

# **Assumptions Matrix for 2021-2040 System & Resource Outlook**

## **Draft for Discussion at Oct. 25, 2021 ESPWG**

Parameter	Reference Case Model		
	Base Case	Contract Case (Preliminary)	Policy Case (Preliminary)
<b>NYCA System Model</b>			
<b>Assumption Lock Down Date</b>	11/1/2021	TBD	TBD
<b>Peak Load</b>	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	Based on 2021 Load & Capacity Data Report (“Gold Book”) Forecast. Impacts of statewide policy programs that impact load included
<b>Energy Forecast</b>	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 based on 2021 Load & Capacity Data Report (“Gold Book”) Baseline Forecast of Annual Energy, including impacts of statewide Energy Efficiency programs and other potential modifications for policy
<b>Load Shape Model</b>	2002 Load Shape	2002 Load Shape	2002 Load Shape and additional modifications for policy
<b>Load Uncertainty Model</b>	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
<b>Generating Unit Capacities</b>	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
<b>New Resources</b>	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 described below.

<b>Wind Resource Modeling</b>	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.
<b>Non-NYPA Hydro Capacity Modeling</b>	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.
<b>Special Case Resources</b>	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
<b>EDRP Resources</b>	N/A for production cost modeling	N/A for production cost modeling	N/A for production cost modeling
<b>External Capacity – Purchases and Wheel-Through</b>	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.
<b>Facility Deactivation and Retirements</b>	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)  Policy based unit deactivation may be considered.
<b>Generator Outages</b>	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.
<b>Gas Turbines Ambient Derate</b>	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.

<b>Environmental Modeling and Emission Allowance Price Forecasts</b>	<p>Allowance costs based on projected RGGI costs and New York Department of Environmental Conservation guidance. SO<sub>2</sub> and NO<sub>x</sub> Allowance Prices reflect CSAPR markets.</p>	<p>Allowance costs based on projected RGGI costs and New York Department of Environmental Conservation guidance. SO<sub>2</sub> and NO<sub>x</sub> Allowance Prices reflect CSAPR markets.</p>	<p>Allowance costs based on projected RGGI costs and New York Department of Environmental Conservation guidance. SO<sub>2</sub> and NO<sub>x</sub> Allowance Prices reflect CSAPR markets.</p> <p>Additional policy-based environmental programs may be modeled.</p>
<b>Commitment and Dispatch Options</b>  <b>Operating Reserves</b>	<p>Each Balancing Authority commits separately</p> <p>Hurdle Rates are employed for commitment and dispatch...</p> <p>Operating Reserves as per NYCA requirements.</p>	<p>Each Balancing Authority commits separately</p> <p>Hurdle Rates are employed for commitment and dispatch...</p> <p>Operating Reserves as per NYCA requirements.</p>	<p>Each Balancing Authority commits separately</p> <p>Hurdle Rates are employed for commitment and dispatch...</p> <p>Operating Reserves as per NYCA requirements.</p>
<b>Fuel Price Forecast</b>	<p>Annual bases updated to more heavily weighted recent trends.</p> <p>Seasonality and spikes based on five-year history (2016-2020).</p> <p>Calculated natural price forecasts based on blends of hub price forecasts for four hubs (A-E, F-I, J and K).</p> <p>Utilized unit capacities and reported pricing hubs to weight price forecasts.</p> <p>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.</p>	<p>Annual bases updated to more heavily weighted recent trends.</p> <p>Seasonality and spikes based on five-year history (2016-2020).</p> <p>Calculated natural price forecasts based on blends of hub price forecasts for four hubs (A-E, F-I, J and K).</p> <p>Utilized unit capacities and reported pricing hubs to weight price forecasts.</p> <p>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.</p>	<p>Annual bases updated to more heavily weighted recent trends.</p> <p>Seasonality and spikes based on five-year history (2016-2020).</p> <p>Calculated natural price forecasts based on blends of hub price forecasts for four hubs (A-E, F-I, J and K).</p> <p>Utilized unit capacities and reported pricing hubs to weight price forecasts.</p> <p>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.</p>

<b>Cost Curve Development (including heat rates and emission rates)</b>	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.
<b>Local Reliability Rules</b>	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.
<b>Energy Storage Gilboa PSH Lewiston PSH</b>	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.
<b>Transmission System Model</b>			
<b>Power Flow Cases</b>	As per RPP or STRP.	As per RPP or STRP	As per RPP or STRP

