A vertical image on the left side of the page showing a close-up of a white offshore wind turbine. The turbine has three blades and is mounted on a dark, cylindrical foundation in the ocean. The background is a deep blue with faint, light blue circuit-like patterns.

# Appendix [ ]: Capacity Benefits LOLE Reduction

## Long Island Offshore Wind Export Public Policy Transmission Need Evaluation

**A Report from the New York  
Independent System Operator**

DRAFT for April 25, 2023 ESPWG

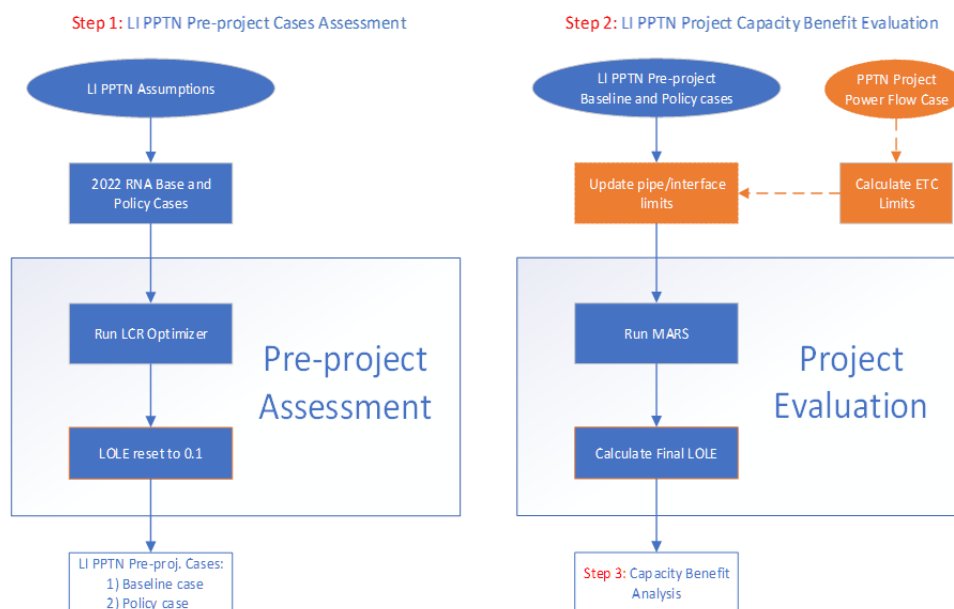
## Appendix [ ]: Capacity Benefits LOLE Reduction

### Overview of Methodology

The capacity benefit metric evaluates the incremental capacity benefits created by each proposed project. The methodology compares the pre- and post-project system resource adequacy to identify the reduction in the NYCA loss of load expectation (LOLE).<sup>1</sup> A greater reduction in the NYCA LOLE, compared to the pre-project case, indicates greater capacity benefits created by a proposed project.

The methodology is comprised of three major steps, as illustrated in Figure 1. The first step evaluates and resets the NYCA LOLE of the pre-project RNA base and policy cases (MARS cases) to criteria (*i.e.*, 0.1 event-days per year) using NYISO's LCR Optimizer. The second step models transmission changes specific to a project by adding new interzonal pipes and updating the Emergency Transfer Criteria (ETC) limits of the associated interfaces. MARS is then run on the modified RNA cases with the project to evaluate the change in NYCA LOLE. The third and final step involves calculating the annual capacity benefit of a project by applying a cost of reliability improvement (CRI) (\$/0.001 LOLE) to the change in NYCA LOLE brought by each project.

