

SUBSTATION ENGINEERING COMPANY




Long Island Offshore Wind Export Public Policy Transmission Need

Technical Review Report

Public Version

DRAFT for 4/25/2023 ESPWG




Client:	NYISO		
Project:	Long Island PPTN Project Evaluation		
Subject:	Report Draft		
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1. Introduction

This report documents the technical evaluation of sixteen proposals submitted to the New York State Independent System Operator, Inc. (“NYISO”) to satisfy the Long Island Offshore Wind Export Public Policy Transmission Need (“Long Island PPTN”). On March 19, 2021, the New York Public Service Commission (“NYPSC”) directed the NYISO to solicit and evaluate solutions for a transmission need to increase the export capability of the LIPA-Con Edison interface to ensure the full output from at least 3,000 MW of offshore wind deliverable to the New York Control Area. In its April 5, 2022 Viability and Sufficiency Assessment Report, the NYISO reported that sixteen of the nineteen submitted proposals are viable and sufficient and satisfy the public policy transmission need criteria. Three Developers submitted proposals including LS Power Grid New York Corporation (“LS Power”), NextEra Energy Transmission New York (“NextEra”), and New York Power Authority (“NYPA”) together with NY Transco (“Transco”) (collectively “Propel NY”). The sixteen proposals evaluated were:

Proposal Number	Developer	Description
T035	LS Power	Atlantic Gateway
T036	NextEra	Renewable Connect- Core 1
T037	NextEra	Renewable Connect- Core 2
T038	NextEra	Renewable Connect- Core 3
T039	NextEra	Renewable Connect- Core 4
T040	NextEra	Renewable Connect- Core 5
T041	NextEra	Renewable Connect- Core 6
T042	NextEra	Renewable Connect- Core 7
T043	NextEra	Renewable Connect- Enhanced 1
T044	NextEra	Renewable Connect- Enhanced 2
T047	Propel NY	Propel NY Energy- Base Solution 1
T048	Propel NY	Propel NY Energy- Base Solution 2
T049	Propel NY	Propel NY Energy- Base Solution 3
T051	Propel NY	Propel NY Energy- Alternate Solution 5
T052	Propel NY	Propel NY Energy- Alternate Solution 6
T053	Propel NY	Propel NY Energy- Alternate Solution 7

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The primary scope and requirements of the Long Island PPTN, as identified and described in the NYPSC Order issued on March 19, 2021 is:

- 1) Adding at least one bulk transmission intertie cable to increase the export capability of the LIPA-Con Edison interface, that connects NYISO's Zone K to Zones I and J to ensure the full output from at least 3,000 MW of offshore wind is deliverable from Long Island to the rest of the State; and
- 2) Upgrading associated local transmission facilities to accompany the expansion of the proposed offshore export capability.

The review team's evaluation focused on the following areas:

- Site review and "walk down" of proposed sites and routes that are accessible from public rights of way to evaluate their constructability and identify potential issues with the proposed design, siting and routing;
- Review of the environmental and permitting requirements for the project as proposed by Developers and identify gaps and issues, which were completed predominately using "desktop" analysis;
- Evaluate technical completeness and reasonableness of the proposed project schedules and sequencing plans, including identification of potential issues associated with delay in obtaining permits for and construction of the proposed project;
- Evaluate the Developers' cost estimates by preparing independent cost estimates for each project;
- Assessment of the constructability and viability of the projects as proposed by the Developers;
- Review, identify and estimate real estate requirements;
- Identify risks associated with the projects;
- Determine expandability of proposed project;
- Evaluate the resiliency of the proposed designs;
- Assess the Developers' plans for site control; and
- Evaluate the Developers' operating plans.

The review team's evaluation did not include further evaluation of Developers' qualifications or credentials beyond the screening performed earlier in the process.

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2. Executive Summary

This technical review focused primarily on schedule, cost, identifiable risks, the ability to expand on the project in the future, assessment of technical viability and thoroughness, site control plan and availability of rights of way (“ROWS”), and the operating plan provided by each Developer. Each Developer’s project was evaluated with the intent of providing consistency and based on the information offered by each Developer. Below is a brief summary of our findings. Please see the remainder of the report for further detail.

2.1. Schedule

Each Developer’s schedule for permitting and construction of its project was evaluated based on the review team’s collective experience with transmission projects sited by the NYPSC under Article VII of the New York State Public Service Law and constructed in New York State. A review of recent Article VII electric transmission projects timelines was completed to identify comparable schedules for obtaining permits and approvals needed to begin construction. The team focused on task durations instead of specific dates.


The main drivers to the project schedule durations considered were:

- Article VII licensing effort,
- Procurement of major equipment,
- Real Estate requirements, and
- Construction requirements.

A summary of the expected durations for each Developer’s proposed scope is detailed in the table below:

Summary of Durations Expected

	Developer Proposed Total Duration	Estimated Minimum Duration (Note #1)
T035 LS Power Atlantic Gateway	70 Months	71 Months
T036 NextEra Core 1	74 Months	74 Months
T037 NextEra Core 2	88 Months	89 Months
T038 NextEra Core 3	88 Months	89 Months
T039 NextEra Core 4	88 Months	105 Months
T040 NextEra Core 5	74 Months	74 Months
T041 NextEra Core 6	74 Months	74 Months
T042 NextEra Core 7	93 Months	109 Months
T043 NextEra Enhanced 1	88 Months	105 Months
T044 NextEra Enhanced 2	93 Months	109 Months
T047 Propel Base Solution 1	72 Months	77 Months

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	Developer Proposed Total Duration	Estimated Minimum Duration (Note #1)
T048 Propel Base Solution 2	72 Months	77 Months
T049 Propel Base Solution 3	72 Months	77 Months
T051 Propel Alternate Solution 5	72 Months	77 Months
T052 Propel Alternate Solution 6	72 Months	77 Months
T053 Propel Alternate Solution 7	96 Months	101 Months

Note #1: "Minimum Duration" is calculated using the anticipated time for Article VII application preparation, the anticipated time for the Article VII approval process, and the anticipated time for construction of the project. For each of these time periods, the review team used the greater of the duration shown by the Developer or what the review team believes to be the minimum. The review team also assumed that the Developer's preparation of an application for an Environmental Management and Construction Plan (EM&CP) is underway when the Article VII Certificate of Environmental Compatibility and Public Need (CECPN) is granted by the New York State Public Service Commission. All these components will depend on the experience and the level of resources of the Developer and the complexity of the project. This is intended to highlight deficiencies in the schedules.

The schedules assume that the identified outages can be obtained as proposed by the Developers. The following table summarizes the required outages for each Developer:

	LS Power T035	NextEra T036-T043	Propel NY T047-T048 T051-T053
Number of Elements Requiring an Outage of at least 7 days	21	51-58	11
Number of Elements Requiring an Outage of 90 days or More	0	7	5
Maximum Number of Elements to Be Out Concurrently	0	5	2
345 kV Lines Being Impacted	Millwood-Buchanan (W97); Millwood-Wood St (W80); Millwood-Wood St (W81); Millwood-Buchanan (W98)	Dunwoodie-Pleasantville #1; Dunwoodie-Pleasantville #2 concurrent with Rainey-Mott Haven (Q11); Dunwoodie-Sprain Brook; Rainey-Ravenswood;	Rainey-Mott Haven (Q11); Rainey-Mott Haven (Q12); East Garden City- Sprain Brook (Y49)

Note: For this table an "element" is a transmission line, transformer, Phase Angle Regulator ("PAR") or main bus.

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2.2. Cost

In evaluating the construction cost of each project, Ferreira Construction (Ferreira) prepared independent cost estimates for each proposal, using applicable representative project data from recent historical projects where possible. Ferreira reviewed the Developers' proposals with the Developers cost estimates redacted. GEI Consultants, Inc. estimated the environmental licensing and permitting costs. The overnight capital cost estimates are shown below and categorized as New Facilities, Public Policy Transmission Upgrades ("Upgrade"), potential Network Upgrade Facilities ("NUF"), and Excluded Third Party ROW:

Independent Cost Estimate 2022 Dollars (\$1,000)					
	New (Excluding Third Party ROW) (A)	Upgrades (B)	NUFs (C)	Excluded Third Party ROW (D)	Overall Total (A+B+C+D)
T035- LS Power	\$5,920,452	\$39,078	\$27,576	\$11,068	\$5,998,174
T036- NextEra Core 1	\$3,230,250	\$1,135,143	\$0	\$1,520	\$4,366,913
T037- NextEra Core 2	\$3,627,277	\$1,256,718	\$0	\$1,726	\$4,885,722
T038- NextEra Core 3	\$4,251,741	\$1,207,700	\$0	\$1,435	\$5,460,876
T039- NextEra Core 4	\$4,457,495	\$1,269,941	\$0	\$1,445	\$5,728,881
T040- NextEra Core 5	\$3,609,641	\$1,084,129	\$0	\$1,431	\$4,695,200
T041- NextEra Core 6	\$4,447,548	\$1,130,640	\$0	\$6,993	\$5,585,181
T042- NextEra Core 7	\$13,750,171	\$1,123,557	\$0	\$7,150	\$14,880,878
T043- NextEra Enhanced 1	\$8,753,245	\$1,285,508	\$0	\$12,525	\$10,051,278
T044- NextEra Enhanced 2	\$16,127,943	\$1,329,334	\$0	\$8,432	\$17,465,709
T047- Propel Base 1	\$2,269,172	\$208,040	\$71,542	\$9,572	\$2,558,327
T048- Propel Base 2	\$1,965,833	\$92,758	\$107,911	\$10,232	\$2,176,735
T049- Propel Base 3	\$2,642,493	\$209,190	\$74,505	\$11,188	\$2,937,376
T051- Propel Alt 5	\$2,902,104	\$297,387	\$122,849	\$9,693	\$3,332,033
T052- Propel Alt 6	\$4,070,887	\$507,215	\$128,163	\$22,225	\$4,728,490
T053- Propel Alt 7	\$5,112,552	\$299,675	\$130,321	\$27,826	\$5,570,374

Notes:

- The estimates include a contingency rate of 20%. After recognizing the very large scale of these project, the review team determined that a 20% contingency should be adequate recognizing that some components may deviate from estimate more than others due to greater uncertainties but will tend to average out. The review team agrees that level of contingency is sufficient to allow for unanticipated costs and estimating accuracy to forecast a reasonable worst-case cost.

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- The independent cost estimates assume that the project can be built as designed. Costs associated with the identified potential risks are not included.

2.3. Risk


2.3.1. The review team completed a review of the potential risks associated with each proposal's schedule and costs, focusing on the most significant drivers, which include:

- Environmental and Permitting Concerns
- Property, Routing and Siting Concerns
- Design Concerns
- Construction and Operational Concerns

The following metrics were used to assign a risk ranking and risk score for each item under the significant drivers listed above:

	Very High (VH) Score 4	High (H) Score 3	Medium (M) Score 2	Low (L) Score 1
Probability Risk Will Occur	90-100%	50-89%	10-49%	Below 10%
Cost to Mitigate Risk	Greater than \$20M	\$11M-20M	\$6-\$10M	Below \$5M
Schedule Impact	More than 6 months	3-6 months	1-3 months	Less than 1 month

The probability, cost impact, and schedule impact scores were assigned to each risk item for each project. Using the highest scored project as a benchmark, the relative scores for each project were then plotted on the following heat map with the total probability score plotted against the sum of the schedule plus the cost scores. This provides a comparative view of the risks between projects. Refer to Section 4.3 and the risk register for more details on the risks identified for each project.


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RISK HEAT MAP

Probability Risk Will Occur	Very High (VH)				T043, T044
	High (H)			T037, T038, T041	T039, T042
	Medium (M)		T053	T036, T040	
	Low (L)		T035, T047, T048, T049, T051, T052		
		Low (L)	Medium (M)	High (H)	Very High (VH)
Cost and Schedule Risk					

2.4. Resiliency

To determine the relative resiliency of each project, the substations were reviewed with regards to the bus type, potential flooding risk, and potential inundation due to a hurricane. Each project was assigned a ranking score based on a set of criteria. Based on this scoring, the following table ranks the projects from most resilient (lowest score) to least resilient (highest score). Additional details are provided in Section 4.4.


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Total Resiliency Ranking

Ranking (Most to Least Resilient)	Proposal	Total Resiliency Score
1	T035- LS Power	13.5
2	T048- Propel NY Base 2	31.5
3	T036- NextEra Core 1	33.5
4	T047- Propel NY Base 1	34
5	T049- Propel NY Base 3	34
6	T052- Propel NY Alt 6	34
7	T051- Propel NY Alt 5	34
8	T037- NextEra Core 2	41.5
9	T042- NextEra Core 7	41.5
10	T053- Propel NY Alt 7	46
11	T041- NextEra Core 6	49.5
12	T040- NextEra Core 5	52
13	T038- NextEra Core 3	61
14	T043- NextEra Enhanced 1	63
15	T039- NextEra Core 4	66
16	T044- NextEra Enhanced 2	75.5


2.5. Expandability

2.5.1. The review team evaluated the potential for future expansion of the proposed transmission solutions to increase their capacity and line terminal positions for Point of Interconnection (“POI”) connections for offshore wind facilities (“OSW”) or future transmission lines. The table below provides a summary of available line terminal positions for each project. Refer to Section 4.5 for the full assessment.

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Number of Available Line Terminal Positions

Proposal	LS Power	
	<i>138kV Line Terminals</i>	<i>345kV Line Terminals</i>
T035	0	8
Proposal	NextEra	
	<i>138kV Line Terminals</i>	<i>345kV Line Terminals</i>
T036	3	10
T037	3	10
T038	5	11
T039	5	11
T040	6	11
T041	4	11
T042	4	13
T043	1	7
T044	4	9
Proposal	Propel NY	
	<i>138kV Line Terminals</i>	<i>345kV Line Terminals</i>
T047	1	1
T048	-	2
T049	-	1
T051	-	2
T052	1	2
T053	-	2

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2.6. Site Control and Real Estate

2.6.1. In all of the proposals, the following is common for the property rights acquisition process:

- All Developers propose to predominately use public thoroughfare for their transmission facilities.
- Some additional real estate is required for new substation construction.
- All Developers have completed preliminary routing of their proposed transmission lines.
- All Developers have documented plans to obtain the property rights (*i.e.*, site control) to implement their projects.
- Temporary construction easements are anticipated for all of the Developers but the level of detail for the location of the easement differ among the Developers' proposals.

2.6.2. The following was considered in determining a Developer's ability to obtain real property rights:

- Under New York State Transportation Corporation Law Article 2 Section 11 the Developers will have certain rights to install facilities on State and Local municipality property and acquire real estate by eminent domain if needed.

2.7. Operational Plan


2.7.1. The review team conducted a review of the Developers' operations and maintenance plans associated with the proposals. The review team did not identify any major flaws with the Developers' plans, and the plans are essentially the same.

2.7.2. For the non-incumbent Developer proposals, the following aspects are common:

- The Developers stated that all O&M activities will comply with required NERC regulations, and
- Proposed facilities will have real-time reporting of operating data.

2.7.3. The Developers proposed the following arrangements for Control Center services:

- LS Power proposes that the project will be operated by their control centers located in Colonie, New York and Clifton Park, New York.
- NextEra proposes minor modifications to the control center constructed in Albany, NY.
- Propel NY proposes that its projects would be operated from the Frederick R. Clark Energy Center Control Room, owned and operated by NYPA.

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3. Discussion of Proposals

Full, detailed descriptions and an overall project map for each proposal are provided in Appendix [] of the NYISO's Public Policy Transmission Planning Report.

Brief descriptions of each proposed project are provided below:

3.1. LS Power Atlantic Gateway

- LS Power's proposal includes the following major components:
 - Proposed Transmission Lines
 - Longshore to Southgate-three underground 345 kV AC transmission lines traversing approximately 21 miles.
 - Southgate to Northgate- three underground/submarine ± 400 kV DC transmission lines traversing approximately 45 miles with 29 miles underground and 16 miles submarine.
 - Proposed Substations
 - Longshore Substation 345/138 kV substation 6 bay 345kV Breaker and a Half ("BAAH") Gas Insulated Substation "GIS".
 - Southgate Substation 345/138 kV substation 6 bay 345kV BAAH GIS with three ± 400 kV monopole Direct Current "DC" converter stations.
 - Northgate Substation 345 kV switchyard 5 bay BAAH GIS with three ± 400 kV monopole DC converter stations
 - Modifications to several 138kV transmission lines and substations.


3.2. NextEra

3.2.1. T036 -New York Renewable Connect – Core 1

Proposal includes the following major components:

Proposed Transmission Lines

- East Garden City to Dunwoodie is a 345 kV underground line traversing approximately 27.4 miles (8.7 miles submarine cable in LI Sound).
- East Garden City to Sprain Brook is a 345 kV underground line traversing approximately 27.7 miles (8.7 miles submarine cable in LI Sound).
- Ruland Road - Sprain Brook is a 345 kV underground line traversing approximately 33.1 miles (8.7 miles submarine cable in LI Sound).

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- East Garden City - Valley Stream Three 345 kV underground lines involving the removal of existing East Garden City - Valley Stream 138 kV circuits #1 and #2 to construct three new 345 kV lines (7.1 mi long)
- East Garden City to Jamaica 138 kV underground line (11.6 mi long)

○ Proposed Substations:

- Proposed East Garden City 345 kV substation is a 345 kV GIS switchyard, 7 bay - BAAH
- Proposed Ruland Road 345/138 kV substation is a 345/138 kV GIS switchyard, 138 kV is a 4 bay - BAAH Configuration and tie back to the existing station and two 345/138 kV transformers.
- Proposed Valley Stream 345/138 kV substation is a 345 kV GIS switchyard, 4 bay - BAAH Configuration with three 345/138 kV transformers
- Dunwoodie 345 kV station GIS, 4 bay-BAAH
- Rainey 345 kV GIS 2 bay- BAAH
- Newbridge 345 kV GIS 4 bay-BAAH
- Barrett 138 kV GIS 4 bay- BAAH

- Modifications to numerous 345 kV and 138 kV substations and 138 kV transmission lines.


3.2.2. T037 -New York Renewable Connect – Core 2

- Core 2 includes the facilities described in Core 1 plus the following:
 - Proposed Transmission Lines:
 - 345 kV Transmission from East Garden City to Farragut with Phase Angle Regulator (“PAR”) at East Garden City.
 - Proposed Substations:
 - Farragut substation is a new 345 kV GIS switchyard, 2 bay -BAAH

3.2.3. T038 -New York Renewable Connect – Core 3

Core 3 includes the facilities described in Core 1 plus the following:

- Proposed Transmission Lines
 - Northport –Dunwoodie is a 345 kV underground line traversing approximately 32.6 miles (25.4 miles submarine cable in LI Sound).

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- East Garden City - Farragut 345 kV line sharing the same duct bank as NextEra's proposed East Garden City - Jamaica 138 kV line (10.1 mi long). Northport 138 kV to existing Pilgrim 138 kV line

○ Proposed Substations:

- Northport 345/138 kV station, including two 345/138 kV transformers
- Northport 138 kV GIS, 5 bays -BAAH
- Farragut 345 kV station GIS, 2 bay-BAAH

3.2.4. T039 – New York Renewable Connect – Core 4

Core 4 includes the facilities described in Core 1 plus the following:

○ Proposed Transmission Lines

- New Farragut – Sprain Brook 345 kV line traversing approximately 24.9 miles (21.7 miles submarine cable in the Hudson River).
- New Northport – New Dunwoodie is a 345 kV underground line traversing approximately 32.6 miles (25.4 miles submarine cable in LI Sound).
- New Northport 138kV to Pilgrim

○ Proposed Substations:

- New Northport 345/138 kV station with two new 345/138 kV transformers
- New Northport 138kV GIS, 5 bays -BAAH
- New Farragut 345kV station GIS, 2 bay-BAAH

3.2.5. T040 – New York Renewable Connect – Core 5

Core 5 includes the facilities described in Core 1 plus the following:

○ Proposed Transmission Lines

- New Northport – New Dunwoodie is a 345 kV underground line traversing approximately 32.6 miles (25.4 miles submarine cable in LI Sound).


○ Proposed Substations:

- New Northport 345/138 kV station with two new 345/138 kV transformers

3.2.6. T041 – New York Renewable Connect – Core 6

Core 6 includes the facilities described in Core 1 plus the following:

○ Proposed Transmission Lines

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- New Northport – New Dunwoodie is a 320 kV DC Line underground line
- New Northport 138kV to Pilgrim

○ Proposed Substations:

- New Northport 320kV HVDC
- New Sprain Brook 320kV HVDC
- New Northport 138kV GIS, 5 bays -BAAH

3.2.7. T042 – New York Renewable Connect – Core 7

Core 7 includes the facilities described in Core 1 plus the following:

○ Proposed Transmission Lines

- New Northport HVDC – New Sprain Brook HVDC is a 320 kV DC Line underground line
- New Northport 138kV to existing Pilgrim
- New Buchanan HVDC to OSW HVDC 320kV DC Line submarine cable running down the Hudson River and NY Harbor.

