

System & Resource Outlook Update

Economic Planning Department

Electric System Planning Working Group (ESPWG)

December 17th, 2021

Agenda

- **Outlook Study Status**
- **Reference Case Updates**
- **Capacity Expansion Modeling Details**
 - Proxy Technology Concept
 - Energy Storage Modelling
- **Next Steps**

Outlook Study Status

- **September – October 2021: Finalize reference case assumptions***
- **November - December 2021: Conduct simulations and analysis***
- **January - February 2022 : Complete analysis and finalize draft report***
- **March 2022: Seek Business Issues Committee and Management Committee review and approval**
- **April 2022: Seek Board of Director review and approval**

* Collaborate with ESPWG and seek stakeholder input

Reference Case Updates

Base Case Update

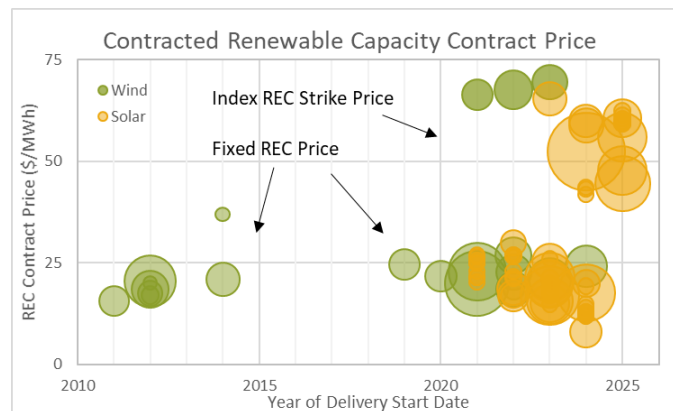
- Preliminary congestion results presented on 11/19 show significant congestion on Moses-Reynolds 115kV, primarily driven by the new North Country Data Center (NCDC) load

Demand Congestion (\$M)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
MOSES-REYNOLDS_115	-	-	-	-	-	0	43	43	49	53	52	56	63	70	86	89	102	117	133	156
CENTRAL EAST	594	276	114	23	4	0	1	6	1	3	1	2	2	5	4	6	6	7	3	1
DUNWOODIE TO LONG ISLAND	56	39	29	26	27	27	29	28	30	32	38	39	47	46	58	54	59	63	73	78

- Discussions w/ NYPA indicated that a System Impact Study has yet to be completed for the NCDC. The Outlook does not predetermine the results of interconnection studies, including how any reliability issues on the Moses-Reynolds 115kV path would be addressed and any related impacts on congestion.
- An updated Base Case simulation is being performed with Moses-Reynolds 115kV congestion removed, with results to be presented at next ESPWG

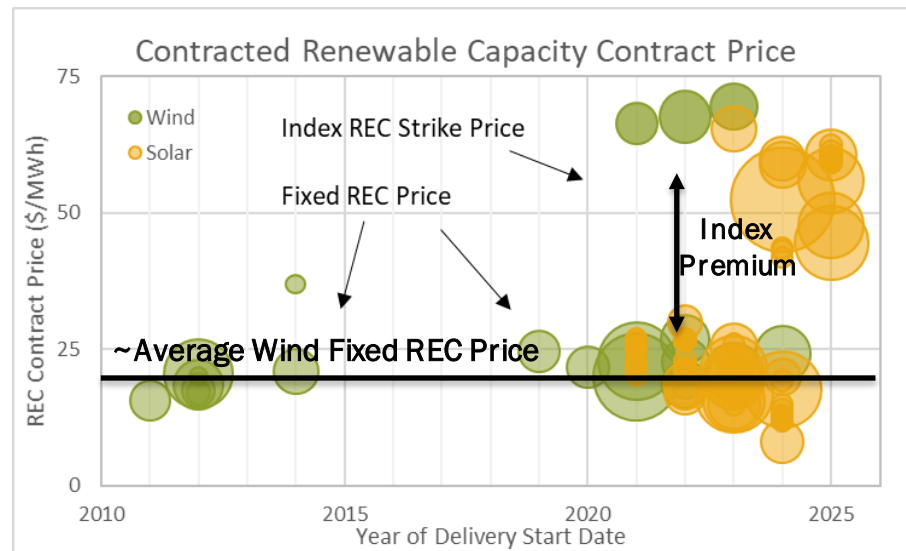
Contract Case Update

- Contract projects modeled and awaiting Base Case update
- At the previous ESPWG, Renewable Energy Credit (REC) data from the published assumptions document was presented (below) and further clarification was requested



