates are employed for commitment and dispatch... Operating Reserves as per NYCA requirements.

Fuel Price Forecast	Annual bases updated to more heavily weighted recent trends. Seasonality and spikes based on five-year history (2016-2020). Calculated natural price forecasts based on blends of hub price forecasts for four hubs (A-E, F-I, J and K). Utilized unit capacities and reported pricing hubs to weight price forecasts. Fuel oil and coal price forecasts are developed utilizing the EIA's annual forecast of national delivered prices. Regional bases are derived using EIA Form 923 data.	Annual bases updated to more heavily weighted recent trends. Seasonality and spikes based on five-year history (2016-2020). Calculated natural price forecasts based on blends of hub price forecasts for four hubs (A-E, F-I, J and K). Utilized unit capacities and reported pricing hubs to weight price forecasts. Fuel oil and coal price forecasts are developed utilizing the EIA's annual forecast of national delivered prices. Regional bases are derived using EIA Form 923 data. .	Annual bases updated to more heavily weighted recent trends. Seasonality and spikes based on five-year history (2016-2020). Calculated natural price forecasts based on blends of hub price forecasts for four hubs (A-E, F-I, J and K). Utilized unit capacities and reported pricing hubs to weight price forecasts. Fuel oil and coal price forecasts are developed utilizing the EIA's annual forecast of national delivered prices. Regional bases are derived using EIA Form 923 data.
Cost Curve Development (including heat rates and emission rates)	Unit heat rates (and emission rates) developed from vendor supplied data, USEPA CAMD fuel input and emissions data matched with NYISO production data for NYCA and USEIA production data for non NYCA units.	Unit heat rates (and emission rates) developed from vendor supplied data, USEPA CAMD fuel input and emissions data matched with NYISO production data for NYCA and USEIA production data for non NYCA units.	Unit heat rates (and emission rates) developed from vendor supplied data, USEPA CAMD fuel input and emissions data matched with NYISO production data for NYCA and USEIA production data for non NYCA units. New technology heat and emission rates developed based upon vendor or publicly available data.
Local Reliability Rules	List and develop appropriate nomograms. Fuel burn restrictions, operating restrictions and exceptions, commitment/dispatch limits.	List and develop appropriate nomograms. Fuel burn restrictions, operating restrictions and exceptions, commitment/dispatch limits.	List and develop appropriate nomograms. Fuel burn restrictions, operating restrictions and exceptions, commitment/dispatch limits. Must-run generation requirements were not replaced as affected generators were retired.

Energy Storage **Gilboa PSH** **Lewiston PSH**	Battery energy storage resources dispatched optimally using zonal load on a daily basis. Gilboa and Lewiston scheduled against NYCA load profile.	Battery energy storage resources dispatched optimally using zonal net load on a daily basis. Gilboa and Lewiston scheduled against NYCA load profile.	Battery energy storage resources dispatched optimally using zonal net load on a daily basis. Gilboa and Lewiston scheduled against NYCA load profile. For capacity expansion storage resources, capacity is based on results from capacity expansion S1 and S2. The resources are dispatched optimally against upstate and downstate zonal load profiles depending on where the resources are located.
Renewable Energy Credit (REC) Bid Modelling	Existing and contracted land-based wind, offshore wind, and solar projects per NYSERDA large scale renewables database specified REC contract price. Index RECs adjusted by premium to equivalent fixed REC.	Existing and contracted land-based wind, offshore wind, and solar projects per NYSERDA large scale renewables database specified REC contract price. Index RECs adjusted by premium to equivalent fixed REC.	Existing and contracted land-based wind, offshore wind, and solar projects per NYSERDA large scale renewables database specified REC contract price. Index RECs adjusted by premium to equivalent fixed REC. Capacity expansion units: Solar - $20/MWh Land Based Wind - $22/MWh Offshore Wind - $49/MWh
Transmission System Model			
Power Flow Cases	As per RPP or STRP.	As per RPP or STRP	As per RPP or STRP

Interface Limits **Monitored - Contingency Pairs**	Internal NYCA line, interface and contingency limits updated consistent with Reliability Planning Process and market and grid operation practices.	Internal NYCA line, interface and contingency limits updated consistent with Reliability Planning Process and market and grid operation practices.	Internal NYCA line, interface and contingency limits updated consistent with Reliability Planning Process and market and grid operation practices.
Nomograms **Joint, Grouping** **Unit Sensitive Voltage**	Contingency pairs are expanded to include monitored constraints and contingency pairs either observed in historical market operation or identified in planning and operation studies. Also coordinate with the Transmission Owners to incorporate the Transmission Owners' Local Transmission Owner Plans and model the non-BPTF portion of the New York State Transmission System. Interface voltage limits modeled as per latest Benchmark model. Data from the results of external planning studies, vendor-supplied data, operational voltage studies, operational limits, transfer limit analysis for critical interfaces utilized to update transmission model for external regions as required.	Contingency pairs are expanded to include monitored constraints and contingency pairs either observed in historical market operation or identified in planning and operation studies. Also coordinate with the Transmission Owners to incorporate the Transmission Owners' Local Transmission Owner Plans and model the non-BPTF portion of the New York State Transmission System. Data from the results of external planning studies, vendor-supplied data, operational voltage studies, operational limits, transfer limit analysis for critical interfaces utilized to update transmission model for external regions as required. Contracted resources and transmission impact captured	Contingency pairs are expanded to include monitored constraints and contingency pairs either observed in historical market operation or identified in planning and operation studies. Also coordinate with the Transmission Owners to incorporate the Transmission Owners' Local Transmission Owner Plans and model the non-BPTF portion of the New York State Transmission System. Data from the results of external planning studies, vendor-supplied data, operational voltage studies, operational limits, transfer limit analysis for critical interfaces utilized to update transmission model for external regions as required. Impact of Resource and transmission under contract as well as driven by policy are captured.