○ Proposed Substations:


- New Northport 320kV HVDC
- New Sprain Brook 320kV HVDC
- Buchanan 2- 320kV HVDC
- OSW Platforms 2-320kV HVDC
- New Buchanan 345kV GIS, 3 bay- BAAH
- New Northport 138kV GIS, 5 bays -BAAH

3.2.8. T043 – New York Renewable Connect – Enhanced 1

Enhanced 1 includes the facilities described in Core 1 plus the following:

○ Proposed Transmission Lines

- New Farragut to Sprain Brook 345 kV line traversing approximately 24.9 miles (21.7 miles submarine cable in the Hudson River).
- New East Garden City - new Farragut 345 kV line sharing the same duct bank as NEXTERA's proposed East Garden City - Jamaica 138 kV line (10.1 mi long).
- New Northport HVDC – New Sprain Brook HVDC is a 320 kV DC Line underground line

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- New Buchanan HVDC to New Barrett HVDC 320kV DC Line submarine cable running down the Hudson River and NY Harbor.
- New Northport to Pilgrim 138kV
- Existing Pilgrim to Holbrook 138kV

○ Proposed Substations:

- New Northport 320kV HVDC
- New Sprain Brook 320kV HVDC
- New Buchanan 320kV HVDC
- New Barrett 320kV HVDC
- New Farragut 345kV station GIS, 2 bay-BAAH
- New Buchanan 345kV GIS, 3 bay- BAAH
- New Northport 138kV GIS, 5 bays -BAAH

3.2.9. T044 – New York Renewable Connect – Enhanced 2


Enhanced 2 includes the facilities described in Core 1 plus the following:

○ Proposed Transmission Lines

- New Farragut – Sprain Brook 345 kV line traversing approximately 24.9 miles (21.7 miles submarine cable in the Hudson River).
- New East Garden City - new Farragut 345 kV line sharing the same duct bank as NEXTERA's proposed East Garden City - Jamaica 138 kV line (10.1 mi long).
- New Northport HVDC – New Sprain Brook HVDC is a 320 kV DC Line underground line
- New Buchanan HVDC to Offshore Wind Platform HVDC 2- 320kV DC Lines submarine cable running down the Hudson River and NY Harbor.
- New Buchanan to Ramapo 345kV
- New Northport 138kV to Pilgrim
- Pilgrim to Holbrook 138kV
- Newbridge to Locust Green 138kV

○ Proposed Substations to be Owned by NextEra:

- New Northport 320kV HVDC
- New Sprain Brook 320kV HVDC
- New Buchanan 2- 320kV HVDC
- New Offshore Wind Platforms 2- 320kV HVDC

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- New Farragut 345kV station GIS, 2 bay-BAAH
- New Buchanan 345kV GIS, 3 bay- BAAH
- New Northport 138kV GIS, 5 bays -BAAH

3.3. Propel NY

3.3.1. T047 – Propel NY Energy Base Solution 1


Propel Base Solution 1 consists of the following major components:

- Proposed Transmission Lines:
 - Barrett to East Garden City 345 kV to Tremont 345 kV (Circuits Y-51) approximately 32.3 miles
 - Ruland Road to Shore Road 345 kV to Sprain Brook 345 kV (Circuits Y-56 & Y-57) crossing the Long Island Sound. Approximately 36.1 miles
 - East Garden City to Shore Road 345 kV (Circuit Y-53)
- Proposed Substations:
 - Barrett Substation (345/138 kV) – 345kV Straight Bus Air Insulated “AIS”
 - New Rochelle Substation (345 kV) – Transition station from submarine cables to terrestrial cables
 - Ruland Road Substation (345 kV/138 kV) -345kV AIS 6 breaker ring, 138kV AIS 6 breaker ring
 - Shore Road Substation (345-138 kV) -345kV 4 breaker ring GIS
- Upgrades and Modifications to some 345kV and 138kV substations and 138kV transmission lines.

3.3.2. T048 – Propel NY Energy Base Solution 2

Propel Base Solution 2 consists of the major components:

- Proposed Transmission Lines:
 - Barrett to Tremont 345 kV (Circuit Y-51) approximately 25.7 miles
 - Ruland Road to Sprain Brook 345 kV (Circuit Y-53) approximately 36.2 miles
 - Syosset to Shore Road 138 kV approximately 11.3 miles
- Proposed Substations:
 - Barrett Substation (345/138 kV) – 345kV 4 breaker ring AIS

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- New Rochelle Substation (345 kV) – Transition station from submarine cables to terrestrial cables.
 - Ruland Road Substation (345 kV/138 kV) -345kV AIS 4 breaker ring, 138kV AIS 5 breaker ring
 - Shore Road Substation (345 kV) - Transition station from submarine cables to terrestrial cables.
- Upgrades and Modifications to some 345kV and 138kV substations and 138kV transmission lines.

3.3.3. T049 – Propel NY Energy Base Solution 3


Propel Base Solution 3 consists of the major components:

- Proposed Transmission Lines:
 - Barrett to East Garden City 345 kV to Tremont 345 kV (Circuits Y-51 & Y-54) approximately 32.3 miles
 - Ruland Road to Shore Road 345 kV to Sprain Brook 345 kV (Circuits Y-56 & Y-57) approximately 36.1 miles,
 - East Garden City to Shore Road 345 kV (Circuit Y-53) and 138 kV approximately 10.3 miles
- Proposed Substations:
 - Barrett Substation (345/138 kV) – 345kV 5 breaker ring AIS
 - New Rochelle Substation (345 kV) – Transition station from submarine cables to terrestrial cables
 - Ruland Road Substation (345 kV/138 kV) -345kV AIS 6 breaker ring, 138kV AIS 6 breaker ring
 - Shore Road Substation (345-138 kV) -345kV 4 breaker ring GIS
- Upgrades and Modifications to some 345kV and 138kV substations and 138kV transmission lines.

3.3.4. T051 – Propel NY Energy Alternate Solution 5

Propel Alternate Solution 5 consists of the following major components:

- Proposed Transmission Lines:
 - Barrett to East Garden City 345 kV to Tremont 345 kV (Circuit Y-51) approximately 32.3 miles


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- Ruland Road to Shore Road 345 kV to Sprain Brook 345 kV (Circuits Y-56, Y-57 & Y-58) approximately 36.1 miles
- East Garden City to Shore Road 345 kV (Circuit Y-53) approximately 10.3 miles
- Proposed Substations:
 - Barrett Substation (345/138 kV) – 345kV Straight Bus AIS
 - New Rochelle Substation (345 kV) – Transition station from submarine cables to terrestrial cables
 - Ruland Road Substation (345 kV/138 kV) -345kV AIS 6 breaker ring, 138kV AIS 6 breaker ring
 - 345 kV Shore Road Substation- 345kV 5 breaker ring GIS
- Upgrades and Modifications to some 345kV and 138kV substations and 138kV transmission lines.

3.3.5. T052 – Propel NY Energy Alternate Solution 6

Propel Alternate Solution 6 consists of the following major components:

- Proposed Transmission Lines:
 - Barrett to East Garden City 345 kV to Tremont 345 kV (Circuit Y-51) approximately 32.3 miles
 - Ruland Road to Shore Road 345 kV to Sprain Brook 345 kV (Circuits Y-56, Y-57 & Y-58) approximately 36.1 miles
 - East Garden City to Shore Road 345 kV (Circuit Y-53) approximately 10.3 miles
- Proposed Substations:
 - Barrett Substation (345/138 kV) – 345kV Straight Bus AIS
 - Eastern Queens Substation (345/138kV)- 345kV GIS 6 breaker ring, 138kV AIS 3 breaker ring, 138kV AIS 4 breaker ring
 - New Rochelle Substation (345 kV) – Transition station from submarine cables to terrestrial cables
 - Ruland Road Substation (345 kV/138 kV) -345kV AIS 5 breaker ring, 138kV AIS 5 breaker ring
 - 345 kV Shore Road Substation- 345kV 5 breaker ring GIS


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- Upgrades and Modifications to some 345kV and 138kV substations and 138kV transmission lines.

3.3.6. T053 – Propel NY Energy Alternate Solution 7

Propel Alternate Solution 7 consists of the following major components:

- Proposed Transmission Lines:
 - Barrett to Tremont 345 kV (Circuit Y-51 & Y55) approximately 25.7 miles
 - Barrett to Brinkerhoff 345 kV (Circuit Y-52 and Y-54) to Dunwoodie 345 kV (Circuit Y-56) approximately 32 miles
 - Ruland Road to Sprain Brook 345 kV (Circuit Y-53) approximately 36.1 miles
 - Syosset to Shore Road 138 kV (S138-1) approximately 11.3 miles
 - Northport to Sprain Brook ± 320 kV HVDC (Y-57) approximately 34.1 miles
- Proposed Substations:
 - Barrett Substation (345/138 kV) – 345kV 7 breaker ring AIS
 - Eastern Queens Substation (345/138kV)- 345kV GIS 8 breaker ring, 2-138kV AIS 4 breaker rings
 - New Rochelle Substation (345 kV) – Transition station from submarine cables to terrestrial cables
 - Ruland Road Substation (345 kV/138 kV) -345kV AIS 4 breaker ring, 138kV AIS 5 breaker ring
 - Shore Road Substation (345 kV) - Transition station from submarine cables to terrestrial cables.
 - HVDC Converter Station Northport and Northport 345 kV Substation
 - HVDC Converter Station Sprain Brook

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4. Evaluation


4.1. Schedule

The NYISO OATT section 31.4.8.1.8 provides the evaluation criteria for evaluating the schedules for the proposed projects.

The review team has completed an evaluation of the schedules submitted with each proposal. In its evaluation of the proposals, the review team leveraged its collective experience with the development, construction, and maintenance of transmission line and substation projects in New York or similar environments and compared the proposed schedules to actual Article VII electric transmission projects completed in New York.

The main drivers to the project schedule durations considered include:

- Article VII licensing process,
- Procurement of major equipment,
- Real Estate requirements, and
- Construction requirements.


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Accordingly, the review team's analysis is based on standard historical durations for siting review. The review team's conclusion for the Article VII process minimum durations are based upon "best case" assumptions as follows:

Article VII Process Minimum Durations

Task	Best Case Estimate for LI-PPTN	Best Case Estimate for LI-PPTN Projects that include Submarine Cable in Hudson or East River
Prepare and submit complete Article VII application (estimate)	8 months	9 months
PSC issues Certificate following Article VII application submission	15 months	24 months
Prepare and submit EM&CP (best case scenario assumes no major changes to design required in Certificate, and EM&CP application prepared during Article VII proceedings)	3 months	9 months
DPS review and approve EM&CP	3 months	4 months
Total: Best Case time duration from submission of Article VII application to the Start of Construction	21 months	37 months
Total: Best Case time duration from preparation of Article VII application to the start of Construction	29 months	46 months

An evaluation of the construction component of the proposals was completed by Ferreira Construction, and an evaluation of the licensing was completed by GEI Consultants.


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The project minimum durations identified by the review team assumes that preparation of the Article VII application and real estate procurement negotiations will begin at the time the project is awarded to the Developer and that any preliminary work required has already been completed by the Developer prior to that date. Likewise, the review team assumes that work to file the first EM&CP segment is complete prior to receipt of Article VII certificate. It is assumed that all federal or non-New York State permits and approvals can be obtained within the Article VII approval timeframe.

Procurement schedules were considered. It is noteworthy that HVDC systems can have very long manufacturing lead-times. One manufacturer, who responded to SECO's request for information, indicated that project durations for HVDC systems are currently at a minimum of 5 years after execution of the contract for an offshore/onshore system and a minimum of 4 years after execution of the contract for a wholly land-based system. A proposal that includes an HVDC system will require that the Developer work quickly with their equipment supplier(s) to ensure that its schedule can be met.

The review team considered the overall construction period for each proposal. Based on our collective experience, the review team assumed that construction of a new major substation could typically be completed in 20 to 24 months. An expansion of an existing major substation could typically be completed in 12 to 18 months. These durations are based on the assumption that the long lead major equipment (i.e. Power Transformers, PARs, GIS, HVDC, Power Cables, etc.) were procured early in the project development process such that they are available within the construction duration. Terrestrial underground cable in this geographical area could be installed at a rate of 50 to 100 ft. per day per crew and would depend on many factors including crew size, allowed shift duration, traffic control management, ground conditions and the accuracy of identifying underground obstructions. Ground penetrating radar and test pits would be good tools to help identify obstructions, but the methods and means are at the discretion of the respective Developer. Submarine cable installation is anticipated to take 2000 to 6000 ft. per day depending on many factors including the vessel and crew size, the number of cables installed per pass, underwater obstructions, water conditions, waves and wind affects and general weather conditions.

Impacts due to issues in obtaining real estate are not anticipated to significantly impact the schedule, as the majority of the requirements are in public thoroughfares and utility owned land. However, Developers need to be aggressive in pursuing rights to property and temporary construction easements immediately after project award.

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Regarding physical construction, the review team believes that all the proposed construction schedules offered by the Developers provide sufficient overall construction durations to complete the work although would be sensitive to the allocation of resources (number of crews, etc.). The review team assumes that due to the magnitude of work required on these projects, multiple contractors will be engaged and work in parallel in various locations to facilitate the schedules. Also, as noted in the risk register, many of these projects require significant outages of existing system components and will require careful planning and coordination by the Developer, incumbent utilities and the NYISO to meet their proposed in-service dates. Summarized below are the review team’s findings for each Developer:

4.1.1. LS Power


Proposal T035 – Atlantic Gateway

- LS Power has included about 7 months for Article VII application preparation. Based on experience, we would allocate 8 months.
- Overall Article VII approval process schedule seems adequate.
- Procurement schedule for major equipment seems adequate.
- Overall Construction schedule appears adequate.
- Their proposed project duration is about 70 months. We feel that is adequate for this project.

4.1.2. NextEra

Proposals T036, T037, T038, T039, T040, T041, T042, T043, T044 – Core Projects 1-7 and Enhanced Projects 1&2

- NextEra’s proposed schedule assumes that all its projects would meet the requirements for the expedited Article VII approval provisions of Case 14-T-0017, which applies to constructing transmission lines on existing rights of way (“ROWS”). These proposed projects include submarine cables in the Long Island Sound, Hudson River, East River, and/or the New York Bay. They also include several substation expansions as well as new “transition” stations where the submarine cables would connect to the terrestrial cables. The review team believes that it is not realistic to assume that NextEra’s projects will qualify for expedited Article VII approval.
- NextEra has also proposed that the PSC/DPS will simultaneously review and approve the CECPN and the EM&CPs. They will likely segment various portions of the project for the EM&CPs (i.e., terrestrial cable, submarine cable and substation expansions).

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The review team believes that it is not realistic to assume that the DPS will allow Article VII segmentation of these projects or that simultaneous review will occur.

- NextEra has included 10 months for Article VII application preparation. Based on the review team's experience, 10 months appears to be adequate.
- Procurement Schedule for major equipment seems adequate.
- Overall construction schedules appear adequate. However, NextEra's schedules show some substation work starting before EM&CP approval, which is unlikely to be allowed. Also, the review team assumes that the expedited approval process discussed above is not possible; therefore, it is assumed that the start of construction would be delayed from what is represented in NextEra's milestone schedules.
- NextEra's Core 1 (T036) project schedule duration is about 74 months. The review team believes that this overall project duration is adequate, but its schedule should be modified to a more realistic sequence.
- NextEra's Core 2 (T037) and Core 3 (T038) projects schedule duration is about 88 months. The review team believes that this overall project duration is adequate, but its schedules should be modified to a more realistic sequence.
- NextEra's Core 4 (T039) and Enhanced 1 (T043) projects schedule duration is about 88 months. Based on review of similar past projects, the review team believes that the project would require a minimum of 105 months to complete because of anticipated additional approval time required to install submarine cable in the Hudson River.
- NextEra's Core 5 (T040) and Core 6 (T041) projects schedule duration is about 74 months. The review team believes that this overall project duration is adequate, but their schedule should be modified to a more realistic sequence.
- NextEra's Core 7 (T042) and Enhanced 2 (T044) projects schedule duration is about 93 months. Based on review of similar past projects, the review team believes that the project would require a minimum of 109 months to complete because of anticipated additional approval time required to install submarine cable in the Hudson River.


4.1.3. Propel NY

Proposals T047, T048, T049, T051, T052, T053 – Base Solutions 1-3 and Alternate Solutions 5-7

- Each Propel NY proposal was submitted with two milestone schedules. One is their more aggressive schedule and the other is a "relaxed" schedule. Propel NY based their proposals (including their estimates) on the more aggressive "base" schedules. Therefore, this evaluation only considers Propel NY's "base" schedules.

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- Propel NY has included about 5 months for Article VII application preparation for each project. Based on its collective experience, the review team would allocate 8 months.
- Propel NY has included about 19 months from Article VII application submittal to start of construction. Based on its collective experience, the review team would allocate 21 months.
- Procurement schedule for major equipment seems adequate for each project.
- Overall construction schedule appears adequate for each project.
- Propel NY's Base Solution 1 (T047), Base Solution 2 (T048), Base Solution 3 (T049), Alternate Solution 5 (T051) and Alternate Solution 6 (T052) projects schedule duration is 72 months. While the review team feels that schedule is within reason for the projects provided that Article VII application preparation is expedited and any complications in the approval process will delay the project. The review team's detailed evaluation suggests that 77 months is a more reasonable estimate.
- Propel NY's Alternate Solution 7 (T053) project schedule duration is 96 months. While the review team feels that schedule is adequate for the project provided that Article VII application preparation is expedited and any complications in the approval process will delay the project. The review team's detailed evaluation suggests that 101 months is a more reasonable estimate.


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Conclusion:

Based on our review we estimate the following total project durations:

Developer	Developer Proposed Total Duration	Estimated Minimum Duration (Note #1)
T035 LSPower Atlantic Gateway	70 Months	71 Months
T036 NextEra Core 1	74 Months	74 Months
T037 NextEra Core 2	88 Months	89 Months
T038 NextEra Core 3	88 Months	89 Months
T039 NextEra Core 4	88 Months	105 Months
T040 NextEra Core 5	74 Months	74 Months
T041 NextEra Core 6	74 Months	74 Months
T042 NextEra Core 7	93 Months	109 Months
T043 NextEra Enhanced 1	88 Months	105 Months
T044 NextEra Enhanced 2	93 Months	109 Months
T047 Propel Base Solution 1	72 Months	77 Months
T048 Propel Base Solution 2	72 Months	77 Months
T049 Propel Base Solution 3	72 Months	77 Months
T051 Propel Alternate Solution 5	72 Months	77 Months
T052 Propel Alternate Solution 6	72 Months	77 Months
T053 Propel Alternate Solution 7	96 Months	101 Months

Note #1: "Minimum Duration" is calculated using the anticipated time for Article VII application preparation, the anticipated time for the Article VII approval process, and the anticipated time for construction of the project. For each of these time periods, the review team used the greater of the duration shown by the Developer or what the review team believes to be the minimum. The review team also assumed that the Developer's preparation of an application for an EM&CP is underway when the Article VII certificate is granted by the PSC. All these components will depend on the experience and the level of resources of the Developer and the complexity of the project. This is intended to highlight deficiencies in the schedules.


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The schedules assume that the identified outages can be obtained as proposed by the Developers. The following table summarizes the required outages for each Developer.

DESCRIPTION	DEVELOPERS		
	LS Power T035	NextEra T036-T043	Propel NY T047-T048 T051- T053
Number of Elements Requiring an Outage of at least 7 days	21	51-58	11
Number of Elements Requiring an Outage of 90 days or more	0	7	5
Maximum Number of Elements to Be Out Concurrently	0	5	2
345kV Lines Being Impacted	Millwood-Buchanan (W97); Millwood-Wood St (W80); Millwood-Wood St (W81); Millwood-Buchanan (W98)	Dunwoodie-Pleasantville #1; Dunwoodie-Pleasantville #2 concurrent with Rainey-Mott Haven (Q11); Dunwoodie-Sprain Brook; Rainey-Ravenswood	Rainey-Mott Haven (Q11); Rainey-Mott Haven (Q12); East Garden City-Sprain Brook (Y49); Tremont-Sprain Brook (X28)

Note: For this table an "element" is a transmission line, transformer, PAR, or main bus.

The top-tier projects' outage plans, as provided by the Developers, were evaluated to identify least impactful to most impactful to the day-to-day operation of the New York grid. The top-tier projects appear in the order of being least impactful to most impactful in the table below.

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	Proposal
1	T035- LS Power
2	T048- Propel Base 2
3	T049- Propel Base 3
4	T051- Propel Alt 5
5	T052- Propel Alt 6
6	T036- NextEra Core 1
7	T040- NextEra Core 5

Risks identified with the proposed outages have been identified in the risk register.

4.2. Cost


4.2.1. The criteria for evaluating the cost of a proposed Public Policy Transmission Project is defined in the NYISO OATT section 31.4.5.1.2.

4.2.2. Estimation Methodology

Development of the independent cost estimates for the Long Island PPTN was an iterative process utilizing the collective expertise and experience of the review team and augmented by vendor budgetary quotations. Ferreira Construction (Ferreira) prepared the independent cost estimates based on its experience in constructing transmission and substation project and purchasing large volumes of transmission and substation materials annually.

A copy of each proposal was provided to Ferreira with all pricing information redacted. Ferreira familiarized itself with the proposals and completed field reviews of the transmission routes accessible via public ROWs. Ferreira employed Google Earth to evaluate facilities not accessible via public ROWs since access to the utilities' existing transmission and substation facilities was not available.

SECo solicited budgetary quotations from vendors for major equipment including transformers, circuit breakers, GIS equipment, Shunt Reactors, Series Reactors, VSC HVDC Systems, and terrestrial and submarine cables. Ferreira used historical data from projects that it had completed to develop unit pricing for the material supply rates and labor and

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equipment rates for equipment such as switches, instrument transformers, station service transformers, transmission components, conductors, grounding, and hardware.

The preliminary designs provided by each Developer were used as the basis for the cost estimates. SECo provided engineering input, as required to assist Ferreira in determining specific technical requirements and verifying the Developers' preliminary designs. Developers' designs were checked for general compliance with standard industry requirements, but they were not optimized.