<p><b>Interface Limits</b></p> <p><b>Monitored - Contingency Pairs</b></p> <p><b>Nomograms</b></p> <p><b>Joint, Grouping</b></p> <p><b>Unit Sensitive Voltage</b></p>	<p>Internal NYCA line, interface and contingency limits updated consistent with Reliability Planning Process and market and grid operation practices.</p> <p>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.</p> <p>Interface voltage limits modeled as per latest Benchmark model.</p> <p>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.</p>	<p>Internal NYCA line, interface and contingency limits updated consistent with Reliability Planning Process and market and grid operation practices.</p> <p>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.</p> <p>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.</p> <p>Contracted resources and transmission impact captured</p>	<p>Internal NYCA line, interface and contingency limits updated consistent with Reliability Planning Process and market and grid operation practices.</p> <p>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.</p> <p>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.</p> <p>Impact of Resource and transmission under contract as well as driven by policy are captured.</p>
<p><b>New Transmission Capability</b></p>	<p>Updated as per 2021 Gold Book and latest Reliability Planning Process. (Application of base case inclusion rules)</p>	<p>Updated as per 2021 Gold Book. (Application of base case inclusion rules)</p> <p>New contracted transmission resources considered</p>	<p>Updated as per 2021 Gold Book. (Application of base case inclusion rules)</p> <p>New contracted and policy transmission resources considered</p>
<p><b>Internal Controllable Lines (PARs, HVDC, VFT)</b></p>	<p>Optimized in simulation consistent with operating protocols and agreements, as appropriate.</p>	<p>Optimized in simulation consistent with operating protocols and agreements, as appropriate.</p>	<p>Optimized in simulation consistent with operating protocols and agreements, as appropriate.</p>
<p><b>External System Model</b></p>			

<p><b>External Area Models</b></p> <p><b>Fuel Forecast</b></p>	<p>Power flow data from RPP and/or STRP, “production” data developed by NYISO with vendor and neighbor input.</p> <p>Linked with NYCA forecast.</p>	<p>Power flow data from RPP and/or STRP, “production” data developed by NYISO with vendor and neighbor input.</p> <p>Linked with NYCA forecast.</p>	<p>Power flow data from RPP and/or STRP, “production” data developed by NYISO with vendor and neighbor input.</p> <p>Linked with NYCA forecast.</p>
<p><b>External Capacity</b></p> <p><b>Demand Forecast</b></p>	<p>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.</p>	<p>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.</p>	<p>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.</p>
<p><b>System Representation</b></p>	<p>HQ modeled as fixed hourly schedule, synchronized with all other external injections.</p> <p>Full Representation/Participation:          NYISO          ISONE          IESO          PJM Classic &amp; AP, AEP, CE, DLCO, DAY, VP, EKPC          Proxy Bus Injection:          HQ-NYISO, HQ-NE-ISO, NB-NEISO, HQ – IESO</p> <p>Transmission Only/Zeroed Out:          MECS, FE, SPP, MAR, NIPS, OVEC, TVA, FRCC, SERC, ERCOT, WECC</p>	<p>HQ modeled as fixed hourly schedule, synchronized with all other external injections.</p> <p>Full Representation/Participation:          NYISO          ISONE          IESO          PJM Classic &amp; AP, AEP, CE, DLCO, DAY, VP, EKPC          Proxy Bus Injection:          HQ-NYISO, HQ-NE-ISO, NB-NEISO, HQ – IESO</p> <p>Transmission Only/Zeroed Out:          MECS, FE, SPP, MAR, NIPS, OVEC, TVA, FRCC, SERC, ERCOT, WECC</p>	<p>HQ modeled as fixed hourly schedule, synchronized with all other external injections.</p> <p>Full Representation/Participation:          NYISO          ISONE          IESO          PJM Classic &amp; AP, AEP, CE, DLCO, DAY, VP, EKPC          Proxy Bus Injection:          HQ-NYISO, HQ-NE-ISO, NB-NEISO, HQ – IESO</p> <p>Transmission Only/Zeroed Out:          MECS, FE, SPP, MAR, NIPS, OVEC, TVA, FRCC, SERC, ERCOT, WECC</p>