**Figure 1: Capacity Benefits Evaluation Process**

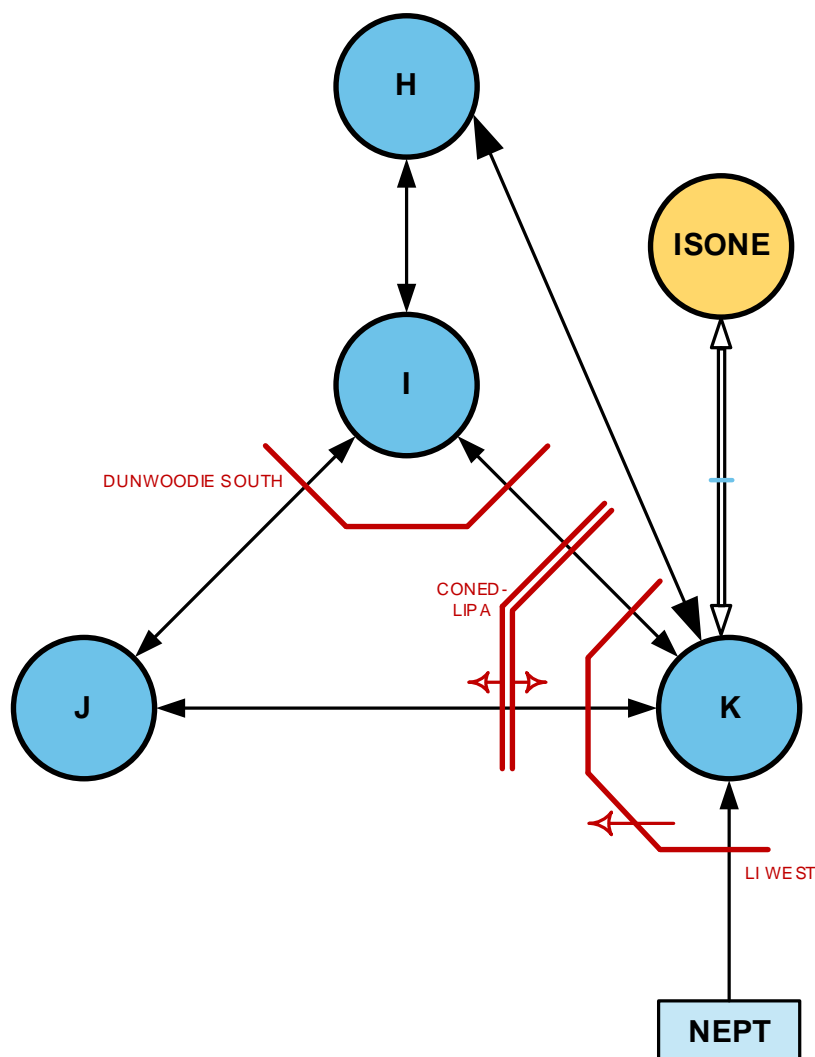


Thermal transfer limit analysis was performed using PowerGEM TARA, based on DC (linear) power flow, which assumes that voltages, reactive flows, or losses do not change with increased transfer levels.

<sup>1</sup> The New York State bulk power system is planned to meet a LOLE that, at any given point in time, is less than or equal to an involuntary firm load disconnection that is not more frequent than once in every 10 years, or 0.1 events per year.

Emergency transfer limits of affected MARS topology interfaces were calculated with and without each project to determine the incremental impact transfer limits due to the addition of each project, as shown in the Figure 2.

**Figure 2: Affected MARS Topology Interfaces**



In accordance with NPCC criteria and NYSRC reliability rules, the contingency list was modified to include each project's related contingencies. Phase angle regulators maintained scheduled power flow in pre-contingency conditions but were fixed at their pre-contingency angle in post-contingency conditions. HVDC facilities maintained scheduled power flow in pre-contingency conditions but were fixed post-contingency conditions.

An emergency interface transfer limit is the transfer level where a) a branch flow reaches its normal rating under pre-contingency conditions or b) a branch flow reaches its short-term emergency (STE)

rating following a single-line, multi-element, or generator outage. Affected MARS topology transfer limits for Export and Import are shown in

Figure 3 and Figure 4, respectively.