Indirect cost percentages were derived by Ferreira from historical project data. Licensing and environmental cost estimates were developed for each project by SECo's subcontractor, GEI Consultants, Inc.

The draft cost estimates from Ferreira were reviewed by SECo for completeness and accuracy. SECo also compared the independent draft cost estimates for the proposals against each other for consistency in estimation approach across the proposals. Lastly, SECo compared the draft cost estimate for each proposal against the Developer's cost estimates as a check for their reasonableness. If large differences were observed between the independent cost estimate and the Developer's cost estimate, SECo investigated and determined whether the differences were justified. If the differences in the cost estimates resulted from calculation errors, they were corrected by Ferreira.


The cost estimates were prepared in accordance with the Association for the Advancement of Cost Engineering International Recommended Practice for Class 4 Accuracy. The expected accuracy range typically varies from a low of (-15% to -30%) and high of (+20% to +50%).

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Association for the Advancement of Cost Engineering Criteria for Class 4 Accuracy

ESTIMATE CLASS	MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES (Expressed as % of complete definition)	END USAGE (Typical purpose of estimate)	METHODOLOGY (Typical estimating method)	EXPECTED ACCURACY RANGE (Typical variation in low and high ranges)
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%

The final cost estimates include the contingency rate of 20%. After recognizing the very large scale of this project, it was decided that a 20% contingency should be adequate recognizing that some components may deviate from estimate more than others due to greater uncertainties but will tend to average out. The review team agrees that level of contingency is sufficient to allow for unanticipated costs and estimating accuracy to forecast a reasonable worst-case cost.


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4.2.3. Summary of Costs

A summary of the costs for all projects is provided, which includes new facilities, Public Policy Transmission Upgrades (“Upgrades”), potential Network Upgrade Facilities (“NUF”), and excluded third party ROW. SECo referenced the “Characterization of Project Facilities” document, posted by the NYISO on June 10, 2022, and reproduced in Appendix [] of the Public Policy Transmission Planning Process Report, in preparing its independent cost estimates. If there is a difference in the characterization of facilities by SECo as a new facility, Upgrades, NUFs, or excluded third party ROW below with the NYISO’s characterization of new facilities and Public Policy Transmission Upgrades or a developer’s identified of a potential NUF in a proposal, the NYISO’s final “Characterization of Project Facilities” document and/or developer’s characterization of potential NUF shall control.

Independent Cost Estimate 2022 Dollars (\$1,000)					
	New Facilities (Excluding Third Party ROW) (A)	Upgrades (B)	NUFs (C)	Total Excluded Third Party ROW for New Facilities (D)	Overall Total (A+B+C+D)
T035- LS Power	\$5,920,452	\$39,078	\$27,576	\$11,068	\$5,998,174
T036- NextEra Core 1	\$3,230,250	\$1,135,143	\$0	\$1,520	\$4,366,913
T037- NextEra Core 2	\$3,627,277	\$1,256,718	\$0	\$1,726	\$4,885,722
T038- NextEra Core 3	\$4,251,741	\$1,207,700	\$0	\$1,435	\$5,460,876
T039- NextEra Core 4	\$4,457,495	\$1,269,941	\$0	\$1,445	\$5,728,881
T040- NextEra Core 5	\$3,609,641	\$1,084,129	\$0	\$1,431	\$4,695,200
T041- NextEra Core 6	\$4,447,548	\$1,130,640	\$0	\$6,993	\$5,585,181
T042- NextEra Core 7	\$13,750,171	\$1,123,557	\$0	\$7,150	\$14,880,878
T043- NextEra Enhanced 1	\$8,753,245	\$1,285,508	\$0	\$12,525	\$10,051,278
T044- NextEra Enhanced 2	\$16,127,943	\$1,329,334	\$0	\$8,432	\$17,465,709
T047- Propel Base 1	\$2,269,172	\$208,040	\$71,542	\$9,572	\$2,558,327
T048- Propel Base 2	\$1,965,833	\$92,758	\$107,911	\$10,232	\$2,176,735
T049- Propel Base 3	\$2,642,493	\$209,190	\$74,505	\$11,188	\$2,937,376
T051- Propel Alt 5	\$2,902,104	\$297,387	\$122,849	\$9,693	\$3,332,033
T052- Propel Alt 6	\$4,070,887	\$507,215	\$128,163	\$22,225	\$4,728,490
T053- Propel Alt 7	\$5,112,552	\$299,675	\$130,321	\$27,826	\$5,570,374

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- Cost estimates assume that a project can be built as designed. Costs associated with the identified potential risks are not included. The potential costs of the risks are described in Section 4.3 and the risk register.

4.2.4. Primary Cost Drivers


The primary design differences between the projects that increase the costs principally include:

- 4.2.4.1.** The number of existing substations being impacted, including new line terminals, new interties, remote end protection upgrades, and line terminal upgrades;
- 4.2.4.2.** The number of existing transmission lines being impacted, including line terminal relocations, line removal, and line upgrades;
- 4.2.4.3.** The number of proposed substations;
- 4.2.4.4.** The length of proposed or modified transmission lines;
- 4.2.4.5.** The use of HVDC technology; and
- 4.2.4.6.** The use of offshore HVDC.

The following table quantifies these primary design differences for each project.

Primary Cost Drivers Between Projects


Developers	# of Existing SS Impacted	# of Existing TLine Impacted	# of Proposed SS	Miles of Proposed TLine- Terrestrial	Miles of Proposed TLine Submarine	# of HVDC Converter Systems	# of Offshore HVDC Converters
T035- LS Power	16	13	3	150	48	3	0
T036- NextEra Core 1	22	22	7	111	26	0	0
T037- NextEra Core 2	23	22	8	100	26	0	0
T038- NextEra Core 3	22	23	9	100	51	0	0
T039- NextEra Core 4	24	25	9	100	73	0	0
T040- NextEra Core 5	20	23	8	80	51	0	0
T041- NextEra Core 6	24	25	10	98	51	1	0
T042- NextEra Core 7	26	26	14	98	301	3	2
T043- NextEra Enh. 1	27	25	12	150	146	2	0
T044- NextEra Enh. 2	31	28	13	163	198	3	2
T047- Propel Base 1	12	8	6	90	9	0	0
T048- Propel Base 2	12	13	6	73	10	0	0
T049- Propel Base 3	12	7	6	91	9	0	0
T051- Propel Alt 5	13	9	6	75	9	0	0

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Developers	# of Existing SS Impacted	# of Existing TLine Impacted	# of Proposed SS	Miles of Proposed TLine- Terrestrial	Miles of Proposed TLine Submarine	# of HVDC Converter Systems	# of Offshore HVDC Converters
T052- Propel Alt 6	12	9	7	133	9	0	0
T053- Propel Alt 7	14	11	9	123	34	1	0

4.2.5. T035 LS Power Cost Estimate:

	2022 Dollars w/o Contingency (\$1,000)
New Facilities- Substation	
1 - Longshore GIS Substation	\$214,993
2 - Southgate HVDC Converter Station and GIS Substation	\$1,071,656
3 - Northgate HVDC Converter Station and GIS Substation	\$1,107,190
New Facilities- Substations Total w/o Contingency	\$2,393,839
Excluded Third Party ROW	-\$10,942
New Facilities- Substations Total w/o Contingency and Third Party ROW	\$2,382,897
Upgrade Facilities- Substation	
9 - Pilgrim Road Substation_ Interconnection	\$22,421
Upgrade Facilities- Substation Total w/o Contingency	\$22,421
Network Upgrade Facilities- Substation	
4 - Millwood Interconnection (Includes substation and transmission interties)	\$452
6 - Ruland Road Substation Interconnection	\$10,931
7 - Pleasant Valley Substation_ Interconnection	\$834
8 - Buchanan Substation_ Interconnection	\$834
10 - Freeport Substation_ Interconnection	\$834
11 - Valley Stream Substation_ Interconnection	\$870
12 - Empire Offshore Wind Substation_ Interconnection	\$980
13 - Control Center Upgrade	\$89
Network Upgrade Facilities- Substation Total w/o Contingency	\$15,825
Total Substation w/o Contingency	\$2,432,085

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	2022 Dollars w/o Contingency (\$1000)
New Facilities- Transmission	
A Longshore-Southgate 345kV Onshore UG Cables - Three circuits-	\$821,144
B Southgate-Northgate 400kV DC Onshore UG Cables -Three circuits DC Cables 2 per circuit	\$1,177,522
C. Southgate to Northgate Offshore Submarine Cables- Three Circuits- DC Cables 2 per Circuit	\$552,274
New Facilities- Transmission Total w/o Contingency	\$2,550,939
Excluded Third Party ROW	-\$126
New Facilities- Transmission Total w/o Contingency and Third Party ROW	\$2,550,813
Upgrade Facilities- Transmission	
D. 138kV Upgrades	\$10,144
Upgrade Facilities -Transmission w/o Contingency	\$2,561,084
Network Upgrade Facilities - Transmission	
Millwood 345 kV Interconnection	\$5,310
Totals with Contingency	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$986,742
Total New Facilities w/ Contingency	\$5,920,452
Upgrade Facilities Contingency	\$6,513
Total Upgrade Facilities w/ Contingency	\$39,078
Network Upgrade Facilities Contingency	\$6,441
Total Network Upgrade Facilities w/ Contingency	\$27,576
Total Excluded Third Party ROW for New Facilities	\$11,068
Overall Total	\$5,998,174

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4.2.6. NextEra Independent Cost Estimates

4.2.6.1. T036 NextEra Core 1


	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1. Station 29 New Ruland Road 345/138 kV Substation	\$81,249
Bethpage to Bagatelle 138kV Circuit (Tie into new Ruland Rd.)	
2. Station 252 East Garden City 345/138 kV Substation	\$289,950
East Garden City- Sprain Brook 345kV (Y49) (Connection between existing transformers and PARs tying into new substation)	
3. Station 48 Valley Stream 345/138 kV Substation	\$119,602
Valley Stream 138kV- (Ties to new Valley Stream Substation)	
New Facilities- Substations Total w/o Contingency	\$490,801
Excluded Third Party ROW	-\$1,158
New Facilities- Substations Total w/o Contingency and Third Party ROW	\$489,643
Upgrade Facilities- Substation	
4. Barrett 138 kV Substation Upgrades	\$64,374
5. Dunwoodie 345 kV GIS Substation	\$53,898
6. Elwood 138 kV Substation Upgrades	\$6,622
7. Jamaica 138 kV Substation Upgrades	\$1,687
8. Newbridge 345/138 kV GIS Substation Upgrades	\$74,882
9. Rainey 345kV GIS Substation Upgrades	\$38,288
10. Shore Road 138kV Substation Upgrades	\$11,720
11. Sprain Brook 345kV Substation Expansion	\$496,938
East Garden City Upgrade- 138kV PAR	\$23,682
Ruland Rd- 138kV Breaker	\$1,792
Valley Stream 138kV- P5 Contingency	\$100
West Bus 138kV and Kings 138kV	\$873
Upgrade Facilities- Substation w/o Contingency	\$774,856
Total Substation	\$1,264,499

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Transmission	2022 Dollars w/o Contingency (\$1000)
New Facilities- Transmission	
Comp 4 - Dunwoodie To New Rochelle Landing 345kV Onshore UG Cables -single circuit (EGC To Dunwoodie 345 kV)	\$157,188
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 345kV UG Cables - Double circuit (EGC- Sprain Brook and Ruland To Sprain Brook 345 kV)	\$288,728
Comp 17. New Rochelle Landing to Hempstead Harbor Landing (Shore Road) 345kV Offshore Submarine Cables - Three circuits (two cables each) EGC-Dunwoodie 345KV / EGC-Sprain Brook/Ruland-Sprain Brook 345KV	\$621,521
Comp 3A - East Garden City To Hempstead Harbor Landing 345kV Onshore UG Cables -Double circuit (EGC to Sprain Brook/EGC To Dunwoodie 345 kV)	\$321,362
Comp 5 - Ruland To Hempstead Harbor Landing (Shore Road) 345kV Onshore UG Cables - Single circuit (Ruland To Sprain Brook 345 kV)	\$291,557
Comp 10A - East Garden City To Valley Stream 345kV Onshore UG Cables -Triple circuits	\$328,526
Comp 113 - Jamaica to East Garden City 138 kV Onshore UG Cables -Single circuit (EGC-Jamaica 138kv)	\$193,712
New Facilities- Transmission w/o Contingency	\$2,202,594
Excluded Third Party ROW	-\$362
New Facilities- Transmission w/o Contingency and Third Party ROW	\$2,202,232
Upgrade Facilities- Transmission	
Comp 8C - Rebuild: East Garden City - Newbridge 345kV Onshore UG Cables -Double circuits	\$111,098
Comp 13A - Syosset - Oakwood 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp 13B - Syosset - Greenlawn 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp XX - Ruland Road - Newbridge 138 kV #3 (567 Line) Onshore UG Cables -Single circuit	\$4,462
Ruland Rd.-Newbridge 561	\$6,461
Ruland Rd.-Newbridge 562	\$6,724
Upgrade Facilities- Transmission w/o Contingency	\$171,243
Total Transmission	\$2,373,474


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	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$538,375
Total New Facilities w/ Contingency	\$3,230,250
Upgrade Facilities Contingency	\$189,045
Total Upgrade Facilities w/ Contingency	\$1,135,143
Network Upgrade Facilities Contingency	
Total Network Upgrade Facilities w/ Contingency	
Total Excluded Third Party ROW for New Facilities	\$1,520
Overall Total	\$4,366,913


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4.2.6.2. T037 NextEra Core 2


	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1. Station 29 New Ruland Road 345/138 kV Substation Bethpage to Bagatelle 138kV Circuit (Tie into new Ruland Rd.)	\$108,607
2. Station 31 East Garden City 345/138 kV Substation East Garden City- Sprain Brook 345kV (Y49) (Connection between existing transformers and PARs tying into new substation)	\$243,240
3. Station 48 Valley Stream 345/138 kV Substation Valley Stream 138kV- (Ties to new Valley Stream Substation)	\$119,602
New Facilities- Substations Total w/o Contingency	\$471,449
Excluded Third party ROW	-\$1,158
New Facilities- Substations Total w/o Contingency and Third Party ROW	\$470,291
Upgrade Facilities- Substation	
4. Barrett 138 kV Substation Upgrades	\$64,374
5. Dunwoodie 345 kV GIS Substation	\$53,898
6. Elwood 138 kV Substation Upgrades	\$6,622
7. Jamaica 138 kV Substation Upgrades	\$1,687
8. Newbridge 345/138 kV GIS Substation Upgrades	\$74,882
9. Rainey 345kV GIS Substation Upgrades	\$38,288
10. Shore Road 138kV Substation Upgrades	\$11,720
11. Sprain Brook 345kV Substation Expansion	\$496,938
12. Farragut 345kV Substation Expansion	\$101,278
East Garden City Upgrade- 138kV PAR	\$23,682
Ruland Rd- 138kV Breaker	\$1,792
Valley Stream 138kV- P5 Contingency	\$100
West Bus 138kV and Kings 138kV	\$873
Upgrade Facilities- Substation w/o Contingency	\$876,134
Total Substation	\$1,346,425

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Transmission	2022 Dollars w/o Contingency (\$1000)
New Facilities- Transmission	
Comp 4 - Dunwoodie To New Rochelle Landing 345kV Onshore UG Cables -single circuit (EGC To Dunwoodie 345 kV)	\$157,188
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 345kV UG Cables - Double circuit (EGC- Sprain Brook and Ruland To Sprain Brook 345 kV)	\$288,728
Comp 17. New Rochelle Landing to Hempstead Harbor Landing (Shore Road) 345kV Offshore Submarine Cables - Three circuits (two cables each) EGC-Dunwoodie 345KV / EGC-Sprain Brook/ Ruland-Sprain Brook 345KV	\$621,521
Comp 3A - East Garden City To Hempstead Harbor Landing 345kV Onshore UG Cables -Double circuit (EGC to Sprain Brook/ EGC To Dunwoodie 345 kV)	\$321,362
Comp 5 - Ruland To Hempstead Harbor Landing (Shore Road) 345kV Onshore UG Cables - Single circuit (Ruland To Sprain Brook 345 kV)	\$291,557
Comp 10A - East Garden City To Valley Stream 345kV Onshore UG Cables -Triple circuits	\$328,526
Comp 249 - Jamaica To Farragut 345kV Onshore UG Cables -Single circuit (EGC-Farragut 345kv)	\$196,066
Comp 247 - Jamaica to East Garden City 138 and 345kV Onshore UG Cables -Double & Single circuit (EGC-Jamaica 138kv & EGC-Farragut 345kv)	\$348,060
New Facilities- Transmission w/o Contingency	\$2,553,008
Excluded Third Party ROW	-\$568
New Facilities- Transmission w/o Contingency and Third Party ROW	\$2,552,440
Upgrade Facilities- Transmission	
Comp 8C - Rebuild: East Garden City - Newbridge 345kV Onshore UG Cables -Double circuits	\$111,098
Comp 13A - Syosset - Oakwood 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp 13B - Syosset - Greenlawn 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp XX - Ruland Road - Newbridge138 kV #3 (567 Line) Onshore UG Cables -Single circuit	\$4,462
Ruland Rd.-Newbridge 561	\$6,461
Ruland Rd.-Newbridge 562	\$6,724
Upgrade Facilities- Transmission w/o Contingency	\$171,243
Total Transmission	\$2,723,682


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	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$604,546
Total New Facilities w/ Contingency	\$3,627,277
Upgrade Facilities Contingency	\$209,475
Total Upgrade Facilities w/ Contingency	\$1,256,852
Network Upgrade Facilities Contingency	
Total Network Upgrade Facilities w/ Contingency	
Total Excluded Third Party ROW for New Facilities	\$1,726
Overall Total	\$4,885,722


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4.2.6.3. T038 NextEra Core 3


	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1. Station 29 New Ruland Road 345/138 kV Substation Bethpage to Bagatelle 138kV Circuit (Tie into new Ruland Rd.)	\$108,607
2. Station 31 East Garden City 345/138 kV Substation East Garden City- Sprain Brook 345kV (Y49) (Connection between existing transformers and PARs tying into new substation)	\$289,950
3. Station 48 Valley Stream 345/138 kV Substation Valley Stream 138kV- (Ties to new Valley Stream Substation)	\$119,602
13. Station 30 Northport 345/138kV AIS 14 - Northport 138kV GIS Substation	\$82,353
New Facilities- Substations Total w/o Contingency	\$600,512
Excluded Third Party Right-of-Way	-\$1,158
New Facilities- Substations Total w/o Contingency and Third Party ROW	\$599,354
Upgrade Facilities- Substation	
4. Barrett 138 kV Substation Upgrades	\$64,374
5. Dunwoodie 345 kV GIS Substation	\$53,898
6. Elwood 138 kV Substation Upgrades	\$6,622
7. Jamaica 138 kV Substation Upgrades	\$1,687
8. Newbridge 345/138 kV GIS Substation Upgrades	\$74,882
9. Rainey 345kV GIS Substation Upgrades	\$38,288
10. Shore Road 138kV Substation Upgrades	\$11,720
11. Sprain Brook 345kV Substation Expansion	\$496,938
12. Farragut 345kV Substation Expansion	\$101,278
14. Pilgrim 138kV Substation Upgrades	\$1,697
East Garden City Upgrade- 138kV PAR	\$23,682
Ruland Rd- 138kV Breaker	\$1,792
Valley Stream 138kV- P5 Contingency	\$100
West Bus 138kV and Kings 138kV	\$873
Upgrade Facilities- Substation w/o Contingency	\$877,831
Total Substation	\$1,477,185

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	2022 Dollars w/o Contingency (\$1000)
New Facilities- Transmission	
Comp 4 - Dunwoodie To New Rochelle Landing 345kV Onshore UG Cables -single circuit (Northport To Dunwoodie 345 kV)	\$157,188
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 345kV UG Cables - Double circuit (EGC- Sprain Brook and Ruland To Sprain Brook 345 kV)	\$288,728
Comp 17. New Rochelle Landing to Hempstead Harbor Landing (Shore Road) 345kV Offshore Submarine Cables - Double circuits (two lines, single circuit each) EGC-Sprain Brook 345KV/ Ruland-Sprain Brook 345KV	\$437,499
Comp 18. New Rochelle Landing to Northport Landing 345kV Offshore Submarine Cables - Single circuit (Double Tri-Core Cable)	\$583,146
Comp 3 - East Garden City To Hempstead Harbor Landing 345kV Onshore UG Cables -Single circuit (EGC To Sprain Brook 345 kV)	\$175,226
Comp 5 - Ruland To Hempstead Harbor Landing (Shore Road) 345kV Onshore UG Cables - Single circuit (Ruland To Sprain Brook 345 kV)	\$291,557
Comp 10A - East Garden City To Valley Stream 345kV Onshore UG Cables -Triple circuits	\$328,526
Comp 11 - Pilgrim to Northport 138kV Onshore UG Cables -Single circuit (Pilgrim to Northport kV)	\$138,044
Comp 249 - Jamaica To Farragut 345kV Onshore UG Cables -Single circuit (EGC-Farragut 345kv)	\$196,066
Comp 247 - Jamaica to East Garden City 138 and 345kV Onshore UG Cables -Double & Single circuit (EGC-Jamaica 138kv & EGC-Farragut 345kv)	\$348,060
New Facilities- Transmission w/o Contingency	\$2,944,041
Excluded Third Party ROW	-\$277
New Facilities- Transmission w/o Contingency and Third Party ROW	\$2,943,763
Upgrade Facilities- Transmission	
Comp 8C - Rebuild: East Garden City - Newbridge 345kV Onshore UG Cables -Double circuits	\$111,098
Comp XX - Ruland Road - Newbridge 138 kV #3 (567 Line) Onshore UG Cables -Single circuit	\$4,462
Ruland Rd.-Newbridge 561	\$6,461
Ruland Rd.-Newbridge 562	\$6,724
Upgrade Facilities- Transmission w/o Contingency	\$128,745
Total Transmission	\$3,072,509


