

Assumptions Matrix for 2021-2040 System & Resource Outlook

Draft for Discussion at Jan. 25, 2022 ESPWG

Preliminary Assumptions in Capacity Expansion Model for Policy

Reference Case

Existing Generation	Consistent with Policy Case production cost simulation database, <u>noting that the model simulates optimal retirement decisions which may differ from production cost database.</u>
Existing Generation 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	<p>Energy Forecast based on 2021 Load & Capacity Data Report (“Gold Book”) CLCPA Case Forecast of Annual Energy, <u>with modifications to account for the following:</u></p> <ul style="list-style-type: none"> • <u>10 GW BTM-PV by 2030 CLCPA target.</u> • <u>Removal of impact from energy storage resources, and</u> • <u>Smoothed annual electrification forecasts through 2040, maintaining the original forecast for 2040.</u> <p>Each year is represented by <u>17</u> load blocks. <u>For each year, 16 of the load blocks are represented</u> by slicing hours of the year by season (Spring, Summer, Fall, Winter) and time of day (overnight, morning, afternoon, evening) <u>and one load block 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.</u></p>
Existing Transmission	<p>Nodal to zonal reduction performed by PLEXOS to create a pipe-and-bubble equivalent model, where intra-zonal lines are collapsed to a single “pipe”.</p> <p>Voltage and stability limited interface limits consistent with Policy Case production cost simulation database. Thermally limited interface limits set to sum of thermal normal ratings of each interface line (N-0 normal limit). Applicable N-X contingencies modeled specifically in production cost simulation.</p>

<p>New Generation Types</p>	<p>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.</p> <p>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.</p> <p>Generation types from 2021 EIA Energy Outlook Table 3 assumed in model:</p> <ul style="list-style-type: none"> Land based wind Offshore wind Utility PV 4-hour battery storage Combined Cycle Combined Cycle with 90% CCS Nuclear Internal combustion engine Combustion turbine <p>In addition to the generator types noted above, Dispatchable Emission Free Resource (DEFR) has been added as a candidate technology type, with additional details below.</p>																																																																																																																																													
<p>New Generation Costs</p>	<p>Overnight (capital) costs, fixed O&M, and variable O&M costs assumed per 2021 EIA Energy Outlook.</p> <p>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.</p> <p>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).</p> <table border="1" data-bbox="358 1226 1471 1509"> <thead> <tr> <th rowspan="2">Candidate Technology</th> <th rowspan="2">Base Capital Cost (2020\$/kW)</th> <th colspan="11">Zonal Multiplier for Capital Costs</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> <th>G</th> <th>H</th> <th>I</th> <th>J</th> <th>K</th> </tr> </thead> <tbody> <tr> <td>Combined Cycle</td> <td>957</td> <td>1.47</td> <td>1.47</td> <td>1.47</td> <td>1.47</td> <td>1.47</td> <td>1.47</td> <td>1.67</td> <td>1.67</td> <td>1.67</td> <td>2.05</td> <td>1.91</td> </tr> <tr> <td>Combined Cycle with 90% CCS</td> <td>2,471</td> <td>1.03</td> <td>1.03</td> <td>1.03</td> <td>1.03</td> <td>1.03</td> <td>1.03</td> <td>1.03</td> <td>1.03</td> <td>1.03</td> <td>1.20</td> <td>1.20</td> </tr> <tr> <td>Internal combustion engine</td> <td>1,813</td> <td>1.05</td> <td>1.05</td> <td>1.05</td> <td>1.05</td> <td>1.05</td> <td>1.05</td> <td>1.05</td> <td>1.05</td> <td>1.05</td> <td>1.37</td> <td>1.37</td> </tr> <tr> <td>Combustion turbine</td> <td>709</td> <td>1.01</td> <td>1.01</td> <td>1.01</td> <td>1.01</td> <td>1.01</td> <td>1.48</td> <td>1.53</td> <td>1.53</td> <td>1.53</td> <td>1.91</td> <td>1.65</td> </tr> <tr> <td>Nuclear</td> <td>6,183</td> <td>1.07</td> <td>1.07</td> <td>1.07</td> <td>1.07</td> <td>1.07</td> <td>1.07</td> <td>1.07</td> <td>1.07</td> <td>1.07</td> <td>1.47</td> <td>1.47</td> </tr> <tr> <td>Utility PV</td> <td>1,248</td> <td>1.05</td> <td>1.04</td> <td>1.04</td> <td>1.01</td> <td>1.01</td> <td>1.04</td> <td>1.20</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Land based wind</td> <td>1,846</td> <td>1.02</td> <td>1.00</td> <td>1.06</td> <td>1.11</td> <td>1.07</td> <td>1.07</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Offshore wind</td> <td>4,362</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>1.01</td> <td>1.01</td> </tr> <tr> <td>4-hour battery storage</td> <td>1,165</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.03</td> <td>1.03</td> </tr> </tbody> </table> <p>Technological optimism factors per NREL 2020-ATB-data.</p>	Candidate Technology	Base Capital Cost (2020\$/kW)	Zonal Multiplier for Capital Costs											A	B	C	D	E	F	G	H	I	J	K	Combined Cycle	957	1.47	1.47	1.47	1.47	1.47	1.47	1.67	1.67	1.67	2.05	1.91	Combined Cycle with 90% CCS	2,471	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.20	1.20	Internal combustion engine	1,813	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.37	1.37	Combustion turbine	709	1.01	1.01	1.01	1.01	1.01	1.48	1.53	1.53	1.53	1.91	1.65	Nuclear	6,183	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.47	1.47	Utility PV	1,248	1.05	1.04	1.04	1.01	1.01	1.04	1.20	-	-	-	-	Land based wind	1,846	1.02	1.00	1.06	1.11	1.07	1.07	-	-	-	-	-	Offshore wind	4,362	-	-	-	-	-	-	-	-	-	1.01	1.01	4-hour battery storage	1,165	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.03
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New Generation Properties	<p>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.</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. The firm capacity values for the Dispatchable Emission Free Resource (DEFR) option are consistent with the Combined Cycle technology option.</p> <p>As a sensitivity for the capacity expansion model, generators could be modeled as having a declining capacity value as a function of that generator type's installed capacity.</p>
New Transmission	<p>Transmission expansion not enabled in PLEXOS as a modeling option.</p> <p>New policy-based transmission projects included:</p> <ul style="list-style-type: none"> -NYPA Northern New York Priority Transmission Project -Champlain Hudson Power Express -Clean Path New York
Capacity Reserve Margin	<p>Capacity reserve margins (IRM and LCRs) for 2021-2022 Capability Year translated to UCAP equivalent for model years, per NYISO ICAP to UCAP translation.</p> <p>Minimum UCAP requirements by capacity zone are as follows:</p> <ul style="list-style-type: none"> • NYCA: 110.11% • Zones G-J: 84.43% • Zone J: 78.14% • Zone K: 97.85%
Policy Targets and Other Model Constraints	<p>CLCPA targets and other state policy mandates modeled include:</p> <ul style="list-style-type: none"> • 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 <p>As noted above, maximum allowable capacities are enforced for applicable generator types by zone, per Table 7 of Climate Change Impact Phase II.</p>