**Figure 3: Post-Project Emergency Transfer Limits (MW): Export**

Project	K TO H	LIPA-ConEd	LI West	K TO NE	K TO I	K TO J	J TO I	J-I & K-I
Pre-Project	0	190	104	414	515	505	1999	99999
T035-LS Power	3575	190	104	414	515	505	1999	99999
T036-NextEra Core 1	0	3090	3004	414	3090	805	1999	99999
T037-NextEra Core 2	0	3665	3579	414	2915	1555	1999	99999
T038-NextEra Core 3	0	3940	3854	414	3290	1480	1999	99999
T039-NextEra Core 4	0	3265	3179	414	3490	580	1999	99999
T040-NextEra Core 5	0	4240	4154	414	4465	580	1999	99999
T041-NextEra Core 6	0	3615	3529	414	3790	630	1999	99999
T042-NextEra Core 7	0	3615	3529	414	3790	630	1999	99999
T043-NextEra Enh1	1200	4915	4829	414	3940	1130	1999	99999
T043-NextEra Enh 2	0	4915	4829	414	3940	1130	1999	99999
T047-Propel Base 1	0	2065	1979	414	1690	1205	1999	99999
T048-Propel Base 2	0	1815	1729	414	1340	1280	1999	99999
T049-Propel Base 3	0	2115	2029	414	1740	1205	1999	99999
T051-Propel Alt 5	0	2915	2829	414	2540	1205	1999	99999
T052-Propel Alt 6	0	3815	3729	414	3365	1255	1999	99999
T053-Propel Alt 7	0	3840	3754	414	3415	1255	1999	99999

**Figure 4: Post-Project Emergency Transfer Limits (MW): Import**

Project	DunSouth (I-J&I-K)	I TO J	H TO K	ConEd-LIPA	LI West Reverse	NE TO K	I TO K	J TO K
Pre-Project	5693	4400	0	1613	999999	404	1293	320
T035 - LS Power	5693	4400	3550	1613	999999	404	1293	320
T036 - NextEra Core 1	7768	4400	0	3763	999999	404	3443	320
T037 - NextEra Core 2	7993	4400	0	3763	999999	404	3343	545
T038 - NextEra Core 3	7993	4400	0	3738	999999	404	3743	895
T039 - NextEra Core 4	6143	4400	0	3588	999999	404	3268	320
T040 - NextEra Core 5	7718	4400	0	3663	999999	404	3343	320
T041 - NextEra Core 6	7493	4400	0	4638	999999	404	4343	320
T042 - NextEra Core 7	7493	4400	0	4638	999999	404	4343	320
T043 - NextEra Enh 1	6718	4400	1200	3188	999999	404	4043	595
T043 - NextEra Enh 2	6718	4400	0	3188	999999	404	4043	595
T047 - Propel Base 1	6393	4400	0	3013	999999	404	1993	1020
T048 - Propel Base 2	6393	4400	0	3013	999999	404	1993	1020
T049 - Propel Base 3	6393	4400	0	3013	999999	404	1993	1020
T051 - Propel Alt 5	7093	4400	0	3738	999999	404	2693	1020
T052 - Propel Alt 6	7793	4400	0	3788	999999	404	3293	470
T053 - Propel Alt 7	7118	4400	0	3613	999999	404	3118	495

Capacity benefits can be theoretically evaluated by comparing the capacity procurement requirement in the downstate area before and after each of the proposed solutions to the Long Island Offshore Wind

Export Public Policy Transmission Need are in service. Currently, the NYISO determines the capacity procurement requirements for the downstate area through the Locational Capacity Requirements (LCR) process. The methodology and assumptions used in the LCR process via the LCR Optimizer are based on current system and market configurations, as well as near-term economic conditions. They include, but are not limited to, the limitations on the NYCA topology and Net Cost of New Entry (CONE) for new technologies. Based on the NYISO's past experience, the outcomes from the LCR Optimizer are sensitive to small changes in any of these assumptions.