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	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$708,623
Total New Facilities w/ Contingency	\$4,251,741
Upgrade Facilities Contingency	\$201,123
Total Upgrade Facilities w/ Contingency	\$1,207,700
Network Upgrade Facilities Contingency	
Total Network Upgrade Facilities w/ Contingency	
Total Excluded Third Party ROW for New Facilities	\$1,453
Overall Total	\$5,460,876


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4.2.6.4. T039 NextEra Core 4


	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1. Station 29 New Ruland Road 345/138 kV Substation Bethpage to Bagatelle 138kV Circuit (Tie into new Ruland Rd.)	\$81,249
2. Station 31 East Garden City 345/138 kV Substation East Garden City- Sprain Brook 345kV (Y49) (Connection between existing transformers and PARs tying into new substation)	\$272,191
3. Station 48 Valley Stream 345/138 kV Substation Valley Stream 138kV- (Ties to new Valley Stream Substation)	\$119,602
13. Station 30 Northport 345/138kV AIS 14 - Northport 138kV GIS Substation	\$82,353
New Facilities- Substations Total w/o Contingency	\$555,396
Excluded Third Party Right-of-Way	-\$1,158
New Facilities- Substations Total w/o Contingency and Third Party ROW	\$554,238
Upgrade Facilities- Substation	
4. Barrett 138 kV Substation Upgrades	\$64,374
5. Dunwoodie 345 kV GIS Substation	\$53,898
6. Elwood 138 kV Substation Upgrades	\$6,622
7. Jamaica 138 kV Substation Upgrades	\$1,687
8. Newbridge 345/138 kV GIS Substation Upgrades	\$74,882
9. Rainey 345kV GIS Substation Upgrades	\$38,288
10. Shore Road 138kV Substation Upgrades	\$11,720
11. Sprain Brook 345kV Substation Expansion	\$504,760
12. Farragut 345kV Substation Expansion	\$102,825
14. Pilgrim 138kV Substation Upgrades	\$1,697
East Garden City Upgrade- 138kV PAR	\$23,682
Ruland Rd- 138kV Breaker	\$1,792
Valley Stream 138kV- P5 Contingency	\$100
West Bus 138kV and Kings 138kV	\$873
Upgrade Facilities- Substation w/o Contingency	\$887,200
Total Substation	\$1,441,438

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	2022 Dollars w/o Contingency (\$1000)
New Facilities- Transmission	
Comp 4 - Dunwoodie To New Rochelle Landing 345kV Onshore UG Cables -single circuit (Northport To Dunwoodie 345 kV)	\$157,188
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 345kV UG Cables -Double circuits (EGC To Sprain Brook 345 kV / Ruland To Sprain Brook 345 kV)	\$288,728
Comp 17. New Rochelle Landing to Hempstead Harbor Landing (Shore Road) 345kV Offshore Submarine Cables - Double circuits (two lines, single circuit each) EGC-Sprain Brook 345KV/ Ruland-Sprain Brook 345KV	\$437,499
Comp 18. New Rochelle Landing to Northport Landing 345kV Offshore Submarine Cables - Single circuit (2 cables per circuit)	\$584,114
Comp 3 - East Garden City To Hempstead Harbor Landing 345kV Onshore UG Cables -Single circuit (EGC To Sprain Brook 345 kV)	\$175,226
Comp 5 - Ruland To Hempstead Harbor Landing (Shore Road) 345kV Onshore UG Cables - Single circuit (Ruland To Sprain Brook 345 kV)	\$291,557
Comp 10A - East Garden City To Valley Stream 345kV Onshore UG Cables -Triple circuits	\$328,526
Comp 11 - Pilgrim to Northport 138kV Onshore UG Cables -Single circuit (Pilgrim to Northport kV)	\$138,044
Comp 113 - Jamaica to East Garden City 138 kV Onshore UG Cables -Single circuit (EGC-Jamaica 138kv)	\$193,712
Comp 87. Farragut to Sprain Brook Landing 345kV Offshore Submarine Cables - Single circuit (Farragut-Sprain Brook 345KV)	\$505,509
Comp 85 - Sprain Brook Sub to Sprain Brook Landing 345kV Onshore UG Cables -Single circuit (Farragut-Sprain Brook 345KV)	\$60,525
New Facilities- Transmission w/o Contingency	\$3,160,628
Excluded Third Party ROW	-\$287
New Facilities- Transmission w/o Contingency and Third Party ROW	\$3,160,341
Upgrade Facilities- Transmission	
Comp 8C - Rebuild: East Garden City - Newbridge 345kV Onshore UG Cables -Double circuits	\$111,098
Comp 13A - Syosset - Oakwood 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp 13B - Syosset - Greenlawn 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp XX - Ruland Road - Newbridge 138 kV #3 (567 Line) Onshore UG Cables -Single circuit	\$4,462
Ruland Rd.-Newbridge 561	\$6,461
Ruland Rd.-Newbridge 562	\$6,724


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	2022 Dollars w/o Contingency (\$1000)
Upgrade Facilities- Transmission w/o Contingency	\$171,243
Total Transmission	\$3,331,584
	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$742,916
Total New Facilities w/ Contingency	\$4,457,495
Upgrade Facilities Contingency	\$211,689
Total Upgrade Facilities w/ Contingency	\$1,269,941
Network Upgrade Facilities Contingency	
Total Network Upgrade Facilities w/ Contingency	
Total Excluded Third Party ROW for New Facilities	\$1,4445
Overall Total	\$5,728,881


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4.2.6.5. T040 NextEra Core 5


	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1. Station 29 New Ruland Road 345/138 kV Substation Bethpage to Bagatelle 138kV Circuit (Tie into new Ruland Rd.)	\$81,249
2. Station 31 East Garden City 345/138 kV Substation East Garden City- Sprain Brook 345kV (Y49) (Connection between existing transformers and PARs tying into new substation)	\$272,191
3. Station 48 Valley Stream 345/138 kV Substation Valley Stream 138kV- (Ties to new Valley Stream Substation)	\$119,602
13. Station 30 Northport 345/138kV AIS 14 - Northport 138kV GIS Substation	\$80,840
New Facilities- Substations Total w/o Contingency	\$553,882
Excluded Third Party ROW	-\$1,158
New Facilities- Substation w/o Contingency and Third Party ROW	\$552,724
Upgrade Facilities- Substation	
4. Barrett 138 kV Substation Upgrades	\$64,374
5. Dunwoodie 345 kV GIS Substation	\$53,898
6. Elwood 138 kV Substation Upgrades	\$6,622
7. Jamaica 138 kV Substation Upgrades	\$1,687
8. Newbridge 345/138 kV GIS Substation Upgrades	\$74,882
9. Rainey 345kV GIS Substation Upgrades	\$38,288
10. Shore Road 138kV Substation Upgrades	\$11,720
11. Sprain Brook 345kV Substation Expansion	\$496,938
East Garden City Upgrade- 138kV PAR	\$23,682
Ruland Rd- 138kV Breaker	\$1,792
Valley Stream 138kV- P5 Contingency	\$100
West Bus 138kV and Kings 138kV	\$873
Upgrade Facilities- Substation w/o Contingency	\$774,856
Total Substation	\$1,327,580

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	2022 Dollars w/o Contingency (\$1000)
New Facilities- Transmission	
Comp 4 - Dunwoodie To New Rochelle Landing 345kV Onshore UG Cables -single circuit (Northport To Dunwoodie 345 kV)	\$157,188
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 345kV UG Cables -Double circuits (EGC To Sprain Brook 345 kV / Ruland To Sprain Brook 345 kV)	\$288,728
Comp 17. New Rochelle Landing to Hempstead Harbor Landing (Shore Road) 345kV Offshore Submarine Cables - Double circuits (two lines, single circuit each) EGC-Sprain Brook 345KV/ Ruland-Sprain Brook 345KV	\$437,499
Comp 18. New Rochelle Landing to Northport Landing 345kV Offshore Submarine Cables - Single circuit (2 cables per circuit)	\$583,146
Comp 3 - East Garden City To Hempstead Harbor Landing 345kV Onshore UG Cables -Single circuit (EGC To Sprain Brook 345 kV)	\$175,226
Comp 5 - Ruland To Hempstead Harbor Landing (Shore Road) 345kV Onshore UG Cables - Single circuit (Ruland To Sprain Brook 345 kV)	\$291,557
Comp 10A - East Garden City To Valley Stream 345kV Onshore UG Cables -Triple circuits	\$328,526
Comp 113 - Jamaica to East Garden City 138 kV Onshore UG Cables -Single circuit (EGC-Jamaica 138kv)	\$193,712
New Facilities- Transmission w/o Contingency	\$2,455,582
Excluded Third Party ROW	-\$273
New Facilities- Transmission w/o Contingency and Third Party ROW	\$2,455,310


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Upgrade Facilities- Transmission	
Comp 8C - Rebuild: East Garden City - Newbridge 345kV Onshore UG Cables -Double circuits	\$111,098
Comp XX - Ruland Road - Newbridge138 kV #3 (567 Line) Onshore UG Cables -Single circuit	\$4,462
Ruland Rd.-Newbridge 561	\$6,461
Ruland Rd.-Newbridge 562	\$6,724
Upgrade Facilities- Transmission w/o Contingency	\$128,745
Total Transmission	\$2,584,055
	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$601,607
Total New Facilities w/ Contingency	\$3,609,641
Upgrade Facilities Contingency	\$180,527
Total Upgrade Facilities w/ Contingency	\$1,084,129
Network Upgrade Facilities Contingency	
Total Network Upgrade Facilities w/ Contingency	
Total Excluded Third Party ROW for New Facilities	\$1,431
Overall Total	\$4,695,200


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	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1. Station 29 New Ruland Road 345/138 kV Substation	\$81,249
Bethpage to Bagatelle 138kV Circuit (Tie into new Ruland Rd.)	
2. Station 31 East Garden City 345/138 kV Substation	\$272,191
East Garden City- Sprain Brook 345kV (Y49) (Connection between existing transformers and PARs tying into new substation)	
3. Station 48 Valley Stream 345/138 kV Substation	\$119,602
Valley Stream 138kV- (Ties to new Valley Stream Substation)	
12 - Station 36a Sprain Brook HVDC 1200MW Converter Station	\$379,120
13- Station 30a New Northport HVDC 1200MW Converter Station	\$373,951
14 - Northport 138kV GIS Substation	\$33,439
New Facilities- Substation w/o Contingency	\$1,259,552
Excluded Third Party ROW	-\$6,716
New Facilities- Substation w/o Contingency and Third Party ROW	\$1,252,836
Upgrade Facilities- Substation	
4. Barrett 138 kV Substation Upgrades	\$64,374
5. Dunwoodie 345 kV GIS Substation	\$53,898
6. Elwood 138 kV Substation Upgrades	\$6,622
7. Jamaica 138 kV Substation Upgrades	\$1,687
8. Newbridge 345/138 kV GIS Substation Upgrades	\$74,882
9. Rainey 345kV GIS Substation Upgrades	\$38,288
10. Shore Road 138kV Substation Upgrades	\$11,720
11. Sprain Brook 345kV Substation Expansion	\$490,576
15. Pilgrim 138kV Substation	\$1,697
East Garden City Upgrade- 138kV PAR	\$23,682
Ruland Rd- 138kV Breaker	\$1,792
Valley Stream 138kV- P5 Contingency	\$100
West Bus 138kV and Kings 138kV	\$873
Upgrade Facilities- Substation w/o Contingency	\$770,191
Total Substation	\$2,023,027

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New Facilities- Transmission	
	2022 Dollars w/o Contingency (\$1000)
New Facilities- Transmission	
Comp 4 - Dunwoodie To New Rochelle Landing 345kV Onshore UG Cables -single circuit (EGC To Dunwoodie 345 kV)	\$157,188
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 345kV UG Cables - Single circuit (Ruland To Sprain Brook 345 kV)	\$158,624
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 320kV DC UG Cables - Single circuit (Northport To Sprain Brook 320 kV DC)	\$132,603
Comp 17. New Rochelle Landing to Hempstead Harbor Landing (Shore Road) 345kV Offshore Submarine Cables - Two circuits (two lines, single circuit each) EGC-Dunwoodie 345KV / Ruland-Sprain Brook 345KV	\$437,499
Comp 68. Northport to New Rochelle Landing 320kV DC Offshore Submarine Cables - One circuit Northport-Sprain Brook 320KV DC	\$440,751
Comp 3A - East Garden City To Hempstead Harbor Landing 345kV Onshore UG Cables -Single circuit (EGC To Dunwoodie 345 kV)	\$175,226
Comp 5 - Ruland To Hempstead Harbor Landing (Shore Road) 345kV Onshore UG Cables - Single circuit (Ruland To Sprain Brook 345 kV)	\$291,557
Comp 10A - East Garden City To Valley Stream 345kV Onshore UG Cables -Triple circuits	\$328,526
Comp 113 - Jamaica to East Garden City 138 kV Onshore UG Cables -Single circuit (EGC-Jamaica 138kv)	\$193,712
Comp 11- Northport to Pilgrim	\$138,044
New Facilities- Transmission w/o Contingency	\$2,453,731
Excluded Third Party ROW	-\$277
New Facilities- Transmission w/o Contingency and Third Party ROW	\$2,453,454
Upgrade Facilities- Transmission	
Comp 8C - Rebuild: East Garden City - Newbridge 345kV Onshore UG Cables -Double circuits	\$111,098
Comp 13A - Syosset - Oakwood 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp 13B - Syosset - Greenlawn 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp XX - Ruland Road - Newbridge138 kV #3 (567 Line) Onshore UG Cables -Single circuit	\$4,462
Ruland Rd.-Newbridge 561	\$6,461
Ruland Rd.-Newbridge 562	\$6,724
Upgrade Facilities- Transmission w/o Contingency	\$171,243
Total Transmission	\$2,624,696


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	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$741,258
Total New Facilities w/ Contingency	\$4,447,548
Upgrade Facilities Contingency	\$188,206
Total Upgrade Facilities w/ Contingency	\$1,130,640
Network Upgrade Facilities Contingency	
Total Network Upgrade Facilities w/ Contingency	
Total Excluded Third Party ROW for New Facilities	\$6,993
Overall Total	\$5,585,181


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	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1. Station 29 New Ruland Road 345/138 kV Substation Bethpage to Bagatelle 138kV Circuit (Tie into new Ruland Rd.)	\$81,249
2. Station 31 East Garden City 345/138 kV Substation East Garden City- Sprain Brook 345kV (Y49) (Connection between existing transformers and PARs tying into new substation)	\$272,191
3. Station 48 Valley Stream 345/138 kV Substation Valley Stream 138kV- (Ties to new Valley Stream Substation)	\$119,602
12 - Station 36a Sprain Brook HVDC 1200MW Converter Station	\$379,120
13- Station 30a New Northport HVDC 1200MW Converter Station	\$373,951
14 - Northport 138kV GIS Substation	\$33,439
16. - Comp 101 Buchanan 345kV & HVDC Substation Upgrade Buchanan 345kV Substation	\$799,716
New Facilities- Substations Total w/o Contingency	\$2,059,268
Excluded Third Party ROW	-\$6,871
New Facilities- Substation w/o Contingency and Third Party ROW	\$2,052,397
Upgrade Facilities- Substation	
4. Barrett 138 kV Substation Upgrades	\$64,374
5. Dunwoodie 345 kV GIS Substation	\$53,898
6. Elwood 138 kV Substation Upgrades	\$6,622
7. Jamaica 138 kV Substation Upgrades	\$1,687
8. Newbridge 345/138 kV GIS Substation Upgrades	\$74,882
9. Rainey 345kV GIS Substation Upgrades	\$38,288
10. Shore Road 138kV Substation Upgrades	\$11,720
11. Sprain Brook 345kV Substation Expansion	\$490,576
15. Pilgrim 138kV Substation Upgrades	\$1,697
East Garden City Upgrade- 138kV PAR	\$23,682
Ruland Rd- 138kV Breaker	\$1,792
Valley Stream 138kV- P5 Contingency	\$100
West Bus 138kV and Kings 138kV	\$873
Upgrade Facilities- Substation w/o Contingency	\$770,191
Total Substation	\$2,822,588

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	2022 Dollars w/o Contingency (\$1000)
New Facilities- Transmission	
Comp 4 - Dunwoodie To New Rochelle Landing 345kV Onshore UG Cables -single circuit (EGC To Dunwoodie 345 kV)	\$157,188
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 345kV UG Cables - Single circuit (Ruland To Sprain Brook 345 kV)	\$158,624
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 320kV DC UG Cables - Single circuit (Northport To Sprain Brook 320 kV DC)	\$132,603
Comp 17. New Rochelle Landing to Hempstead Harbor Landing (Shore Road) 345kV Offshore Submarine Cables - Two circuits (two circuits, two cables each) EGC-Dunwoodie 345KV / Ruland-Sprain Brook 345KV	\$437,469
Comp 68. Northport to New Rochelle Landing 320kV DC Offshore Submarine Cables - One circuit Northport-Sprain Brook 320KV DC	\$440,751
Comp 3 - East Garden City To Hempstead Harbor Landing 345kV Onshore UG Cables -Single circuit (EGC To Dunwoodie 345 kV)	\$175,226
Comp 5 - Ruland To Hempstead Harbor Landing (Shore Road) 345kV Onshore UG Cables - Single circuit (Ruland To Sprain Brook 345 kV)	\$291,557
Comp 10A - East Garden City To Valley Stream 345kV Onshore UG Cables -Triple circuits	\$328,526
Comp 11 - Pilgrim to Northport 138kV Onshore UG Cables -Single circuit (Pilgrim to Northport kV)	\$138,044
Comp 113 - Jamaica to East Garden City 138 kV Onshore UG Cables -Single circuit (EGC-Jamaica 138kv)	\$193,712
Comp 226 & 227. Offshore Platform HSA to Buchanan Landing 320kV #1, #2 DC Offshore Submarine Cables - Double circuits (Hudson South OSW platform #1 & #2- Buchanan HVDC #1 & #2 320 kV)	\$6,907,895
Station 205 OSW Platform	
Comp 254 - Buchanan Landing-Buchanan Onshore 320kV DC UG Cables - Double circuits (Hudson South OSW platform #1 & #2- Buchanan HVDC #1 & #2 320 kV)	\$38,803
New Facilities- Transmission w/o Contingency	\$9,400,399
Excluded Third Party ROW	-\$279
New Facilities- Transmission w/o Contingency and Third Party ROW	\$9,400,121


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Upgrade Facilities- Transmission	
Comp 8C - Rebuild: East Garden City - Newbridge 345kV Onshore UG Cables -Double circuits	\$111,098
Comp 13A - Syosset - Oakwood 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp 13B - Syosset - Greenlawn 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp XX - Ruland Road - Newbridge138 kV #3 (567 Line) Onshore UG Cables -Single circuit	\$4,462
Ruland Rd.-Newbridge 561	\$6,461
Ruland Rd.-Newbridge 562	\$6,724
Upgrade Facilities- Transmission w/o Contingency	\$171,243
Total Transmission	\$9,571,363
	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$2,290,503
Total New Facilities w/ Contingency	\$13,750,171
Upgrade Facilities Contingency	\$182,123
Total Upgrade Facilities w/ Contingency	\$1,123,557
Network Upgrade Facilities Contingency	
Total Network Upgrade Facilities w/ Contingency	
Total Excluded Third Party ROW for New Facilities	\$7,150
Overall Total	\$14,880,878


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	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1. Station 253 New Ruland Road 345/138 kV Substation Bethpage to Bagatelle 138kV Circuit (Tie into new Ruland Rd.)	\$108,607
2. Station 252 East Garden City 345/138 kV Substation East Garden City- Sprain Brook 345kV (Y49) (Connection between existing transformers and PARs tying into new substation)	\$292,317
3. Station 48 Valley Stream 345/138 kV Substation Valley Stream 138kV- (Ties to new Valley Stream Substation)	\$119,602
12. Station 36a Sprain Brook HVDC 1200MW Converter Station Sprain Brook HVDC intertie to existing Sprain Brook 345kV	\$379,120
13. Station 30a New Northport HVDC 1200MW Converter Station New Northport HVDC intertie to existing Northport 138kV	\$373,951
14. Northport 138kV GIS Substation	\$33,439
16. Comp 155 Buchanan 1200 MW HVDC Converter Substation Buchanan 345kV Substation Buchanan HVDC intertie to existing Buchanan 345kV	\$355,355
18. New Barrett HVDC 1200MW Converter Station New Barrett HVDC intertie to existing Barrett 138kV	\$365,441
New Facilities- Substations Total w/o Contingency	\$2,027,832
Excluded Third Party ROW	-\$11,762
New Facilities- Substation w/o Contingency and Third Party ROW	\$2,016,070
Upgrade Facilities- Substation	
4. Barrett 138 kV Substation Upgrades	\$64,374
5. Dunwoodie 345 kV GIS Substation	\$53,898
6. Elwood 138 kV Substation Upgrades	\$6,622
7. Jamaica 138 kV Substation Upgrades	\$1,687
8. Newbridge 345/138 kV GIS Substation Upgrades	\$74,882
9. Rainey 345kV GIS Substation Upgrades	\$38,288
10. Shore Road 138kV Substation Upgrades	\$11,720
11. Sprain Brook 345kV Substation Expansion	\$504,766
15. Pilgrim 138kV Substation Upgrades	\$3,109