<p><b>External Controllable Lines (PARs, HVDC, VFT, Radial lines)</b></p>	<p>B and C modeled as out of service. Current JOA modeled under these outage conditions.</p> <p>Western ties to carry 46% of PJM-NYISO AC Interchange + 20% of RECO Load</p> <p>5018 line to carry 32% of PJM-NYISO AC Interchange + 80% of RECO Load</p> <p>PAR A to carry 7% of PJM-NYISO AC Interchange</p> <p>PAR J-K to carry 15% of PJM-NYISO AC Interchange</p> <p>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”</p> <p>HTP (0, 660) Linden VFT (-315,315)</p>	<p>B and C modeled as out of service. Current JOA modeled under these outage conditions.</p> <p>Western ties to carry 46% of PJM-NYISO AC Interchange + 20% of RECO Load</p> <p>5018 line to carry 32% of PJM-NYISO AC Interchange + 80% of RECO Load</p> <p>PAR A to carry 7% of PJM-NYISO AC Interchange</p> <p>PAR J-K to carry 15% of PJM-NYISO AC Interchange</p> <p>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”</p> <p>HTP (0, 660) Linden VFT (-315,315)</p> <p>New contracted and policy transmission resources considered.</p>	<p>B and C modeled as out of service. Current JOA modeled under these outage conditions.</p> <p>Western ties to carry 46% of PJM-NYISO AC Interchange + 20% of RECO Load</p> <p>5018 line to carry 32% of PJM-NYISO AC Interchange + 80% of RECO Load</p> <p>PAR A to carry 7% of PJM-NYISO AC Interchange</p> <p>PAR J-K to carry 15% of PJM-NYISO AC Interchange</p> <p>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”</p> <p>HTP (0, 660) Linden VFT (-315,315)</p> <p>New contracted and policy transmission resources considered.</p>
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## Preliminary Assumptions in Capacity Expansion Model for Policy Case

<b>Existing Generation</b>	Consistent with Policy case as noted above
<b>Existing Generation Costs</b>	Fixed O&M costs for existing generators assumed per 2018 documentation for <a href="#">EPA Platform, Chapter 4: Generating Resources</a>
<b>Existing Generation Properties</b>	Firm capacity (i.e., UCAP) values based on 2016-2020 historic values, as used in 2020 RNA base case.
<b>Energy Demand &amp; Profile</b>	Energy Forecast based on 2021 Load & Capacity Data Report (“Gold Book”) Baseline Forecast of Annual Energy, including impacts of statewide Energy Efficiency programs. Each year is represented by 16 load blocks by slicing hours of the year by season and time of day. Block are based on 2018 NREL ReEDS documentation.
<b>Existing Transmission</b>	Nodal to zonal reduction performed by PLEXOS to create a pipe-and-bubble equivalent model, where intra-zonal lines are collapsed.  Interface limits consistent with Policy case as noted above.
<b>New Generation Types</b>	Updated to include units with financial contract, including state sponsored programs, per firm builds as noted in <a href="#">large-scale renewable projects reported by NYSERDA</a> .  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 EIA Energy Outlook Table 3 assumed in model: Land based wind Offshore wind Utility PV 4-hour battery storage Combined Cycle Combined Cycle with 90% CCS Nuclear Internal combustion engine Combustion turbine
<b>New Generation Costs</b>	Overnight costs, fixed O&M, variable O&M costs, and regional multipliers assumed per 2021 EIA Energy Outlook.  Technological optimism factors per 2020 NREL ATB database.

<b>New Generation Properties</b>	<p>Unit heat rates per 2021 EIA Energy Outlook.</p> <p>Linear capacity expansion by technology-zone. Maximum allowable capacities are enforced for applicable generator types, per Table 7 of Climate Change Impact Phase II.</p> <p>Firm capacity (i.e., UCAP) values based on default derating factor values. NERC GADS database and ICAP Manual, as applicable to generator type.</p>
<b>New Transmission</b>	<p>Transmission expansion not enabled.</p> <p>New policy based transmission projects with included:</p> <ul style="list-style-type: none"> <li>-<a href="#">NYPA Northern New York Priority Transmission Project</a></li> <li>-<a href="#">Champlain Hudson Power Express</a></li> <li>-<a href="#">Clean Path New York</a></li> </ul>
<b>Capacity Reserve Margin</b>	<p>Capacity reserve margins (IRM and LCRs) for 2021-2022 Capability Year translated to UCAP equivalent for model years</p>
<b>Policy Targets and Other Model Constraints</b>	<p>CLCPA targets modeled:</p> <ul style="list-style-type: none"> <li>• 6 GW BTM-PV by 2025</li> <li>• 70% renewable energy by 2030</li> <li>• 3 GW energy storage by 2030</li> <li>• 10 GW BTM-PV by 2030</li> <li>• 9 GW offshore wind by 2035</li> <li>• 100% - emission free by 2040</li> </ul>