REC Contract Prices and Modeling

- REC contract prices to be included as negative bid adder in the contract and policy case to represent impact of out of market payments
- Aggregate premium of Index REC Strike price to Fixed RECs would be used as proxy to represent negative bid adder for Index RECs



Production Cost Modeling of RECs

- Index RECs are difficult to model in production cost simulations and therefore the following bid values were used for fixed and index:

$$\textit{Modeled Fixed REC Bid} = -\textit{REC Price}$$

$$\textit{Modeled Index REC Bid} = -(\textit{Index Strike Price} - \textit{Average Fixed REC})$$

- Index REC bids are offset by the average fixed REC by generator type
- For example, if average wind fixed REC is \$21 and Wind Plant X index REC is \$60, modeled REC bid = $-(\$60 - \$21) = -\$39$
- Generally, REC bidding models only help to determine the appropriate curtailment order in production cost model

Policy Case

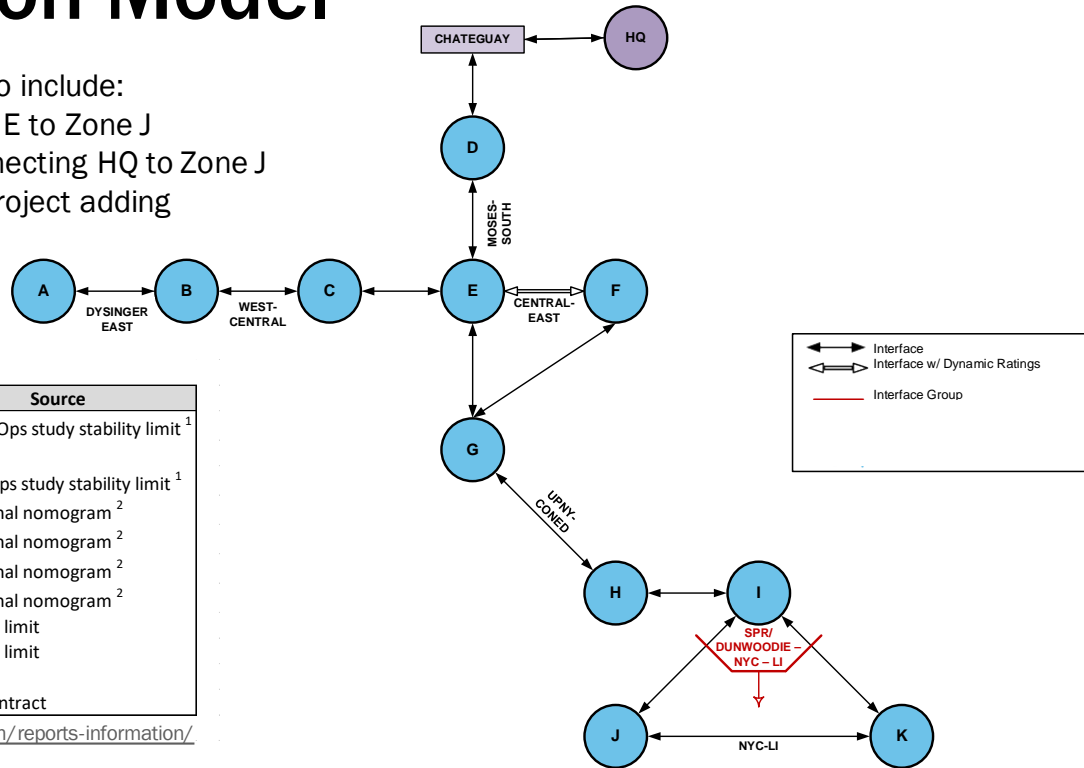
- **Capacity Expansion Modeling In-Progress**
 - ELCC Curves Being Created & Implemented
 - Proxy Technology Generators Being Modeled
- **Once complete, the NYISO will begin the iterative process of siting expansion generators and performing production cost simulations**