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	2022 Dollars w/o Contingency (\$1000)
17. Farragut 345kV Substation Expansion	\$109,709
19. Holbrook 138kV Substation Upgrades	\$3,584
East Garden City Upgrade- 138kV PAR	\$23,682
Ruland Rd- 138kV Breaker	\$1,792
Valley Stream 138kV- P5 Contingency	\$100
West Bus 138kV and Kings 138kV	\$873
Upgrade Facilities- Substation w/o Contingency	\$899,087
Total Substation	\$2,915,157
New Facilities- Transmission	
Comp 4 - Dunwoodie To New Rochelle Landing 345kV Onshore UG Cables -single circuit (EGC To Dunwoodie 345kV)	\$157,188
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 345kV UG Cables -Double circuits (EGC To Sprain Brook 345 kV / Ruland To Sprain Brook 345 kV)	\$288,728
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 320kV DC UG Cables - Single circuit (Northport To Sprain Brook 320 kV DC)	\$132,603
Comp 17. New Rochelle Landing to Hempstead Harbor Landing (Shore Road) 345kV Offshore Submarine Cables - Three circuits (three lines, single circuit each) EGC-Dunwoodie 345KV / EGC-Sprain Brook 345KV/ Ruland-Sprain Brook 345KV	\$621,521
Comp 68. Northport to New Rochelle Landing 320kV DC Offshore Submarine Cables - One circuit Northport-Sprain Brook 320KV DC	\$440,751
Comp 3A - East Garden City To Hempstead Harbor Landing 345kV Onshore UG Cables -Double circuits (EGC To Sprain Brook 345 kV / EGC To Dunwoodie 345 kV)	\$321,362
Comp 5 - Ruland To Hempstead Harbor Landing (Shore Road) 345kV Onshore UG Cables - Single circuit (Ruland To Sprain Brook 345 kV)	\$291,557
Comp 10A - East Garden City To Valley Stream 345kV Onshore UG Cables -Triple circuits	\$328,526
Comp 11 - Pilgrim to Northport 138kV Onshore UG Cables -Single circuit (Pilgrim to Northport)	\$138,044
Comp 249 - Jamaica To Farragut 345kV Onshore UG Cables -Single circuit (EGC-Farragut 345kv)	\$196,066
Comp 247 - Jamaica to East Garden City 138 and 345kV Onshore UG Cables -Double & Single circuit (EGC-Jamaica 138kv & EGC-Farragut 345kv)	\$348,060

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Comp 121 - Barrett To Barrett Landing Onshore 320kV DC UG Cables - Single circuit (New Barrett HVDC-New Buchanan HVDC 320KV)	\$60,050
Comp 70. Barrett Landing-Buchanan Landing 320kV DC Offshore Submarine Cables - Single circuit (New Barrett HVDC-New Buchanan HVDC 320KV)	\$1,179,371
Comp 91 - Buchanan Landing To Buchanan Onshore 320kV DC UG Cables - Single circuit (New Barrett HVDC-New Buchanan HVDC 320KV)	\$24,950
Comp 85 - Sprain Brook Sub to Sprain Brook Landing 345kV Onshore UG Cables -Single circuit - Single circuit Farragut-Sprain Brook 345KV	\$60,525
Comp 87. Farragut to Sprain Brook Landing 345kV Offshore Submarine Cables - Single circuit Farragut-Sprain Brook 345KV	\$490,782
Comp 210 - Holbrook -Pilgrim 138 kV Onshore UG Cables -Single circuit (Holbrook -Pilgrim 138kv)	\$198,980
New Facilities- Transmission w/o Contingency	\$5,279,064
Excluded Third Party ROW	-\$763
New Facilities- Transmission w/o Contingency and Third Party ROW	\$5,278,301
Upgrade Facilities- Transmission	
Comp 8C - Rebuild: East Garden City - Newbridge 345kV Onshore UG Cables -Double circuits	\$111,098
Comp 13A - Syosset - Oakwood 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp 13B - Syosset - Greenlawn 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp XX - Ruland Road - Newbridge138 kV #3 (567 Line) Onshore UG Cables -Single circuit	\$4,462
Ruland Rd.-Newbridge 561	\$6,461
Ruland Rd.-Newbridge 562	\$6,724
Upgrade Facilities- Transmission w/o Contingency	\$171,243
Total Transmission	\$5,449,544
	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$1,458,874
Total New Facilities w/ Contingency	\$8,753,245
Upgrade Facilities Contingency	\$215,179
Total Upgrade Facilities w/ Contingency	\$1,285,508

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	2022 Dollars w/o Contingency (\$1000)
Network Upgrade Facilities Contingency	
Total Network Upgrade Facilities w/ Contingency	
Total Excluded Third Party ROW for New Facilities	\$12,525
Overall Total	\$10,051,278

4.2.6.9. T044 NextEra Enhanced 2


	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1. Station 253 New Ruland Road 345/138 kV Substation Bethpage to Bagatelle 138kV Circuit (Tie into new Ruland Rd.)	\$108,607
2. Station 252 East Garden City 345/138 kV Substation East Garden City- Sprain Brook 345kV (Y49) (Connection between existing transformers and PARs tying into new substation)	\$292,317
3. Station 48 Valley Stream 345/138 kV Substation Valley Stream 138kV- (Ties to new Valley Stream Substation)	\$119,602
12. Station 36a Sprain Brook HVDC 1200MW Converter Station Sprain Brook HVDC intertie to existing Sprain Brook 345kV	\$379,120
13. Station 30a New Northport HVDC 1200MW Converter Station New Northport HVDC intertie to existing Northport 138kV	\$373,951
14. Northport 138kV GIS Substation	\$33,439
16. - Comp 231 & 101 Buchanan 345kV GIS & HVDC Substation Upgrade Buchanan HVDC intertie to existing Buchanan 345kV	\$866,933
New Facilities- Substations Total w/o Contingency	\$2,173,970
Excluded Third Party ROW	-\$7,669
New Facilities- Substation w/o Contingency and Third Party ROW	\$2,166,300
Upgrade Facilities- Substation	
4. Barrett 138 kV Substation Upgrades	\$64,374
5. Dunwoodie 345 kV GIS Substation	\$53,898
6. Elwood 138 kV Substation Upgrades	\$6,622
7. Jamaica 138 kV Substation Upgrades	\$9,949
8. Newbridge 345/138 kV GIS Substation Upgrades	\$74,882

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	2022 Dollars w/o Contingency (\$1000)
9.Rainey 345kV GIS Substation Upgrades	\$38,288
10.Shore Road 138kV Substation Upgrades	\$11,720
11.Sprain Brook 345kV Substation Expansion	\$504,766
15.Pilgrim 138kV Substation Upgrades	\$3,109
17. Farragut 345kV Substation Expansion	\$109,709
18. Corona 138kV Substation Upgrades	\$18,464
19.Holbrook 138kV Substation Upgrades	\$3,584
20. Ramapo 345kV Substation Upgrades	\$10,478
East Garden City Upgrade- 138kV PAR	\$23,682
Ruland Rd- 138kV Breaker	\$1,792
Valley Stream 138kV- P5 Contingency	\$100
West Bus 138kV and Kings 138kV	\$873
Upgrade Facilities- Substation w/o Contingency	\$936,290
Total Substation	\$3,102,590

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	2022 Dollars w/o Contingency (\$1000)
New Facilities- Transmission	
Comp 4 - Dunwoodie To New Rochelle Landing 345kV Onshore UG Cables -single circuit (EGC To Dunwoodie 345 kV)	\$157,188
Comp 4C - Sprain Brook To New Rochelle Landing Onshore 345kV UG Cables -Double circuits (EGC To Sprain Brook 345 kV / Ruland To Sprain Brook 345 kV)	\$288,728
Comp 4C (242)- Sprain Brook To New Rochelle Landing Onshore 320kV DC UG Cables - Single circuit (Northport To Sprain Brook 320 kV DC)	\$132,603
Comp 17. New Rochelle Landing to Hempstead Harbor Landing (Shore Road) 345kV Offshore Submarine Cables - Three circuits (three lines, single circuit each) EGC-Dunwoodie 345KV / EGC-Sprain Brook 345KV/ Ruland-Sprain Brook 345KV	\$621,521
Comp 68. Northport to New Rochelle Landing 320kV DC Offshore Submarine Cables - One circuit Northport-Sprain Brook 320KV DC	\$440,751
Comp 3A - East Garden City To Hempstead Harbor Landing 345kV Onshore UG Cables -Double circuits (EGC To Sprain Brook 345 kV / EGC To Dunwoodie 345 kV)	\$321,362
Comp 5 - Ruland To Hempstead Harbor Landing (Shore Road) 345kV Onshore UG Cables - Single circuit (Ruland To Sprain Brook 345 kV)	\$291,557
Comp 10A - East Garden City To Valley Stream 345kV Onshore UG Cables -Triple circuits	\$328,526
Comp 11 - Pilgrim to Northport 138kV Onshore UG Cables -Single circuit (Pilgrim to Northport)	\$138,044
Comp 247 - Jamaica to East Garden City 138 and 345kV Onshore UG Cables -Double & Single circuit (EGC-Jamaica 138kv & EGC-Farragut 345kv, Corona-Jamaica)	\$350,246
Comp 85 - Sprain Brook Sub to Sprain Brook Landing 345kV Onshore UG Cables -Single circuit - Single circuit Farragut-Sprain Brook 345KV	\$60,525
Comp 87. Farragut to Sprain Brook Landing 345kV Offshore Submarine Cables - Single circuit Farragut-Sprain Brook 345KV	\$490,782
Comp 210 - Holbrook -Pilgrim 138 kV Onshore UG Cables -Single circuit (Holbrook -Pilgrim 138kv)	\$198,980
Comp 207 (Modify)- Corona to Jamaica (Corona-Metropolitan Ave) 138kV Onshore UG Cables -Single circuit (Corona to Jamaica 138kv)	\$43,395
Comp 207&249 - Metropolitan Ave-JA 138 and 345kV Onshore UG Cables -Double circuits (Corona-Jamaica 138kv & EGC-Farragut 345kv)	\$88,496

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	2022 Dollars w/o Contingency (\$1000)
Comp 249 - Jamaica To Farragut (Farragut-Metropolitan Ave) 345kV Onshore UG Cables - Single circuit (EGC-Farragut 345kv)	\$145,909
Comp 225&248 - Buchanan to Ramapo 345kV OH/UG Cables - Single circuit (New Buchanan - Ramapo 345 kV)	\$229,103
Comp 226 & 227. Offshore Platform HSA to Buchanan Landing 320kV #1, #2 DC Offshore Submarine Cables - Double circuits (Hudson South OSW platform #1 & #2- Buchanan HVDC #1 & #2 320 kV)	\$6,907,895
Station 205 OSW Platform	
Comp 254 - Buchanan Landing-Buchanan Onshore 320kV DC UG Cables - Double circuits (Hudson South OSW platform #1 & #2- Buchanan HVDC #1 & #2 320 kV)	\$38,803
New Facilities- Transmission w/o Contingency	\$11,274,415
Excluded Third Party ROW	-\$763
New Facilities- Transmission w/o Contingency and Third Party ROW	\$11,273,652
Upgrade Facilities- Transmission	
Comp 8C - Rebuild: East Garden City - Newbridge 345kV Onshore UG Cables -Double circuits	\$111,098
Comp 13A - Syosset - Oakwood 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp 13B - Syosset - Greenlawn 138 kV Onshore UG Cables -Single circuit	\$21,249
Comp XX - Ruland Road - Newbridge 138 kV #3 (567 Line) Onshore UG Cables -Single circuit	\$4,462
Ruland Rd.-Newbridge 561	\$6,461
Ruland Rd.-Newbridge 562	\$6,724
Newbridge-Locust Grove 138kV	\$53,010
Upgrade Facilities- Transmission w/o Contingency	\$171,243
Total Transmission	\$11,444,895
	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$2,687,990
Total New Facilities w/ Contingency	\$16,127,943
Upgrade Facilities Contingency	\$221,802
Total Upgrade Facilities w/ Contingency	\$1,329,334
Network Upgrade Facilities Contingency	

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	2022 Dollars w/o Contingency (\$1000)
Total Network Upgrade Facilities w/ Contingency	
Total Excluded Third Party ROW for New Facilities	\$8,432
Overall Total	\$17,465,709

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4.2.7. Propel NY

4.2.7.1. T047 Propel Base 1

	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1 - New Rochelle 345kV	\$11,069
2 - New Shore Road 345 kV	\$144,488
3 - New Ruland Road 345/138 kV	\$134,953
4 - New Barrett 345 kV	\$97,563
New Facilities- Substations Total w/o Contingency	\$388,072
Excluded Third Party ROW	-\$9,247
New Facilities- Substation w/o Contingency and Third Party ROW	\$378,825
Upgrade Facilities- Substation	
9 -Existing Holbrook 138 kV	\$1,589
10 -Existing Newbridge 138 kV	\$3,870
11 - Existing East Garden City 138 kV	\$12,807
12 - Existing Rainey 345 kV	\$8,187
13 - Existing East Garden City 345 kV	\$134,860
Barrett 138kV- P5 Contingency	\$100
Upgrade Facilities- Substation w/o Contingency	\$161,413
Network Upgrade Facilities- Substation	
5 - Existing 345 kV Tremont	\$27,309
6 - Existing Sprain Brook 345 kV	\$15,395
7 - Existing Ruland 138 kV	\$7,783
8 -Existing Shore Road 138 kV	\$7,804
Network Upgrade Facilities- Substation w/o Contingency	\$58,291
Total Substation w/o Contingency	\$598,529
New Facilities- Transmission	
BS1.1 Barrett to East Garden City 345kV Onshore UG Cables -single circuit	\$148,981
BS1.2 East Garden City To Tremont 345kV Onshore UG Cables -single circuit	\$455,279
BS1.4 East Garden City to Shore Road 345kV Onshore UG Cables -single circuit	\$176,241
BS1.5 Ruland Road to Shore Road 345kV Onshore UG Cables -single circuit	\$299,546
BS1.6a. Shore Road to New Rochelle Offshore Submarine Cables -One circuit (2 cables per circuit)	\$223,943


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	2022 Dollars w/o Contingency (\$1000)
BS1.6a. Shore Road to New Rochelle Onshore UG Cables - One circuit (2 cables per circuit)	\$48,039
BS1.6b New Rochelle to Sprain Brook 345kV Onshore UG Cables -single circuit	\$160,448
New Facilities- Transmission w/o Contingency	\$1,512,477
Excluded Third Party ROW	-\$325
New Facilities- Transmission w/o Contingency and Third Party ROW	\$1,512,151
Upgrade Facilities- Transmission	
BS1.3 Ruland to East Garden City 345kV Onshore UG Cables -single circuit	\$11,892
Upgrade Facilities- Transmission w/o Contingency	\$11,892
Total Transmission w/o Contingency	\$1,524,043
	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$378,195
Total New Facilities w/ Contingency	\$2,269,172
Upgrade Facilities Contingency	\$34,673
Total Upgrade Facilities w/ Contingency	\$208,040
Network Upgrade Facilities Contingency	\$13,251
Total Network Upgrade Facilities w/ Contingency	\$71,542
Total Excluded Third Party ROW for New Facilities	\$9,572
Overall Total	\$2,558,327


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4.2.7.2. T048 Propel Base 2

	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1 - New Rochelle 345kV	\$11,069
2 - New Shore Road 345 kV	\$36,683
3 - New Ruland Road 345/138 kV	\$116,415
4 - New Barrett 345 kV	\$114,278
New Facilities- Substations Total w/o Contingency	\$278,445
Excluded Third Party ROW	-\$9,985
New Facilities- Substation w/o Contingency and Third Party ROW	\$268,460
Upgrade Facilities- Substation	
5 - Existing East Garden City 345 kV	\$23,470
11 - Existing Holbrook 138 kV	\$1,589
12 - Existing Rainey 345 kV	\$4,319
13 - Existing East Garden City 138 kV	\$14,886
14- Existing Lake Success 138kV	\$20,183
Barrett 138kV- P5 Contingency	\$100
Upgrade Facilities- Substation w/o Contingency	\$64,548
Network Upgrade Facilities- Substation	
6 - Existing 345 kV Tremont	\$27,309
7 - Existing Sprain Brook 345 kV	\$15,775
8 - Existing Ruland 138 kV	\$11,345
9 -Existing Shore Road 138 kV	\$14,606
10- Existing Syosset 138kV	\$19,385
Network Upgrade Facilities- Substation w/o Contingency	\$88,421
Total Substation w/o Contingency	\$421,429


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New Facilities- Transmission	
	2022 Dollars w/o Contingency (\$1000)
BS2.1 Barrett to Tremont 345kV Onshore UG Cables -single circuit	\$469,483
BS2.2 Syosset to Shore Rd 138kV- Onshore UG- single circuit	\$168,589
BS2.3 Ruland Road to Shore Road 345kV Onshore UG Cables -single circuit	\$299,546
BS2.4a. Shore Road to New Rochelle Offshore Submarine Cables -One circuit (2 cables per circuit)	\$223,943
BS2.4a. Shore Road to New Rochelle Onshore UG Cables - One circuit (2 cables per circuit)	\$48,039
BS1.6b New Rochelle to Sprain brook 345kV Onshore UG Cables -single circuit	\$160,381
New Facilities- Transmission w/o Contingency	\$1,369,981
Excluded Third Party ROW	-\$247
New Facilities- Transmission w/o Contingency and Third Party ROW	\$1,369,734
Upgrade Facilities- Transmission	
Misc. 903 Lake Success - Jamaica (uprate by reinforcing cooling)	\$12,751
Upgrade Facilities- Transmission w/o Contingency	\$12,751
Total Transmission w/o Contingency	\$1,382,485
	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$327,639
Total New Facilities w/ Contingency	\$1,965,833
Upgrade Facilities Contingency	\$15,460
Total Upgrade Facilities w/ Contingency	\$92,758
Network Upgrade Facilities Contingency	\$17,684
Total Network Upgrade Facilities w/ Contingency	\$106,105
Total Excluded Third Party ROW for New Facilities	\$10,232
Overall Total	\$2,164,697


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4.2.7.3. T049 Propel Base 3

	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1 - New Rochelle 345kV	\$11,069
2 - New Shore Road 345 kV	\$144,488
3 - New Ruland Road 345/138 kV	\$134,597
4 - New Barrett 345 kV	\$158,483
New Facilities- Substations Total w/o Contingency	\$448,636
Excluded Third Party ROW	-\$9,985
New Facilities- Substation w/o Contingency and Third Party ROW	\$438,651
Upgrade Facilities- Substation	
9 -Existing Holbrook 138 kV	\$1,589
10 -Existing Newbridge 138 Kv	\$3,870
11 - Existing East Garden City 138 kV	\$12,807
12 - Existing Rainey 345 kV	\$8,187
13 - Existing East Garden City 345 kV	\$135,818
Barrett 138kV- P5 Contingency	\$100
Upgrade Facilities- Substation w/o Contingency	\$162,372
Network Upgrade Facilities- Substation	
5 - Existing 345 kV Tremont	\$27,309
6 - Existing Sprain Brook 345 kV	\$15,395
7 - Existing Ruland 138 kV	\$7,783
8 -Existing Shore Road 138 kV	\$9,936
Network Upgrade Facilities- Substation w/o Contingency	\$60,423
Total Substation w/o Contingency	\$661,446


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New Facilities- Transmission	
	2022 Dollars w/o Contingency (\$1000)
BS3.1 Barrett to East Garden City 345kV Onshore UG Cables -double circuit	\$250,458
BS3.2 East Garden City To Tremont 345kV Onshore UG Cables -single circuit	\$455,279
BS3.4 East Garden City to Shore Road 345kV Onshore UG Cables -single circuit	\$176,241
BS3.5 East Garden City to Shore Road 138kV Onshore UG Cables -single circuit	\$150,742
BS3.6 Ruland Road to Shore Road 345kV Onshore UG Cables -single circuit	\$299,546
BS3.7a. Shore Road to New Rochelle Offshore Submarine Cables -One circuit (2 cables per circuit)	\$223,943
BS3.7a. Shore Road to New Rochelle Onshore UG Cables - One circuit (2 cables per circuit)	\$48,039
BS3.7b New Rochelle to Sprain brook 345kV Onshore UG Cables -single circuit	\$160,381
New Facilities- Transmission w/o Contingency	\$1,764,629
Excluded Third Party ROW	-\$448
New Facilities- Transmission w/o Contingency and Third Party ROW	\$1,764,181
Upgrade Facilities- Transmission	
BS3.3 Ruland to East Garden City 345kV Onshore UG Cables -single circuit	\$11,954
Upgrade Facilities- Transmission w/o Contingency	\$11,954
Total Transmission w/o Contingency	\$1,776,135
	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$440,566
Total New Facilities w/ Contingency	\$2,643,399
Upgrade Facilities Contingency	\$34,865
Total Upgrade Facilities w/ Contingency	\$209,190
Network Upgrade Facilities Contingency	\$12,085
Total Network Upgrade Facilities w/ Contingency	\$72,508
Total Excluded Third Party ROW for New Facilities	\$11,188
Overall Total	\$2,925,097


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4.2.7.4. T051 Propel Alternate 5