New Transmission Capability	Updated as per 2021 Gold Book and latest Reliability Planning Process. (Application of base case inclusion rules)	Updated as per 2021 Gold Book. (Application of base case inclusion rules)	Updated as per 2021 Gold Book. (Application of base case inclusion rules) New policy-based transmission projects included: NYPA Northern New York Priority Transmission Project (-0MW, +1000MW on Moses South Interface) in 2025 Champlain Hudson Power Express (-0MW, 1250MW) – modeled as fixed profile in Zone J in 2025 Clean Path New York Clean Path New York HVDC (-0MW, +1300MW) in 2027
Internal Controllable Lines (PARs, HVDC, VFT)	Optimized in simulation consistent with operating protocols and agreements, as appropriate.	Optimized in simulation consistent with operating protocols and agreements, as appropriate.	Optimized in simulation consistent with operating protocols and agreements, as appropriate.
External System Model			
External Area Models **Fuel Forecast**	Power flow data from RPP and/or STRP, "production" data developed by NYISO with vendor and neighbor input. Linked with NYCA forecast.	Power flow data from RPP and/or STRP, "production" data developed by NYISO with vendor and neighbor input. Linked with NYCA forecast.	Power flow data from RPP and/or STRP, "production" data developed by NYISO with vendor and neighbor input. Linked with NYCA forecast.
External Capacity **Demand Forecast**	Neighboring systems updated in August 2021. PJM generation fleet updated based PJM New Services Queue. ISO-NE generation fleet updated based CELT filings. IESO generation fleet based on publicly available reports.	Neighboring systems updated in August 2021. PJM generation fleet updated based PJM New Services Queue. ISO-NE generation fleet updated based CELT filings. IESO generation fleet based on publicly available reports.	Neighboring systems updated in August 2021. PJM generation fleet updated based PJM New Services Queue. ISO-NE generation fleet updated based CELT filings. IESO generation fleet based on publicly available reports.

System Representation	HQ modeled as fixed hourly schedule, synchronized with all other external injections. Full Representation/Participation: NYISO ISONE IESO PJM Classic & AP, AEP, CE, DLCO, DAY, VP, EKPC Proxy Bus Injection: HQ-NYISO, HQ-NE-ISO, NB-NEISO, HQ – IESO Transmission Only/Zeroed Out: MECS, FE, SPP, MAR, NIPS, OVEC, TVA, FRCC, SERC, ERCOT, WECC	HQ modeled as fixed hourly schedule, synchronized with all other external injections. Full Representation/Participation: NYISO ISONE IESO PJM Classic & AP, AEP, CE, DLCO, DAY, VP, EKPC Proxy Bus Injection: HQ-NYISO, HQ-NE-ISO, NB-NEISO, HQ – IESO Transmission Only/Zeroed Out: MECS, FE, SPP, MAR, NIPS, OVEC, TVA, FRCC, SERC, ERCOT, WECC	HQ modeled as fixed hourly schedule, synchronized with all other external injections. Full Representation/Participation: NYISO ISONE IESO PJM Classic & AP, AEP, CE, DLCO, DAY, VP, EKPC Proxy Bus Injection: HQ-NYISO, HQ-NE-ISO, NB-NEISO, HQ – IESO Transmission Only/Zeroed Out: MECS, FE, SPP, MAR, NIPS, OVEC, TVA, FRCC, SERC, ERCOT, WECC

External Controllable Lines (PARs, HVDC, VFT, Radial lines)	B and C modeled as out of service. Current JOA modeled under these outage conditions. Western ties to carry 46% of PJM-NYISO AC Interchange + 20% of RECO Load 5018 line to carry 32% of PJM-NYISO AC Interchange + 80% of RECO Load PAR A to carry 7% of PJM-NYISO AC Interchange PAR J-K to carry 15% of PJM-NYISO AC Interchange Norwalk (-200MW, +200MW) L33,34 (-300MW, +300MW) PV20 (0MW, +150MW) Neptune (0MW, +660MW) CSC (0MW, +330MW) CSC and Neptune optimized subject to "cost of use" HTP (0, 660) Linden VFT (-315,315)	B and C modeled as out of service. Current JOA modeled under these outage conditions. Western ties to carry 46% of PJM-NYISO AC Interchange + 20% of RECO Load 5018 line to carry 32% of PJM-NYISO AC Interchange + 80% of RECO Load PAR A to carry 7% of PJM-NYISO AC Interchange PAR J-K to carry 15% of PJM-NYISO AC Interchange Norwalk (-200MW, +200MW) L33,34 (-300MW, +300MW) PV20 (0MW, +150MW) Neptune (0MW, +660MW) CSC (0MW, +330MW) CSC and Neptune optimized subject to "cost of use" HTP (0, 660) Linden VFT (-315,315)	B and C modeled as out of service. Current JOA modeled under these outage conditions. Western ties to carry 46% of PJM-NYISO AC Interchange + 20% of RECO Load 5018 line to carry 32% of PJM-NYISO AC Interchange + 80% of RECO Load PAR A to carry 7% of PJM-NYISO AC Interchange PAR J-K to carry 15% of PJM-NYISO AC Interchange Norwalk (-200MW, +200MW) L33,34 (-300MW, +300MW) PV20 (0MW, +150MW) Neptune (0MW, +660MW) CSC (0MW, +330MW) CSC and Neptune optimized subject to "cost of use" HTP (0, 660) Linden VFT (-315,315)