In developing the methodology for calculating the capacity benefits based on LOLE reduction, the NYISO staff considered but decided against using the LCR process directly to evaluate capacity benefits of proposed solutions to the Long Island PPTN. First, the assumptions used in the LCR Optimizer, as discussed above, are expected to go through significant changes in the next decade. The NYISO is also planning to explore enhancements to the LCR Optimizer in 2023. Assessment with the current LCR Optimizer might introduce unnecessary volatility in the evaluation outcomes. Second, applying the LCR Optimizer directly to evaluate each project would require significant efforts and computing time to develop and test different combinations of future system, economic and market assumptions. Based on the foregoing, the NYISO considered it was not prudent to use the LCR process directly to evaluate capacity benefits of proposed project.

However, the current LCR Optimizer provides a methodology in bringing a MARS database to meet the 0.1 event-days/year LOLE criterion. This will be discussed further in the following section.

## **LOLE Calculation Assumptions and Results**

### **Pre-Project**

To establish a reference point for post-project NYCA LOLE impact comparison, the NYISO developed two pre-project models—both based on the MARS models developed under the 2022 Reliability Need Assessment<sup>2</sup> study process for study year 2030:

1. The 2022 Reliability Need Assessment (RNA) Base Case for study year 2030 was further updated to reflect offshore wind targets (Figure 5) and also to remove the proposed Champlain Hudson Power Express (CHPE) HVDC transmission project (Figure 6).
2. The 2022 Reliability Need Assessment (RNA) Policy Case Scenario 2 was further updated to

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<sup>2</sup> Additional RNA details are available at the links below:

2022 RNA Report: <https://www.nyiso.com/documents/20142/2248793/2022-RNA-Report.pdf>

2022 RNA Appendices: <https://www.nyiso.com/documents/20142/34651464/2022-RNA-Appendices.pdf>

reflect offshore wind targets (Figure 5). Both CHPE and the proposed Clean Path New York (CPNY) HVDC transmission projects continue to be modeled in this case (Figure 6).

**Figure 5: Offshore Wind Capacity Assumptions (MW)**

	Baseline	Policy Case
Zone K Total	2279	2539
Zone J Total	2046	2046

**Figure 6: Tier 4 Proposed HVDC Project Assumptions**

Tier 4 Projects	Baseline	Policy Case
CHPE	Remove	Retain
CPNY	Not modeled	Retain

Each of the two models were developed to reflect the expected system conditions of a specific planning study year and scenario and have much lower LOLE than the 0.1 event-days/year LOLE criterion. In order to have visible LOLE improvements to facilitate the evaluation, the NYISO applied the current LCR Optimizer and inputs used in the 2021 LCR study, adjusting these two models to meet the LOLE criterion of 0.1 event-days/year. With the adjustments, each of these two models became the reference point for the post-project NYCA LOLE impact. Better performance under this metric is represented by greater decreases in LOLE from 0.1 event-days/year reference, as lower NYCA LOLE means a more reliable system from resource adequacy perspective.

#### **Post-Project**

Starting from the two pre-project MARS models at-criterion described above, two models were developed for each of the projects, by reflecting their impacts on the affected MARS topology transfer limits, and as shown in the Figure 3 and Figure 4 in blue font.

The NYCA LOLE results are summarized in Figure 7 below.