	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1 - New Rochelle 345kV	\$13,005
2 - New Shore Road 345 kV	\$175,850
3 - New Ruland Road 345/138 kV	\$134,930
4 - New Barrett 345 kV	\$97,539
New Facilities- Substations Total w/o Contingency	\$421,323
Excluded Third Party ROW	-\$9,985
New Facilities- Substation w/o Contingency and Third Party ROW	\$411,338
Upgrade Facilities- Substation	
9 -Existing Holbrook 138 kV	\$1,589
10 -Existing Newbridge 138 Kv	\$3,870
11 - Existing East Garden City 138 kV	\$14,786
12 - Existing Rainey 345 kV	\$8,187
13 - Existing East Garden City 345 kV	\$134,960
15 - Existing Northport 138 kV	\$27,886
16- Existing Oakwood 138 kV	\$1,854
Barrett 138kV- P5 Contingency	\$100
Upgrade Facilities- Substation w/o Contingency	\$193,232
Network Upgrade Facilities- Substation	
5 - Existing 345 kV Tremont	\$27,309
6 - Existing Sprain Brook 345 kV	\$34,455
7 - Existing Ruland 138 kV	\$7,783
8 -Existing Shore Road 138 kV	\$9,936
14 -Existing Syosset 138 kV	\$19,514
17 -Existing Syosset Transition 138 kV	\$1,961
Network Upgrade Facilities- Substation w/o Contingency	\$100,957
Total Substation w/o Contingency	\$705,527


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New Facilities- Transmission	
	2022 Dollars w/o Contingency (\$1000)
AS 5.1. Barrett to East Garden City 345kV Onshore UG Cables -single circuit	\$148,981
AS 5.2. East Garden City To Tremont 345kV Onshore UG Cables -single circuit	\$455,279
AS 5.4. East Garden City to Shore Road 345kV Onshore UG Cables -single circuit	\$176,241
AS 5.5. Ruland Road to Shore Road 345kV Onshore UG Cables -single circuit	\$299,546
AS 5.6a. Shore Road to New Rochelle Offshore Submarine Cables - Two circuits (two cables per circuit)	\$388,521
AS 5.6a. Shore Road to New Rochelle Onshore UG Cables - Two circuits (Two cables per Circuit)	\$92,047
AS 5.6b. New Rochelle to Sprain brook 345kV Onshore UG Cables -double circuit	\$277,586
AS 5.7. Syosset to Shore Road 138kV Onshore UG Cables -single circuit	\$168,589
New Facilities- Transmission w/o Contingency	\$2,006,789
Excluded Third Party ROW	-\$446
New Facilities- Transmission w/o Contingency and Third Party ROW	\$2,006,344
Upgrade Facilities- Transmission	
AS 5.3. East Garden City to Ruland 345kV Onshore UG Cables -single circuit	\$11,954
AS5.8. Syosset to Oakwood 138kV Onshore UG Cables -single circuit	\$42,638
Upgrade Facilities- Transmission w/o Contingency	\$54,591
Total Transmission w/o Contingency	\$2,061,381
	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$483,536
Total New Facilities w/ Contingency	\$2,901,218
Upgrade Facilities Contingency	\$49,565
Total Upgrade Facilities w/ Contingency	\$297,387
Network Upgrade Facilities Contingency	\$20,191
Total Network Upgrade Facilities w/ Contingency	\$121,149
Total Excluded Third Party ROW for New Facilities	\$9,693
Overall Total	\$3,319,755


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4.2.7.5. T052 Propel NY Alternate 6


	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1 - New Rochelle 345kV	\$13,005
2- Eastern Queens	\$228,268
2 - New Shore Road 345 kV	\$175,356
3 - New Ruland Road 345/138 kV	\$134,930
4 - New Barrett 345 kV	\$97,539
New Facilities- Substations Total w/o Contingency	\$649,097
Excluded Third Party ROW	-\$21,521
New Facilities- Substation w/o Contingency and Third Party ROW	\$627,576
Upgrade Facilities- Substation	
9 -Existing Holbrook 138 kV	\$1,589
10 -Existing Newbridge 138 Kv	\$3,870
11 - Existing East Garden City 138 kV	\$12,807
12 - Existing Rainey 345 kV	\$8,187
13 - Existing East Garden City 345 kV	\$156,415
Other Substation Upgrades- Valley Stream/Lake Success Remote End Protection	\$540
Barrett 138kV- P5 Contingency	\$100
Valley Stream 138kV- P5 Contingency	\$100
Upgrade Facilities- Substations Total w/o Contingency	\$183,608
Network Upgrade Facilities- Substation	
5 - Existing 345 kV Tremont	\$27,309
6 - Existing Sprain Brook 345 kV	\$33,812
7 - Existing Ruland 138 kV	\$7,783
8 -Existing Shore Road 138 kV	\$9,936
10- Existing Dunwoodie 345kV	\$5,365
14 -Existing Syosset 138 kV	\$19,514
Network Upgrade Facilities- Substation Total w/o Contingency	\$103,719
Total Substation w/o Contingency	\$914,903

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New Facilities- Transmission	
	2022 Dollars w/o Contingency (\$1000)
AS 6.1. Barrett to East Garden City 345kV Onshore UG Cables -single circuit	\$148,981
AS 6.2. East Garden City To Tremont 345kV Onshore UG Cables -single circuit	\$455,279
AS 6.3. East Garden City to Shore Road 345kV Onshore UG Cables -single circuit	\$176,241
AS 6.4. Ruland Road to Shore Road 345kV Onshore UG Cables -single circuit	\$299,546
AS 6.5a. Shore Road to New Rochelle Offshore Submarine Cables - Two circuits (two cables per circuit)	\$388,521
AS 6.5a. Shore Road to New Rochelle Onshore UG Cables - Two circuits (Two cables per Circuit)	\$92,047
AS 6.5b. New Rochelle to Sprain brook 345kV Onshore UG Cables -double circuit	\$277,586
AS 6.6. Syosset to Shore Road 138kV Onshore UG Cables -single circuit	\$168,589
AS6.8 East Garden City to Eastern Queens Onshore UG Cables -Double circuit	\$355,194
AS6.9 Eastern Queens to Dunwoodie 345kV Onshore UG Cables -single circuit	\$403,551
New Facilities- Transmission Total w/o Contingency	\$2,765,534
Excluded Third Party ROW	-\$704
New Facilities- Transmission w/o Contingency and Third Party ROW	\$2,764,830
Upgrade Facilities- Transmission	
AS6.7. Syosset to Oakwood 138kV Onshore UG Cables -single circuit	\$42,638
AS6.10a- 901 Intercept Jamaica to Eastern Queens 138kV Onshore UG Cables- Double Circuit (Separate Conduit)	\$16,938
AS6.10b- 903 Intercept Jamaica to Eastern Queens 138kV Onshore UG Cables- Double Circuit (Separate Conduit)	\$60,102
AS6.11 901 Eastern Queens to Valley Stream 138kV Replacement Onshore UG Cables- Single Circuit	\$94,750
AS6.12 Lake Success - Jamaica (uprate by reinforcing cooling)	\$12,751
AS 6.13. East Garden City to Ruland 345kV Onshore UG Cables -single circuit	\$11,892
Upgrade Facilities- Transmission Total w/o Contingency	\$239,071
Total Transmission w/o Contingency	\$3,003,901


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	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$678,481
Total New Facilities w/ Contingency	\$4,070,887
Upgrade Facilities Contingency	\$84,536
Total Upgrade Facilities w/ Contingency	\$507,215
Network Upgrade Facilities Contingency	\$20,744
Total Network Upgrade Facilities w/ Contingency	\$124,463
Total Excluded Third Party ROW for New Facilities	\$22,225
Overall Total	\$4,702,565


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4.2.7.6. T053 Propel NY Alternate 7


	2022 Dollars w/o Contingency (\$1000)
New Facilities- Substation	
1 - New Rochelle 345kV	\$11,069
2 - New Shore Road 345 kV	\$36,683
3 - New Ruland Road 345/138 kV	\$116,415
4- Eastern Queens	\$235,941
5 - New Barrett 345 kV	\$159,479
6- New HVDC Converter Station at Sprain brook	\$384,139
7- New HVDC Converter Station at Northport	\$359,637
8- New 345kV Northport Substation	\$151,718
New Facilities- Substations Total w/o Contingency	\$1,455,081
Excluded Third Party ROW	-\$27,175
New Facilities- Substation w/o Contingency and Third Party ROW	\$1,427,906
Upgrade Facilities- Substation	
9 - Existing East Garden City 345 kV	\$23,470
12 - Existing Rainey 345 kV	\$4,319
16 -Existing Holbrook 138 kV	\$1,589
18 - Existing East Garden City 138 kV	\$14,886
19- Existing Lake Success 138kV	\$20,183
Other Substation Upgrades- Valley Stream/Oakwood Remote End Protection	\$540
Barrett 138kV- P5 Contingency	\$100
Valley Stream 138kV- P5 Contingency	\$100
Upgrade Facilities- Substations Total w/o Contingency	\$65,188
Network Upgrade Facilities- Substation	
10 - Existing 345 kV Tremont	\$27,309
11 - Existing Sprain Brook 345 kV	\$26,124
12 - Existing Ruland 138 kV	\$11,345
13 -Existing Shore Road 138 kV	\$14,606
14 -Existing Syosset 138 kV	\$19,514
15- Existing Dunwoodie 345kV	\$5,365
Network Upgrade Facilities- Substation Total w/o Contingency	\$104,263
Total Substation w/o Contingency	\$1,597,356

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New Facilities- Transmission	
	2022 Dollars w/o Contingency (\$1000)
AS 7.1 Barrett to Tremont (345 SCT)	\$469,483
AS 7.2 Syosset to Shore Road (138 SCT)	\$168,589
AS 7.3. Ruland Road to Shore Road 345kV Onshore UG Cables -single circuit	\$299,546
AS 7.4a. Shore Road to New Rochelle Offshore Submarine Cables - one circuits (two cables per circuit)	\$223,943
AS 7.4a. Shore Road to New Rochelle Onshore UG Cables - Two circuits (Two cables per Circuit)	\$48,039
AS 7.4b. New Rochelle to Sprain brook 345kV Onshore UG Cables	\$160,381
AS 7.5 Barrett to Eastern Queens (345 DCT)	\$389,173
AS7.6 Eastern Queens to Dunwoodie 345kV Onshore UG Cables -single circuit	\$403,551
AS 7.7a Northport to New Rochelle-HVDC (320 SCT) submarine	\$446,253
AS 7.7b Shore Landing @ New Rochelle to Sprain Brook HVDC (320 SCT)	\$224,248
New Facilities- Transmission Total w/o Contingency	\$2,833,206
Excluded Third Party ROW	-\$651
New Facilities- Transmission w/o Contingency and Third Party ROW	\$2,832,555
Upgrade Facilities- Transmission	
AS7.8a- 901 Intercept Jamaica to Eastern Queens 138kV Onshore UG Cables- Double Circuit (Separate Conduit)	\$16,938
A7.8b- 903 Intercept Jamaica to Eastern Queens 138kV Onshore UG Cables- Double Circuit (Separate Conduit)	\$60,102
AS7.9 901 Eastern Queens to Valley Stream 138kV Replacement Onshore UG Cables- Single Circuit	\$94,750
Misc. 903 Lake Success - Jamaica (uprate by reinforcing cooling)	\$12,751
Upgrade Facilities- Transmission Total w/o Contingency	\$184,541
Total Transmission w/o Contingency	\$3,017,096

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	2022 Dollars w/ Contingency (\$1000)
New Facilities Contingency	\$852,092
Total New Facilities w/ Contingency	\$5,112,552
Upgrade Facilities Contingency	\$49,946
Total Upgrade Facilities w/ Contingency	\$299,675
Network Upgrade Facilities Contingency	\$20,853
Total Network Upgrade Facilities w/ Contingency	\$125,116
Total Excluded Third Party ROW for New Facilities	\$27,826
Overall Total	\$5,537,343

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4.3. Risk

The review team completed an evaluation of the potential risks associated with each proposal and summarized the significant risks. The review team's evaluation was based on the team's collective experience with transmission line and substation projects in New York.

The significant drivers to the project risks that the review team considered were:

- Environmental and Permitting Concerns
- Property, Routing and Siting Concerns
- Design Concerns
- Construction and Operational Concerns


The following metrics were used to assign a risk ranking:

	Very High (VH)	High (H)	Medium (M)	Low (L)
Probability Risk Will Occur	90-100%	50-89%	10-49%	Below 10%
Cost to Mitigate Risk	Greater than \$20M	\$11M-20M	\$6-\$10M	Below \$5M
Schedule Impact	More than 6 month	3-6 months	1-3 months	Less than 1 month

The most significant risks are summarized below. The detailed descriptions can be found in the risk register. The review team also recommends that a Risk Management Program be implemented in the execution of the project or projects selected by the NYISO. A Risk Management Program will highlight items such as safety management, materials management, construction operations, outage planning, QA/QC program, field inspection, and environmental controls that are critical in identifying both risk areas and specific mitigation strategies. It is also important that Risk Management become a living project component that is constantly monitored and updated as the project progresses.

4.3.1. Common Risks


The high risks that are common to all proposals are summarized below.

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High-Risks Common to all Proposals

Environmental and Permit Concerns- Common

Item #	Risk Title	Description
E-6	Construction Approval Restrictions – Long Island Sound Crossing	Time of year restrictions will likely be imposed. The Army Corps of Engineers will likely not allow work from Jan 1 – May 31 as a condition of their Nationwide Permit. Further, based on experience in Region 1 tidal waters, NYSDEC imposes a no-work window from Jan 1 – Sept 30. These combined restrictions would result in an allowable work window of Oct 1 – Dec 31.
E-7	Environmental Study Findings – NYSDEC Wetland and Adjacent Areas - Barrett	The wetlands and/or the 300' Tidal Wetland Adjacent Area at Barrett Substation are likely unavoidable by any project looking to construct in this area. Mitigation in the form of restoration is anticipated to be required.

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Property, Routing and Siting Concerns- Common

Item #	Risk Title	Description
P-2	Transmission line crossings	<p>Crossing of other transmission and distribution lines:</p> <p>creates additional schedule risk, to the extent an outage needs to be scheduled;</p> <p>creates additional operating risk, to the extent a single event could remove both elements from services; and creates cost risk to the extent unexpected costs such as raising, lowering, or relocating an existing line is required.</p>
P-3	Highway, Railroad Crossings, Navigable Waterway crossings	Crossing of Highways, Rail Roads, and Navigable Waterways creates additional risk to the project schedule and cost, depending on the requirements imposed during construction.
P-6	Routing Concern – Significant Route Changes	During the Article VII process, there is a risk that the final approved route may have material differences than the proposed route.

Generally, the risks associated with the transmission line crossings of highway, railroad and navigable waterway can be mitigated by early identification of all necessary crossings and frequent coordination with those responsible for the operation of the facilities being crossed.

4.3.2. Project-Specific Risks

Summarized below are the review team's most significant risk findings specific to each proposal. This is not all inclusive but is intended to highlight those items that pose the most critical risks to the completion of the projects. See the risk register for additional risk items.

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4.3.2.1. T035 LS Power :

Property, Routes, and Siting Concerns – LS Power

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
P-2	Property Site Concerns – Northgate substation - subsurface condition	Approximately 50% of the site could encounter rock during excavation and the site might require extensive slope protection. Site conditions will require further investigation to quantify. This could have high cost and schedule impact depending on volume of rock excavation and methods used (<i>i.e.</i> , blasting likely not allowed in this area)	H	M	L

Design Concerns – LS Power


Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-9	Design Concern – Ruland Rd.	The two proposed 138kV bay additions at Ruland Rd will interfere with an overhead 138kV strain bus to Banks #2 and #4, an overhead 69kV line running from the 69kV yard to air core reactors located in the 138kV yard, and an underground 138kV cable (Line 567)	H	M	L
D-10	Design Concern – Ruland Rd.	The one-line diagram shows that one of the 138kV ties from Southgate to Ruland Rd is going to terminate in the existing line terminal position for the 661 line to Pilgrim and the Pilgrim 661 line is to be relocated to the new bay addition. However, the Plot Plan is showing the underground connection between Southgate	H	M	L

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Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
		to Ruland Rd terminating in the incorrect line terminal position. The existing 661 line exits overhead, not underground. Also, the proposed design does not provide a method for tying the existing OH 661 line into the new bay addition.			
D-11	Design Concern – Southgate	The west side of the proposed new Southgate substation borders the U.S. Post Office. There is a large discharge area of the property that is owned by the U.S. Post Office. The layout will need to be designed around this area.	H	L	L


Construction and Operational Concerns – LS Power

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
C-1	HVDC Lead-times	Due to high demand and equipment complexities, manufacturers are quoting lead times up to 4 years. With three units being installed, it would take an additional 6 months for the second unit and another six months for the third unit to be installed, tested, and commissioned.	H	L	H
C-2	Construction Concern – Millwood - Lines to Buchanan and Pleasant Valley Outage	Pleasant Valley (W80, W81) and Buchanan (W97, W98) exit the Millwood substation to a double circuit pole. The proposed design is showing two deadend structures being installed at this	H	H	H

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Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
		location to make the transition from overhead to GIS. This installation will require the outages for both lines for an extended period of time. However, this is not accounted for in the Outage Plan.			
C-4	Construction Concern-Submarine Cable Landing Sites	Construction of the underground cables within a roadway requires approximately 30'-35' width for vehicles and equipment. Fox Island Rd near the submarine cable landing at Port Chester and Shore Rd near the submarine cable landing at Cold Springs Harbor are only 25' wide. Therefore, the entire roadways would be closed down during construction eliminating the only access to homes and businesses.	VH	VH	M

For Item C-4, the use of the alternate landing locations included in LS Power's proposal would mitigate the potential risks.

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4.3.2.2. NextEra


The following high or very high probability risks impact all of NextEra's proposals (T036-T044). Additional risks are provided in the risk register.

Environmental and Permit Concerns – All NextEra Proposals

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
E-9	Permitting Concern – Sprain Brook Bay Addition	345kV AIS Bay addition will require a very large and complex retaining wall to accommodate the 60'-90' drop-off. Permitting is expected to be difficult due to its impact on the residential neighborhood.	VH	M	VH
E-10	Permitting Concern- Cable Landing and Transition Substations at Davenport Park	Transition stations are required to interconnect the proposed 2- submarine cables per phase with the single terrestrial cable per phase. The proposed location where the submarine cables are coming ashore in the New Rochelle area at Davenport Park is in sensitive areas due to the park, beach, and adjacent country club. Construction of a transition station in these areas would have significant visual impact and may be subject to public opposition that may require relocation away from those sensitive areas.	H	M	H

It is anticipated that the required transition stations (Item E-10) will require a sizeable footprint (75 ft x 75 ft per circuit or 75 ft x 225 ft to accommodate all three circuits). Construction of transition stations in the identified sensitive areas are expected to have significant permanent visual impact, displace prevailing public use space, and could be subject to public opposition that may require relocation away from these areas. Temporary work areas would also result in use of the public spaces not affected by permanent above-ground facilities. A similar project constructed in the 1990s in this area (near


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Davenport Park in New Rochelle) required securing property and the construction of a sizeable indoor substation building with a "residential" façade to hide the station.


Property, Routes, and Siting Concerns – All NextEra Proposals

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
P-1	Property Acquisition Concern – Proposed 345 kV East Garden City Substation	The fenced area shown on the plot plan appears to impact the rear access for two adjacent commercial buildings.	H	M	L
P-2	Route Concern – East Garden City Line Exits	All the underground lines exiting East Garden City as shown in the map books are being routed in Stewart Ave, which is a busy road and congested with underground utilities. This will make it difficult to construct. There may not be sufficient space to install all of the lines.	H	H	H
p-3	Property Acquisition Concern – Sprain Brook	The addition of the three 345kV reactors are not entirely located within the utility's property. An adjacent property will need to be obtained.	H	L	L
P-4	Property Acquisition Concern – Transition Station at Hempstead Harbor	A transition station is required to interconnect the proposed 2-submarine cables per phase with the single terrestrial cable per phase. The proposed location for the submarine cables coming ashore at Tappen Beach for the New Rochelle-Hempstead Harbor line is an existing gas regulator station.	VH	VH	M


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Design Concerns – All NextEra Proposals

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-1	Design Concern – Jamaica	The proposed design does not meet Con Edison's design principle. There is not sufficient space to install the breaker at the location proposed by the Developer. Installing additional equipment on the roof of an existing building may result in the need for significant structural reinforcement. Spacing is extremely congested. The installation of GIS bus and equipment would require the existing, open air 138kV bus to be de-energized to safely conduct the work. Any future maintenance on the GIS bus, or replacement thereof due to electrical failure, would require other station components, such as open-air bus, to be de-energized. Per Con Edison's specification (CE-ES-2002-I), equipment needs to be arranged such that a failure does not jeopardize the continued operation of the facility.	H	M	L
D-9	Design Concern – 345kV PAR East Garden City	Manufacturer, who responded to SECO's budgetary quotation request, indicated that PAR of the proposed size (1050 MVA) cannot be built. Two 3-phase or three 1-phase parallel PARs are required. Design modification is required. There may not be sufficient space to accommodate additional equipment.	H	H	L


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Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-14	Design Concern – Dunwoodie 345kV Existing Lines	The proposed location for the proposed 345kV GIS is in the ROW of three 345kV transmission lines. The design neither provides a means to relocate the existing three 345kV lines to allow the GIS building to be constructed nor a means to interconnect them into the proposed substation.	VH	VH	VH
D-16	Design Concern – Sprain Brook Bay	345kV AIS bay on the east side of the substation will be very difficult to construct due to the 90' drop off in this area. A very large and complex retaining wall would be necessary, which is not included in NextEra's design. It will be difficult to construct due to the limited access available and the estimated impact on the residential neighborhood.	VH	VH	H
D-17	Design Concern – Sprain Brook Proposed 345kV Line Exits	Due to a rock outcropping and a significant drop in elevation along the eastern and western side of the substation, it will be difficult to route an underground line, as proposed.	H	H	L
D-18	Design Concern – Potential Flooding or Inundation by Storm Surge	Some proposed substations are located in or near a 100-year or 500-year flood zone and/or have the potential for being inundated by a Category 1 storm. The proposals do not address how the substations will be designed to reduce the potential impact of flooding.	H	M	L
D-24	Design Concern – Rainey	The proposed design does not meet Con Edison's design principle. Due to the location of the existing access road, surrounding equipment and a	VH	VH	H

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Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
		below grade oil tank, there is insufficient space between breakers 1E and 2E for the installation of a line terminal. Also, it will be very difficult to install the underground cable through the substation, as proposed, due to interference with existing tunnels that run between Rainey and the Ravenswood plant, transformer oil containment pits, and a security brick wall.			
D-25	Design Concern – Rainey	Due to the location of the existing access road and surrounding equipment, there is insufficient space between breakers 1W and 2W for the installation of a line terminal. Also, it will be very difficult to install the underground cable through the substation, as proposed, due to interference with existing cable trench and crossing through the area of the installed transformer and PAR located on the north side of the substation.	VH	VH	H
D-27	Design Concern – Ruland Rd.	There is insufficient space to add a breaker and line terminal position between breaker 1420 and the main bus.	H	M	M
D-28	Design Concern – Valley Stream	There is insufficient space to add a breaker and line terminal position between breakers 1430 and 1450.	H	M	M


The risk associated with the size of the PAR proposed by NextEra (Item D-9) also applies to the PARs being installed at Ruland Rd (T037 Core 2, T038 Core 3, T043 Enhanced 1 and T044 Enhanced 2) and at Buchanan (T044 Enhanced 2).