Capacity Expansion Modeling Details

Preliminary Pipe & Bubble Representation for Capacity Expansion Model

Note: The final Policy Case representation will also include:

- Clean Path New York (CPNY) connecting Zones E to Zone J
- Champlain Hudson Power Express (CHPE) connecting HQ to Zone J
- Northern New York Smart Path Transmission Project adding increase transfer capability to Moses South



Years	Interface/Interzonal Pipes	+ Limit (MW)	- Limit (MW)	Source
All	DYSINGER EAST	3,050	*	10/2021 Ops study stability limit ¹
All	WEST-CENTRAL	*	*	
All	MOSES-SOUTH	3,050	-1,500	1/2015 Ops study stability limit ¹
2021-2023	CENTRAL-EAST (summer)	2,380	-2,380	Operational nomogram ²
2021-2023	CENTRAL-EAST (winter)	2,615	-2,615	Operational nomogram ²
2024-2040	CENTRAL-EAST (summer)	3,255	-3,255	Operational nomogram ²
2024-2040	CENTRAL-EAST (winter)	3,490	-3,490	Operational nomogram ²
2021-2023	UPNY-CONED	6,150	*	2021 CRP limit
2024-2040	UPNY-CONED	6,525	*	2021 CRP limit
All	SPR/DUNWOODIE - NYC - LI	*	*	
All	NYC-LI	0	-350	Wheel contract

1: See "Interface Limits & Ops Studies" here: <https://www.nyiso.com/reports-information/>

2: Max Limit Applied Proportionally to Operational Nomogram:

<https://www.nyiso.com/documents/20142/3692791/Central-East%20Voltage-Collapse-Limit-Evaluation-FINAL.pdf/>