**Figure 7: NYCA LOLE Results**

LI PPTN Delta NYCA LOLE (event-day/year) on Study Year 2030				
Projects	Baseline	Policy	Delta	
			Baseline	Policy
Pre-Project	0.01383	0.00708		
Pre-Project at Criteria	0.10008	0.10047		
T035 - LS Power	0.07430	0.07413	-0.02578	-0.02634
T036 - NextEra Core 1	0.08012	0.07848	-0.01996	-0.02199
T037 - NextEra Core 2	0.06279	0.06157	-0.03729	-0.03890
T038 - NextEra Core 3	0.05754	0.05393	-0.04254	-0.04654
T039 - NextEra Core 4	0.08854	0.08876	-0.01154	-0.01171
T040 - NextEra Core 5	0.08854	0.08876	-0.01154	-0.01171
T041 - NextEra Core 6	0.08672	0.08655	-0.01336	-0.01392
T042 - NextEra Core 7	0.08672	0.08655	-0.01336	-0.01392
T043 - NextEra Enh 1	0.05627	0.05231	-0.04381	-0.04816
T044 - NextEra Enh 2	0.06311	0.05811	-0.03697	-0.04236
T047 - Propel Base 1	0.05789	0.05533	-0.04219	-0.04514
T048 - Propel Base 2	0.05786	0.05513	-0.04222	-0.04534
T049 - Propel Base 3	0.05789	0.05533	-0.04219	-0.04514
T051 - Propel Alt 5	0.05770	0.05498	-0.04238	-0.04549
T052 - Propel Alt 6	0.06717	0.06251	-0.03291	-0.03796
T053 - Propel Alt 7	0.06601	0.06166	-0.03407	-0.03881

### Cost of Reliability Improvement

The monetary value of capacity benefits is measured by how each project affects LOLE and the Cost of Reliability Improvement (CRI). CRI represents the compensation that a generator would receive in the capacity market for providing comparable LOLE benefits. Based on the Net CONE values of the current capacity demand curves and the estimated reliability benefit from additional capacity, it is estimated that a generator would receive \$2.5 million per 0.001 change in LOLE per year. In the table below, the Delta LOLE results of each project are multiplied by the \$2.5M CRI value to provide an annual capacity benefit of each project.

**Figure 8: NYCA Delta LOLE Results and Annual Capacity Benefits**

LI PPTN Delta NYCA LOLE (event-day/year) on Study Year 2030						
Projects			Delta		Annual Capacity Benefit (2022 \$M)	
	Baseline	Policy	Baseline	Policy	Baseline	Policy
Pre-Project	0.01383	0.00708				
Pre-Project at Criteria	0.10008	0.10047				
T035 - LS Power	0.07430	0.07413	-0.02578	-0.02634	\$ 64.45	\$ 65.85
T036 - NextEra Core 1	0.08012	0.07848	-0.01996	-0.02199	\$ 49.90	\$ 54.98
T037 - NextEra Core 2	0.06279	0.06157	-0.03729	-0.03890	\$ 93.23	\$ 97.25
T038 - NextEra Core 3	0.05754	0.05393	-0.04254	-0.04654	\$106.35	\$116.35
T039 - NextEra Core 4	0.08854	0.08876	-0.01154	-0.01171	\$ 28.85	\$ 29.28
T040 - NextEra Core 5	0.08854	0.08876	-0.01154	-0.01171	\$ 28.85	\$ 29.28
T041 - NextEra Core 6	0.08672	0.08655	-0.01336	-0.01392	\$ 33.40	\$ 34.80
T042 - NextEra Core 7	0.08672	0.08655	-0.01336	-0.01392	\$ 33.40	\$ 34.80
T043 - NextEra Enh 1	0.05627	0.05231	-0.04381	-0.04816	\$109.53	\$120.40
T044 - NextEra Enh 2	0.06311	0.05811	-0.03697	-0.04236	\$ 92.43	\$105.90
T047 - Propel Base 1	0.05789	0.05533	-0.04219	-0.04514	\$105.48	\$112.85
T048 - Propel Base 2	0.05786	0.05513	-0.04222	-0.04534	\$105.55	\$113.35
T049 - Propel Base 3	0.05789	0.05533	-0.04219	-0.04514	\$105.48	\$112.85
T051 - Propel Alt 5	0.05770	0.05498	-0.04238	-0.04549	\$105.95	\$113.73
T052 - Propel Alt 6	0.06717	0.06251	-0.03291	-0.03796	\$ 82.28	\$ 94.90
T053 - Propel Alt 7	0.06601	0.06166	-0.03407	-0.03881	\$ 85.18	\$ 97.03