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NextEra's projects have between six and ten substations potentially impacted by flooding. As a result, NextEra's projects have received a risk score ranging from 19-45. See the Section 4.3 for more details.

Construction and Operational Concerns- All NextEra Proposals

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
C-1	Construction Concern – Installing underground cables in existing substations.	Installing proposed underground cables in the existing substations will be difficult without impacting existing foundations, conduit/trench systems, grounding, and bus work. Such installation could require additional outages, complex construction sequences and/or more expensive construction methods.	H	M	M
C-4	Construction Concerns – New Rochelle - Dunwoodie, New Rochelle - Sprain Brook	Davenport Ave and Church St. near the Davenport Park transition station are only 25' wide. Therefore, the entire roadway would be closed down during construction eliminating the only access to homes on the peninsula.	VH	VH	M
C-5	Construction Concern – Pipe Type Cables	One 345kV line and several 138kV transmission lines that are to be intercepted and tied into a proposed substation are oil-filled, pipe type cables. Tying into these types of cables requires managing the oil pressure and transitioning to EPR which adds an additional level of complexity to the construction. The extent of work required will be dependent on the cable's condition and age.	H	L	L

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Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
C-6	Construction Concern – East Garden City 345kV Underground Cables to PARs	The proposed route for the underground cables to tie the existing 345kV PARs to the proposed GIS substation is along the west side of the substation heading north. Along the west side of the substation is a double-circuit overhead 138kV Lines 361 and 362 along with an overhead distribution circuit and communication circuit. There is a large double-circuit lattice structure for Lines 361 and 362 located in the northwest corner of the substation adjacent to a building. Due to these interferences, it will be very difficult to install the 345kV cables through this area.	H	L	L
C-7	Construction Concern – East Garden City 345kV Cables to Transformers and 138kV Cable to Proposed PAR	The proposed route for the underground cables to tie the existing 345kV transformers to the proposed GIS substation and the 138kV cable to the proposed PAR are exiting towards the east and then turning north. It will be difficult to exit the substation to the east since there are three gas lines (30", 20", 8"), one 138kV pipe-type cable (Line 463), and 8" water lines that run North-South along the east side of the station that will need to be crossed.	H	L	L

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Projects that include a proposed Farragut substation (T037 Core 2, T038 Core3, T039 Core 4, T043 Enhanced 1 and T044 Enhanced 2) have the following additional High or Very High risks:

Environmental and Permit Concerns – NextEra Farragut Proposals (T037, T038, T039, T043, T044)

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
E-4	Expansion into East River – New Farragut Substation	Pursuant to G304.2 V-Zone Construction Standards Section 6, (NYC, 2022) Development, including land-disturbing activities, seaward of the reach of mean high tide are prohibited. Therefore, to develop a pier in this area, which appears to be prohibited under the above code, a variance from the Board of Standards and Appeals would likely be needed.	H	M	H
E-7	Hudson River Routing – Tunnel Crossing: To Buchannan and Farragut-Sprain Brook 345kV	Hudson Tunnels including the Lincoln, Holland, NJ Transit and multiple PATH tunnels will need to be crossed. MTA, Port Authority of NY/NJ, and potential other owners are likely to require permission to cross these pieces of infrastructure.	H	H	H
E-11	Design Concern – Cable Landing and Transition Substations for Sprain Brook - Farragut	A transition station is required to interconnect the proposed 2-submarine cables per phase with the single terrestrial cable per phase. The proposed location where the submarine cables are coming ashore at Sprain Brook landing is for a marina with limited space. Construction of a transition station in this area is expected to have significant visual impact and be subject to public opposition that may require relocation away from those sensitive areas.	VH	H	H


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NYC Department of Small Business Services is the agency that issues permits for improvement and maintenance to waterfront structures and NYC-owned waterfront buildings. The proposed Farragut substation (Item E-4) into the East River appears to be in a mapped V-Zone based on the NYC Preliminary Flood Insurance Rate Maps. This has the potential of being a “no go” condition if a variance is not granted.

The Hudson River Routing (Items E-7) requires at least 10 tunnels to be crossed. This has the potential of being a “no go” condition if owners do not allow permission to cross. There does not appear to be much of a precedent for crossing these tunnels with linear infrastructure.

Design Concerns – NextEra Farragut Proposals (T037, T038, T039, T043, T044)


Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-20	Design Concern – Farragut Substation	The proposed design does not meet Con Edison’s design principle. The design requires the use of 345kV Gas Insulated Bus (GIB) and 345kV cables to connect the new substation to the existing facility. The installation of GIB would impede the replacement of existing Con Edison assets and the operations of the facility. Due to the below grade congestion around the Farragut substation, it is not feasible to install underground cables.	VH	H	H

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Projects that include a proposed Buchanan substation (T042 Core 7, T043 Enhanced 1, T044 Enhanced 2) have the following additional High or Very High risks:

Environmental and Permit Concerns- NextEra Buchanan Proposals

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
E-1C	Hudson River Routing – Cable and Pipeline Crossings: To Buchanan	There are a large number of existing pipelines/cables that must be crossed. ▪ Implications: Owner approval to cross these is likely required. Failure to get owner approval could be a no/go for a proposed route. Proper setbacks must be maintained to ensure no impacts to existing infrastructure.	VH	H	VH
E-3A	Contaminated Sediment – Hudson River from Battery to 200 miles North	This area is considered a Federal and NY State Superfund Site as a result of PCB contamination. ▪ Implication: Sediment sampling will be required and if impacts found, mitigation measures or rerouting could be required.	H	M	H
E-7	Hudson River Routing – Tunnel Crossing: To Buchanan and Farragut-Sprain Brook 345kV	Hudson Tunnels including the Lincoln, Holland, NJ Transit and multiple PATH tunnels will need to be crossed. MTA, Port Authority of NY/NJ, and potential other owners are likely to require permission to cross these pieces of infrastructure. There does not appear to be much of a precedent for crossing these tunnels with linear infrastructure.	H	H	H
E-8	Hudson River Routing – The Narrows: To Buchanan	The Narrows themselves and the areas immediately north pose a physical constraint in the number of cables coming into Upper NY Harbor. ▪ Implications: Given the limited amount of space that physically exists in the Narrows and setbacks between cables necessary for installation and maintenance, only a finite number of cables can be routed here.	H	H	H


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Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
E-12	Permitting Concern – Cable Landing at Buchanan	The proposed landing for the cable going to Buchanan is at a commercial boat docking area. It may be difficult to obtain permits or construction may be limited to specific time of year due to potential impact to commercial operations parking.	H	M	M

The Hudson River Routing (Items E-1B) requires 33 cables and eight pipelines to be crossed (e.g., Lower New York Bay Lateral Pipeline, multiple Narrows Cables/Pipeline Areas, Neptune Transmission, Bayonne Energy Center, 3 Cross Hudson Pipelines, and a large number of telecom cables). Such crossings have the potential of being a “no go” condition if the owners do not allow permission to cross.

The cable being routed in the Hudson River PCB Superfund (Item E-3A) includes T039 - 19 miles, T042 - 41 miles, T043 - 59.5 miles, and T044 - 60 miles. The seafloor sediments in the areas surrounding Long Island and New York City contain known areas of contamination, as well as areas that are likely to contain contaminated sediments, as a result of historic industrial activities and discharges. The bottom disturbance necessary to install a submarine cable into the seafloor has the potential to resuspend these contaminated sediments. Agencies are likely to require avoidance and rerouting around areas of high contamination. This route has the potential of being a “no go” condition if not approved.

There are physical constraints to be able to bring cables through the Narrows to Buchanan (Item E-8) considering that an offshore wind project is already proposing to come in on the east side of Ambrose Channel going to Gowanus substation and other offshore wind projects are likely considering to directly interconnection from offshore wind sites to onshore substations in New York City. Ambrose Channel is the only deep draft channel to Upper New York Bay and is highly important to commerce. Routing within the channel and limiting its navigability is likely to be an issue. Depending on the timing of the transmission project and the offshore wind generation, cables may need to be routed outside the Ambrose Channel. The abutments of the Verrazano Bridge further reduce the size of this area.

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Design Concerns – NextEra Buchanan Proposals

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-6	Design Concern – Buchanan HVDC	Design calls for two HVDC stacked converters. However, the space shown is the same as for one converter. Additional property may be required for additional equipment for two converters.	H	H	L
D-7	Design Concern – Buchanan HVDC	The planned location for the HVDC station impacts an existing 345kV transmission line. The proposed design does not address the relocation of the line.	H	M	L

Projects that include HVDC facilities (T041 Core 6, T042 Core 7, T043 Enhanced 1, T044 Enhanced 2) have the following additional High or Very High risks:

Design Concerns – NextEra HVDC Proposals


Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-2	Design Concern – Northport HVDC	Design shows three 138kV lines tied to the HVDC converter. However, there is no means shown or space provided for tying these lines together and connecting to the HVDC interface transformers. Interconnecting the HVDC to 138kV results in high current (5000A), which increases the complexity of the design. The space allocated is the same as Sprain Brook which ties to one 345kV line.	H	M	L
D-5	Design Concern – Barrett HVDC	Design shows 3-138kV lines tied to the HVDC converter. However, there is no means shown nor space provided for tying these lines together and connecting to the HVDC Interface transformers. Interconnecting the HVDC to 138kV results in high current (5000A) which increases the	H	M	L

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Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
		complexity of the design. The space allocated is the same as Sprain Brook, which ties to one 345kV line.			
D-6	Design Concern – Buchanan HVDC	Design calls for two HVDC stacked converters. However, the space shown is the same as for one converter. Additional property may be required for additional equipment for two converters.	H	H	L
D-7	Design Concern – Buchanan HVDC	The planned location for the HVDC station impacts an existing 345kV transmission line. The proposed design does not address the relocation of the line.	H	M	L

Construction and Operational Concerns – NextEra HVDC Proposals

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
C-2	HVDC Lead Times	Due to high demand and equipment complexities, manufacturers are quoting lead times up to 4 years for land based HVDC units and 5 years for sea based. It will take an additional six months to install, test and commission a second unit.	H	L	H
C-3	Property Site Concerns – Sprain Brook HVDC substation - subsurface condition	Approximately 90% of the site could encounter rock during excavation and the site might require extensive slope protection. Site conditions will require further investigation to quantify. This could have high cost and schedule impact depending on volume of rock excavation and methods used (i.e., blasting likely not allowed in this area)	H	M	L


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Projects that include a proposed Northport substation (T038 to T044) have the additional High probability risk:

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-3	Design Concern – Northport	The underground cables running the length of the existing substation from the proposed transformers to the proposed GIS will be crossing several 12'-16' deep tunnels that run from the plant to the discharge area across the substation. Some are only 5'-6' below grade. These may cause interference with installing the proposed cables.	H	M	M

Projects that include Pilgrim (T038, T041 to T044) have the additional High probability risk:

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-29	Design Concern – Pilgrim	There is insufficient space to add a breaker(s) and line terminal position(s) between breakers 1350, 1390, and 1310.	H	M	M

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4.3.2.3. Propel NY Risks


The following high or very high probability risks impact all of Propel NY's proposals (T047-T049 and T051-T053). Additional risks are provided in the risk register.

Design Concerns – All Propel NY's Proposals

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-9	Design Concern – Sprain Brook Proposed 345kV Line Exits	Due to a rock outcropping and a significant drop in elevation along the eastern and western side of the substation, it will be difficult to route an underground line, as proposed.	H	H	L
D-10	Design Concern – Tremont	The proposed GIS equipment, which Propel NY preliminary identified as a potential NUF, is to be installed at the location of the existing bus connections between Banks 1 and 2 and the tie to the 345kV X28 line to Sprain Brook. The construction of the proposed NUF would require an extensive outage of the transformers and the line. Also, the proposed location of the control house will cut off access to the northern side of the substation.	H	M	M

Construction and Operational Issues – All Propel NY's Proposals

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
C-12	Construction Concern – East Garden City 138kV Cable Installation	Proposals did not include proposed routes for intercepting the 138kV lines (462, 463, 465, and 262) to the proposed substation. However, due to the extensive underground facilities throughout the yard, along the east side (two 345kV cables,	H	M	M

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Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
		three gas lines (30", 20", 8") and one 138kV pipe-type cable (Line 463) and along the south side (one gas line 30", two 138kV cables 465 and 467, one 69kV cable, and the railroad track) it will be difficult to install the cables. Also, along the west and north sides there are overhead 138kV lines, 69kV lines, distribution circuits, and communication circuits.			

Projects that include a proposed substation at Eastern Queens (T052 Alternate 6 and T053 Alternate 7) have the following additional High risks:

Property, Routes, and Siting Concerns – Propel Eastern Queens:

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
P-1	Property Acquisition Concern- Eastern Queens	Utility may be utilizing available property at the site. Therefore, sufficient property may not be available to build a new substation.	H	M	L

This could be mitigated by locating an alternative site for the Eastern Queens substation.

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Projects that include HVDC (T053 Alternate 7) have the following additional High risks:


Construction and Operational Concerns- Propel HVDC:

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
C-7	Property Site Concerns – Sprain Brook HVDC substation-subsurface condition	Approximately 90% of the site could encounter rock during excavation and the site might require extensive slope protection. Site conditions will require further investigation to quantify. This could have high cost and schedule impact depending on volume of rock excavation and methods used (i.e., blasting likely not allowed in this area)	H	M	L
C-8	Schedule Concern – HVDC Lead Times	Due to high demand and equipment complexities, manufacturers are quoting lead times up to 4 years.	H	L	H

The independent cost estimate has assumed that rock excavation is required for the proposed Sprain Brook HVDC substation.

Property, Routes, and Siting Concerns – Propel HVDC:

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
P-4	Property Acquisition Concern – Northport	The proposed location for the HVDC converter station at Northport is at a large above-ground oil storage tank farm. This site is currently in use as back up source for the power plant.	H	M	L

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Projects that include a proposed substation at Dunwoodie (T052 Alternate 6 and T053 Alternate 7) have the following additional Very High or High risks:

Design Concerns – Propel Dunwoodie:

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-7	Design Concern – Dunwoodie - Insufficient Space for Line Terminal	Per the one-line diagram, the project plans to add a 345kV line terminal to the Eastern Queens substation between breakers 6 and 8. However, the plot plan shows the connection to the existing GIS equipment between breakers 3 and 4, and there is not sufficient space between breakers 6 and 8 to add the line terminal.	VH	H	H
D-8	Design Concern – Dunwoodie Proposed 345kV Line Exit	Due to a rock outcropping and a significant drop in elevation along the eastern side of the substation and ROW, it will be difficult to route an underground line out of the proposed GIS towards the east as proposed.	H	H	L

Projects that include the Barrett 138kV Breaker 1330 Replacement (T048 and T053) have the following additional High risks:

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-11	Design Concern – Barrett 138kV	There is insufficient space to replace the existing breaker 1330 with a double PASS breaker due to a large lattice deadend structure that would interfere with this installation.	H	L	L


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Projects that include the East Garden City 345kV reactor addition (T048 and T053 have the following additional High risks:

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-12	Design Concern- East Garden City Proposed 345kV Reactor	The location for the proposed 345kV reactor will interfere with a main cable trench and access road. In addition, the Plot Plan provided incorrectly shows the location of the existing Y49 line exit. Therefore, the proposed 345kV reactor will extend further to the west than shown. It may not fit within the fenced area of the substation. Also, the reactor would be installed under the double ckt overhead Lines 361 and 362, a distribution, and communication circuits.	H	H	M

Projects that included a PAR at **Northport** (T051) has the following additional High risk:

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-15	Design Concern – Northport	The new 138kV underground cables running to the proposed PAR will cross several 12'-16' deep tunnels that run from the plant to the discharge area. Some are only 5'-6' below grade. Also, the underground termination being installed next to breaker 1450 is the location of one of the tunnels. These may cause interference with installing the proposed cables.	H	M	M

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Projects that include the **Jamaica-Lake Success (903) Cooling** (T048 and T052) have the following additional High risk:

Item #	Risk Title	Description	Probability	Cost Impact	Schedule Impact
D-16	Design Concern – Jamaica- Lake Success 903 Line Cooling	The project requires forced cooling to be added to the lines to increase their capability. However, the required cooling equipment is not shown on the substation plans. There may not be adequate space to add the required equipment.	H	M	M

4.4. Resiliency and Security

4.4.1. Resiliency

The Presidential Policy Directive, PPD-21, defines resiliency as: “The ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions.” Resilience is measured as a response to an abnormal event. Some elements that impact a substation or transmission lines ability to withstand a major storm include:

1. Overhead lines or open-air substations that can be damaged from ice accumulation or downed poles due to high winds,
2. Flooding of substation’s equipment control cabinets making them inoperable,
3. Flooding of substation’s control houses impacting the protection and control systems, and
4. Flashover of insulators due to salt contamination.


Some elements that impact the ability to restore facilities after a disruption include:

1. Flooding of control houses impacting the station service systems, batteries, and communication to control centers, and
2. Downed trees or flooded streets and access roads can impact crews’ ability to restore damaged facilities.

Substations located along the coast, near the bank of a river, or near wetlands will be at a higher risk for flooding and being inundated by hurricanes.

4.4.1.1. Transmission Review

Transmission lines being proposed for all projects are underground or submarine cables. Therefore, these cables would not be subject to damage during a major ice storm or high winds.

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There is a potential risk to the submarine cables due to an anchor strike. However, this requires a cable burial risk assessment, which is usually very detailed and is not addressed in these preliminary designs.

4.4.1.2. Substation Bus Type Review

Proposed substations are being proposed as gas-insulated substations (“GIS”) or are using GIB. These facilities are less susceptible to damage due to high winds, blowing debris, or salt contamination. GIS facilities enclosed in buildings will also be less likely to be impacted by vandalism, such as gunfire or objects thrown into the substation.


The following table lists the proposed AIS substations, which would be at a higher risk to damage due to high wind conditions or salt contamination.

Proposed Air-Insulated Substations

Substation	LS Power	NextEra	Propel NY
Barrett or Longshore	T035- See Note 1	All- See Note 1	All
East Garden City	N/A	All- See Note 1	T047, T049, T051
Eastern Queens	N/A	N/A	T051, T052- See Note 1
Northport	N/A	T038, T039, T040- See Note 1	-
Ruland Rd	T035- See Note 1	All- See Note 1	All
Shore Rd	N/A	All	T048, T053

Note 1: Portions of the proposed facilities are AIS.

Each proposed substation was reviewed to determine its potential risk of damage due to the type of bus work installed and a ranking score assigned based on the following criteria:

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Bus Type Ranking

0	All Building Enclosed GIS
1	All Outdoor GIS
2	Partial AIS & Enclosed GIS
3	Partial AIS & Outdoor GIS
4	All AIS

4.4.1.3. Flood Risk Review


The following table lists substations that are located within or adjacent to a 100-year flood zone:

100 Year Flood Zone Table

Substation	LS Power	NextEra	Propel NY
Barrett (Longshore)	T035	All	All
Farragut	N/A	T037, T038, T039, T043, T044	N/A
Rainey	N/A	All	-
Northport	N/A	T038 to T043	See Note 1
Buchanan	N/A	T043, T044, T045	
Tappen Beach- Transition from Submarine to Terrestrial Cable Location	N/A	All	See Note 2
Long Beach- Transition from Submarine to Terrestrial Cable Location	N/A	T043	N/A
New Rochelle	N/A		All

Note 1: Propel NY selected location for their proposed 345/138 kV substation and the HVDC yard at Northport is not adjacent to the 100-year flood zone.

Note 2: Propel NY's transition from submarine to terrestrial cable occurs in a below ground transition vault.