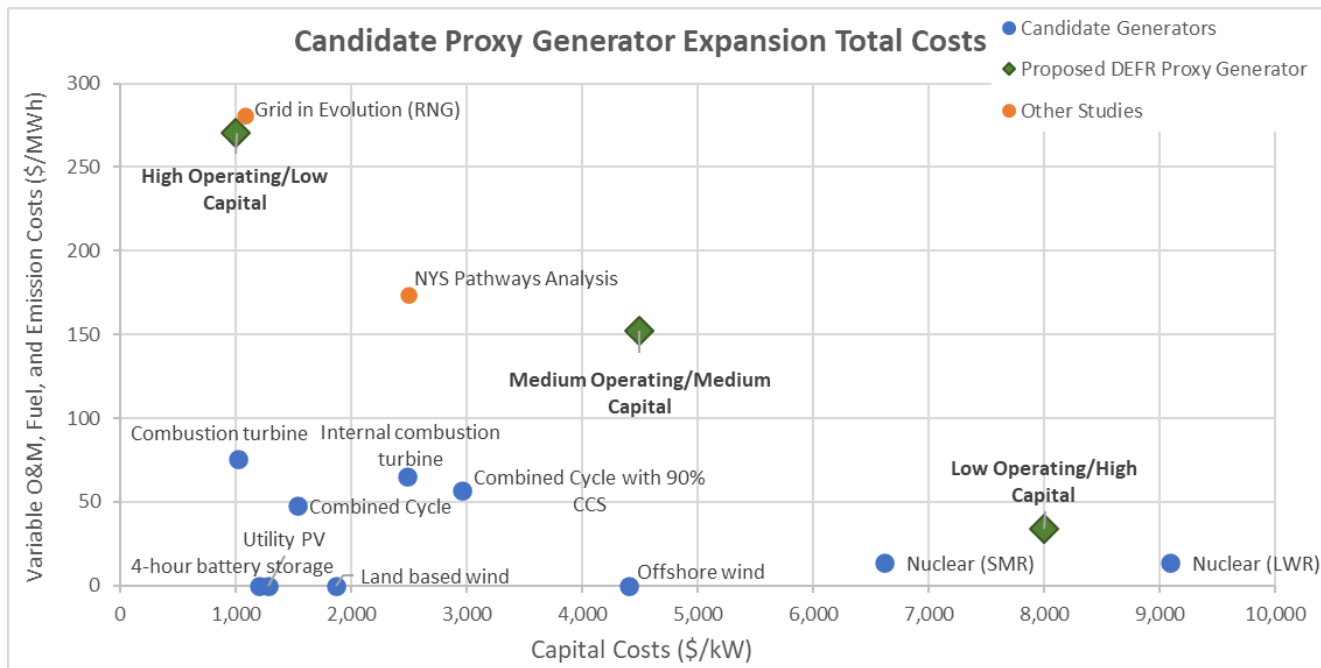
Proxy Technology Concept

- Existing technologies cannot solve for 100% by 2040 and future technology development and costs are difficult to quantify
- Future technologies that potentially produce carbon-free energy (e.g. hydrogen, RNG, nuclear) will have higher costs, limited production profiles (solar, wind, etc.) or both
- Studies have shown long term seasonal shift in peak load will require some form of long duration storage need well beyond the extent that 4-8 hour batteries can discharge
- The inclusion of a set of proxy resources in the capacity expansion model, which capture a range of costs, would allow the identification the desired resource characteristics to meet State targets
 - This is similar to the Dispatchable Emissions Free Resource (DEFR) concept used in the NYISO Climate Change Study

Proxy Technology Proposal

- The selection of specific proxy generators/DEFERs is a key assumption driving the resulting system cost and operation
- Cost data from other studies is limited, assumption based, highly uncertain, and difficult to compare across studies (orange values on next slide are estimated from studies)
- Fuel costs for the proxy generators are assumed based on publicly available data and the costs for other generators are assumed consistent with the fuel forecasts for the Outlook, as applicable to technology type
- Blue dots in the figure on the following slide represent the assumed variable O&M and capital costs of assumed national average generation from EIA
 - https://www.eia.gov/outlooks/aeo/assumptions/pdf/table_8.2.pdf
- Proxy generation set shown in green in the figure on the following slide span a high overall range with a blend of operating/capital costs
 - High capital cost & Low operating cost
 - Medium capital cost & Medium operating cost
 - Low capital cost & High operating cost
- The model will select among the proxy generators based on optimal cost and performance (consistent between proxy generators) outcomes. This will inform relative value of energy and capacity in future systems

Proxy Technology Proposal



Energy Storage Resource Modeling

- In the capacity expansion model, batteries are modeled similar to generators, except that they are modeled in the Battery category, which includes additional attributes specific to their technological capabilities
 - For example, attributes such as State of Charge, charge/discharge efficiencies, MWh capability, etc. are also assumed for batteries
- In the capacity expansion model, batteries can charge or discharge in each time slice up to their maximum MW rating
- The State of Charge is tracked at the beginning and end of each year (i.e. remain within its maximum and minimum State of Charge levels)
- The charge and discharge efficiencies are considered when tracking State of Charge for batteries
- In the capacity expansion model, batteries are assumed with a 4-hour duration, consistent with 2021 EIA Energy Outlook
 - The batteries are assumed to have charge and discharge efficiencies of 95%

Next Steps

Next Steps

■ Base Case

- Updated Results
- Relaxed Simulation Results

■ Contract Case

- Preliminary Results

■ Policy Case

- Capacity Expansion Preliminary Results Presentation

Questions, Feedback, Comments?

- Email additional feedback to: JFrasier@nyiso.com

2021 Outlook Data Catalog

May 20, 2021

Model Benchmark Results

September 22, 2021

System & Resource Outlook Update

October 25, 2021

Capacity Expansion Model Primer

System & Resource Outlook Update

November 19, 2021

System & Resource Outlook Update

December 19, 2021

System & Resource Outlook Update

Final Reports



Data Posted to ESPWG

Assumptions Matrix v1

Updated Capacity Expansion Assumptions Matrix

Contract Case Renewable Projects

Emissions Price Forecast

Fuel Price Forecast

ESPWG/TPAS Presentations

Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system