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Each substation was reviewed to determine its potential risk of a flood occurring and was assigned a ranking based on the following criteria:

Based Flood Elevation Ranking

0	no flood zone in area
1	adjacent to flood zone
2	500-year flood/storm
3	partially in AE
4	in AE (waves less than 3')
5	in VE (waves greater than 3')

Where:

“AE” refers to a FEMA flood zone with waves less than 3 feet. The number after "AE" is the elevation in feet referenced to North American Vertical Datum of 1988 that flooding is projected at that particular site, referred to as the Based Flood Elevation (BFE).


“VE” refers to a FEMA flood zone with waves greater than 3 feet. The number after "VE" is the elevation in feet referenced to North American Vertical Datum of 1988 that flooding is projected at that particular site, referred to as the BFE.

4.4.1.4. Hurricane Risk Review

Sea, Lake and Overland Surges from Hurricanes (SLOSH) is a model developed by National Weather Service that shows which areas will be inundated by a specific category hurricane. A substation that is susceptible to being inundated with a Category 1 or 2 hurricane has lower resilience than ones that are not impacted until a storm reaches a Category 3 or 4. The following summarizes substations that are susceptible to a Category 1 or 2 storm.

Substations Susceptible to Category 1 or 2 Hurricanes

Substation	LS Power	NextEra	Propel NY
Barrett (Longshore)	T035	All	All
Farragut	N/A	T037, T038, T039, T043, T044	N/A
Rainey	N/A	All	N/A
Northport	N/A	T038 to T043	T051, T053
Buchanan	N/A	T043, T044, T045	

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Tappen Beach - Transition from Submarine to Terrestrial Cable Location	N/A	All	N/A
Long Beach - Transition from Submarine to Terrestrial Cable Location	N/A	T043	N/A
New Rochelle	N/A		All
Shore Rd - Transition from Submarine to Terrestrial Cable Location	N/A	All	N/A

Each proposed substation site was evaluated to determine the probability of it being inundated by a hurricane based on the following criteria:

SLOSH Ranking


0	no inundation
1	inundated in category 4 storm
2	inundated in category 3 storm
3	inundated in category 2 storm
4	inundated in category 1 storm

4.4.1.5. Resiliency Results

A score was assigned to each substation depending on its potential risk of being impacted by a flood or hurricane and its bus type.

Based on this scoring the following table ranks the projects from most resilient (lowest score) to least resilient (highest score):

Total Resiliency Ranking


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Ranking (Most to Least Resilient)	Proposal	Total Resiliency Score
1	T035- LS Power	13.5
2	T048- Propel NY Base 2	31.5
3	T036- NextEra Core 1	33.5
4	T047- Propel NY Base 1	34
5	T049- Propel NY Base 3	34
6	T052- Propel NY Alt 6	34
7	T051- Propel NY Alt 5	34
8	T037- NextEra Core 2	41.5
9	T042- NextEra Core 7	41.5
10	T053- Propel NY Alt 7	46
11	T041- NextEra Core 6	49.5
12	T040- NextEra Core 5	52
13	T038- NextEra Core 3	61
14	T043- NextEra Enhanced 1	63
15	T039- NextEra Core 4	66
16	T044- NextEra Enhanced 2	75.5

4.4.2. Security

Developers would be required to design to existing standards such as IEEE Standard 1402 “Guide for Physical Security of Electric Power Substations,” IEEE Standard C37.240 “Standard Cybersecurity Requirements for Substation Automation, Protection, and Control Systems,” and develop security plans in accordance with the North American Electric Reliability Corporation Critical Infrastructure Protection (NERC CIP) requirements.

In response to recent security breaches at substations in North Carolina, South Carolina, and Washington, the Federal Energy Regulatory Commission (FERC) directed a study of the effectiveness of existing reliability standards for the physical security of the nation’s power grid and determine whether they need to be improved. Standards resulting from this study should be implemented for the proposed project that is identified as the more efficient or cost-effective solution to the Long Island PPTN.

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4.5. Expandability


In evaluating the expandability of a proposed regulated Public Policy Transmission Project, the NYISO OATT section 31.4.8.1.4 provides that the NYISO will consider a project's impact on future construction and the extent to which any subsequent expansion will continue to use the project within the context of system expansion.

The review team conducted a review of the expansion capability of the Developers' proposals. The review centered predominately on the Developers' one lines that showed the availability of open breaker positions for future line terminal positions.

4.5.1. Substation

The review centered predominately on the Developers' one-line diagrams that showed the availability of future line terminal positions. The Developer's plot plans were reviewed to confirm if there was sufficient space to add the terminal additions identified on the one-line diagrams. If there is not sufficient space within the proposed fenced area or between breakers for adding a new line position, then they were not counted as a spare position towards expandability. The potential for expanding the substation and/or installing additional bays not identified on the one-line diagram was not considered. The tables below provide an overall summary of the number of spare line terminal positions provided for each Developer's proposal.

Proposal	LS Power	
	<i>138kV Line Terminals</i>	<i>345kV Line Terminals</i>
T035	0	8
Proposal	NextEra	
	<i>138kV Line Terminals</i>	<i>345kV Line Terminals</i>
T036	3	10
T037	3	10
T038	5	11
T039	5	11
T040	6	11
T041	4	11
T042	4	13
T043	1	7
T044	4	9

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Proposal	Propel NY	
	<i>138kV Line Terminals</i>	<i>345kV Line Terminals</i>
T047	1	1
T048	-	2
T049	-	1
T051	-	2
T052	1	2
T053	-	2

4.5.2. Transmission

Since all new terrestrial transmission lines are being installed underground and primarily routed in existing ROW, none of the Developers provided space for the installation of additional transmission lines.

4.6. Site Control and Real Estate

4.6.1. Site Control


In evaluating the extent to which a Developer of a proposed regulated Public Policy Transmission Project has the property rights (*i.e.*, site control) to implement its project, the NYISO OATT section 31.4.8.1.7 specifies the criteria to be used for evaluating site control.

The review team conducted a review of the Developers' property rights acquisition plans contained in their proposals. The review centered on the Developers' information and plans presented in their proposals and additional information provided in response to NYISO requests for information.

In all proposals, the following is common for the property rights acquisition process:

The following was considered in determining a Developer's ability to obtain real property rights:

- New York Public Service Law § 70 approval will be required from the NYPSC before an electric corporation may transfer or lease its assets as further discussed in the permitting plan.
- Under New York State Transportation Corporation Law Article 2 Section 11, Developers will have certain rights to install facilities on State and Local municipality property and

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acquire real estate by eminent domain if needed after certification of a route by the NYPSC.

4.6.2. Real Estate Analysis

A review of the proposed routing for the transmission lines and substations was completed to identify all private and utility owned property that each Developer would need to obtain for its proposed project. Cost estimates for the property were derived by obtaining recent comparable sales and tax assessments from municipal tax records in the town and county where the property is located and commercially available real estate software. The estimated cost of the required property was included in the independent cost estimates. The tables below provide a summary of the on land real estate costs.

Transmission Line Corridor Real Estate Summary (Excludes Public Roadways)

DEVELOPER	PROPOSAL	Easement				Total Area in Acres	Total Real Estate Cost
		Private		Incumbent Utility			
		No of Parcels	Area in Acres	No of Parcels	Area in Acres		
LS Power	T035	3	0.30	2	0.72	1.02	\$187,232
NextEra	T036 (Core1)	7	1.81	7	0.63	2.44	\$1,323,225
	T037 (Core2)	7	1.83	8	0.63	2.46	\$1,522,725
	T038 (Core3)	9	1.95	11	0.99	2.94	\$1,606,212
	T039 (Core4)	11	5.24	11	0.99	6.23	\$2,227,779
	T040 (Core5)	7	1.90	9	0.85	2.75	\$1,372,235
	T041 (Core6)	8	1.38	11	1.13	2.51	\$1,500,289
	T042 (Core7)	9	2.25	13	1.28	3.53	\$1,514,052
	T043 (Enhance1)	16	2.89	14	5.73	8.62	\$3,425,303
	T044 (Enhance2)	71	100.10	14	5.81	105.91	\$4,141,872
Propel NY	T047 (BS1)	15	0.96	10	0.76	1.72	\$1,566,960
	T048 (BS2)	13	0.78	7	0.34	1.12	\$1,060,013
	T049 (BS3)	15	0.97	12	0.94	1.91	\$1,703,342
	T051 (AS5)	17	1.18	12	1.00	2.18	\$1,798,246
	T052 (AS6)	23	1.59	18	1.28	2.87	\$2,592,883


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DEVELOPER	PROPOSAL	Easement				Total Area in Acres	Total Real Estate Cost
		Private		Incumbent Utility			
		No of Parcels	Area in Acres	No of Parcels	Area in Acres		
	T053 (AS7)	27	1.87	15	1.01	2.72	\$2,575,657

State Own Property - 94 Acres

Substation Real Estate Summary

DEVELOPER	PROPOSAL	Easement				Total Area in Acres	Total Real Estate Cost
		Private		Incumbent Utility			
		No of Parcels	Area in Acres	No of Parcels	Area in Acres		
LS Power	T035	1	1.00	4	44.00	45.00	\$10,942,216
NextEra	T036 (Core1)	3	4.98	7	13.30	18.28	\$44,826,855
	T037 (Core2)	3	4.98	7	13.30	18.28	\$44,826,855
	T038 (Core3)	4	7.58	8	13.30	20.88	\$45,505,135
	T039 (Core4)	4	7.58	8	13.30	20.88	\$45,505,135
	T040 (Core5)	4	7.58	8	13.30	20.88	\$45,505,135
	T041 (Core6)	5	10.48	8	21.30	31.78	\$51,696,287
	T042 (Core7)	5	10.48	9	26.10	36.58	\$51,851,424
	T043 (Enhance1)	5	10.48	11	32.20	42.68	\$56,741,852
	T044 (Enhance2)	5	10.48	10	27.10	37.58	\$51,851,424
Propel NY	T047 (BS1)	1	0.30	8	21.90	22.20	\$37,420,741
	T048 (BS2)	1	0.30	9	18.30	18.60	\$21,066,751
	T049 (BS3)	1	0.30	8	22.80	23.10	\$38,409,490
	T051 (AS5)	2	0.90	9	21.90	22.80	\$37,505,876
	T052 (AS6)	2	5.50	9	21.90	27.40	\$49,633,813
	T053 (AS7)	4	12.10	9	24.10	36.20	\$39,371,620

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4.7. Operational Plan

The review team conducted an evaluation of the Developers' operations and maintenance (O&M) plans detailed in their proposals. The review centered on the Developers' proposals. The following are common elements of the Developers' O&M plans:

- All O&M activities will comply with NERC regulations, and
- Control center schedules will be 24-7-365.

Below is a summary of the review team's review of the proposed O&M plans. The review team did not identify any major flaw with any Developers' O&M plans.

Summary Proposed of O&M Plans			
#	Developer	Operations	Maintenance
T035	LS Power	LS Power's operations staff will perform real-time operations monitoring and control, planned outage coordination, and switching coordination for its project. The project will be operated by LS Power's control centers located in Colonie, New York and Clifton Park, New York.	LS Power will self-perform routine substation maintenance and inspections, minor repairs, and oversee outside contractors. Qualified outside contractors will conduct preventative and predictive maintenance, support forced outage response, perform emergency repair, and complete major facility rebuilds as may be necessary. The HVDC vendor will be used to conduct these activities for the HVDC converter stations. A comprehensive maintenance plan was provided.
	NextEra	The Projects onshore and off-shore system operations will be provided from NextEra's existing transmission control centers located in Albany NY.	

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Summary Proposed of O&M Plans			
#	Developer	Operations	Maintenance
	Propel NY	Facilities would be operated from the Frederick R. Clark Energy Center Control Room, which is owned and operated by NYPA and continuously staffed all hours of every day (24-7-365).	NYPA's Operations and Transmission staff work jointly to operate and monitor the facilities, perform routine inspections, conduct preventive maintenance, and provide emergency response to a corrective maintenance or outage situation.


4.8. Field Reviews

Field review of proposed transmission line routes was limited to routes located in public thoroughfares. The review team used the results to develop the project scheduling and cost estimates and identify potential constructability issues and risks with the proposed design, siting, and routing. The review team was granted access to the incumbent substations and some transmission lines for field review. The concerns noted during this site visit are reflected in the risk register.

4.9. Work Plans

The Developers' work plans should provide a detailed description of the overall work plan from start to finish; should list items to be done by in-house staff; and list services that will be performed by consultants or contractors. No significant deficiencies were found in the work plans and processes proposed by any of the Developers. A high-level summary of the work plans follows:

- All three Developers have a history of managing successful transmission and substation design and construction projects.
- All Developers have a well-defined project management plan to implement the project.
- There was variation in the degree of self-performance of work versus using third-party contractors. All Developers utilize internal staff to manage internal and external resources.
 - LS Power proposes to use internal staff for the majority of the engineering and construction management supplemented by consultants.
 - NextEra proposes to utilize internal resources as subject matter experts and project management personnel to manage external resources.

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- Propel NY will draw from both organizations to establish either internal teams of subject matter experts to complete tasks or procure, through existing MSAs or an open bidding process, the necessary consultants and contractors needed to complete tasks.
- All Developers include work plan activities in their estimates and schedules. More detailed analysis of the construction work plans is discussed in the schedule analysis section of this report.
- All Developers propose permitting and regulatory activities to be performed by a mix of in-house staff and outside consultants.
- All Developers propose to contract transmission line and substation surveying.
- All Developers propose to contract for site work and construction.
- LS Power would share public outreach efforts with public relations firms. All Developers signal the importance of early and careful attention to public outreach.
- It was not possible to evaluate specific team members at this stage, as they are expected to be selected from internal staff and competitively from leading engineering, geo-technical, environmental, and construction firms.


4.10. Environmental

All of the Developers' proposals recognize the need for environmental studies, permits, and approvals from various federal and state government agencies. Standard permit requirements include transmission approval from the NYPSC under Article VII; wetland delineation and protection; archeological studies; storm water pollution prevention requirements; stream protection; invasive species management; agricultural land protection; and rare, threatened and endangered species surveys and protection. The Developers acknowledge the possibility that their proposals could require modification to address additional permit conditions. Based on available information, there do not appear to be any reasonably foreseeable environmental issues that would prevent the projects from being constructed. In general, the underground terrestrial cable installations and substations have minimal environmental risks when compared to the submarine components of each proposal.

The following is a general discussion of the most significant foreseeable environmental issues and factors that could affect each of the proposals.

4.10.1 Submarine Transmission Line Constraints

As component of the proposals, Developers propose submarine transmission lines that are

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HVDC or alternating current (“AC”). Those cables are proposed to be routed through the marine waters surrounding New York. The waterways that these cables could cross vary between proposals and include, but are not limited, to Long Island Sound, Atlantic Ocean, Lower New York Bay, Upper New York Bay, East River, and Hudson River.

4.10.1.1 Existing Infrastructure Crossings - Pipelines, Cables and Transportation Tunnels

The waters surrounding Long Island and New York City contains a large number of existing submarine linear infrastructure, including electric/telecommunication cables, pipelines, and vehicle/railway/subway tunnels. This infrastructure is owned by a combination of private companies and public entities, such as the Metropolitan Transportation Authority (MTA) and Port Authority of New York and New Jersey. The following table summarizes the number of tunnels, cable area, and pipeline crossings involved for each proposal:

Linear infrastructure crossing for all PPTN Projects

Route	Tunnel Crossings	Cable Area Crossings	Pipeline Area Crossings
T035 – LSP Atlantic Gateway	-	1	1
T036 – NextEra Core 1	-	1	-
T037 – NextEra Core 2	-	1	-
T038 – NextEra Core 3	-	2	-
T039 - NextEra Core 4	16	4	3
T040 – NextEra Core 5	-	2	-
T041 NextEra Core 6	-	2	-
T042 - NextEra Core 7	10	33	8
T043 - NextEra Enhanced 1	16	23	8
T044 - NextEra Enhanced 2	16	33	8
T047 – Propel Base Solution 1	-	1	-
T048 – Propel Base Solution 2	-	1	-
T049 – Propel Base Solution 3	-	1	-
T051 – Propel Alternate Solution 5	-	1	-
T052 – Propel Alternate Solution 6	-	1	-
T053 – Propel Alternate Solution 7	-	1	-
Source: BOEM, 2022/MARCO, 2022			
Notes: This table only identifies routes that cross linear infrastructure. Routes that are immediately adjacent to linear infrastructure area not included in this table.			

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4.10.1.2 Navigation Channels and Anchorage Areas


There are several proposed routes that cross or run adjacent to designated and maintained federal navigation channels and anchorage areas. Routing through this area is very complex and will cross multiple navigation features. The following table provides the quantity of crossings for each proposed project route.

Federal Navigation and Anchorage Area Crossing for All Projects.

Route	Navigation Channel Crossings ¹	Anchorage Area Crossings
T035 – LSP Atlantic Gateway	1	1
T036 – NextEra Core 1	-	1
T037 – NextEra Core 2	-	1
T038 – NextEra Core 3	-	1
T039 - NextEra Core 4	2	3
T040 – NextEra Core 5	-	1
T041 NextEra Core 6	-	1
T042 - NextEra Core 7	6	7
T043 - NextEra Enhanced 1	5	8
T044 - NextEra Enhanced 2	6	8
T047 – Propel Base Solution 1	2	3
T048 – Propel Base Solution 2	2	3
T049 – Propel Base Solution 3	2	3
T051 – Propel Alternate Solution 5	2	3
T052 – Propel Alternate Solution 6	2	3
T053 – Propel Alternate Solution 7	2	3
Note: ¹ Some of these cross/ run within channels for extended distances within high traffic areas in New York Harbor. Source: NOAA, 2022		

4.10.1.3 Contaminated Sediment

The Hudson River starting from the Battery at the southern end of Manhattan and extending 200 miles north is considered a federal and New York State Superfund Site as a result of PCB contamination (EPA, 2022). Several projects (T039, T042, T043, T044) propose to route through the Lower Hudson portion of the Superfund Site. See the following table for submarine cable distances within the designated Superfund Site.

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Submarine Route Lengths within Hudson River PCB Superfund Site.

Route	Approximate Length of Hudson River PCB Superfund Site Crossed
T039 - NextEra Core 4	19 miles
T042 - NextEra Core 7	41 miles
T043 - NextEra Enhanced 1	59.5 miles
T044 - NextEra Enhanced 2	60 miles
Notes: Other submarine routes not identified do not cross mapped remediation areas.	
Source: ArcGIS NYSDEC Remediation Areas	

4.10.1.4 Sensitive Species and Habitats


The marine waters surrounding New York contain sensitive marine species and habitats. Sensitive species can include aquatic species, such as threatened and endangered whales/sturgeon/sea turtles or species, that are regionally significant and are located in New York area waters. In many instances regulatory agencies will impose Time-of-Year Restrictions (TOYR) in the form of special permit conditions to minimize potential impacts to sensitive species or habitat during construction. It is likely that all project routes will be subject to some form of TOYR. TOYR will vary based on the specific location or routing of the project. Several TOYRs that are generally included in state and/or federal permits are identified in the table below.

General Time-of-Year Restrictions (TOYR) for waters surrounding New York

Species	TOYR Window Dates	PPTN Projects Affected
Winter Flounder Spawning ¹	January 1 to May 31	Likely All
Anadromous Fish Migration and Spawning ¹	March 1 to June 30	T039, T042, T043, T044, T047, T048, T049, T051, T052
Finfish/Shellfish Spawning ²	June 1 to September 30	Likely All
Nesting Shorebird ²	April 1 to August 31	T038, T039, T040, T041, T042, T043, T044, T053
Atlantic Sturgeon NY Bight Congregation ³	October 1 to November 31	T042, T043, T044
Source: ¹ (USACE, 2022), ² (NYSDEC, 2022), ³ (FERC, 2019)		

4.10.1.5 Additional Regulatory Concerns – Farragut

The New York City Department of Small Business Services is the agency that issues permits for improvement and maintenance to waterfront structures and NYC-owned

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waterfront buildings. The proposed expansion of the Farragut Substation, as proposed by NextEra in T037, 038, 039, 040, 041, 042, 043, and 044 into the East River appears to be in a mapped V-Zone based on the NYC Preliminary Flood Insurance Rate Maps. Pursuant to G304.2 V-Zone Construction Standards Section 6, (NYC, 2022) Development, including land-disturbing activities, seaward of the reach of mean high tide are prohibited. Therefore, to develop a pier in this area, which appears to be prohibited under the above code, would likely require a variance from the Board of Standards and Appeals.

4.10.1.6 Additional Regulatory Concerns – Adjacent States


A portion of the submarine alignment under T035 is in close proximity to the Connecticut state line near the landing at Port Chester. Additionally, a portion of the submarine route for T039, T042, T043, and T044 is near the New Jersey state line within Upper New York Bay and the Lower Hudson River. Routing of these projects outside of the boundaries of New York State could require additional permitting and authorizations from New Jersey or Connecticut regulatory agencies.

4.10.2 Substation and Transition Stations

4.10.2.1 Visual Impacts

The visual impacts of any proposed substation or transition station will need to be considered during the Article VII permitting process. None of the potential impacts described herein represent fatal flaws for any of the proposals but could result in additional public opposition, especially in areas with high property value or sensitive areas (*e.g.*, parks). This could result in the need for visual screening to minimize impact or could delay project approval. The following are the substations with the most likely visual impacts:

The visual impacts from development of transition stations, likely located at or near Shore Road and Davenport Park (*i.e.*, all NextEra proposals T036-T044), Northport Power Station (T038-T044), and JFK Marina and Park Parking (T039, T043, and T044), would be most visible from the water. At Shore Road, the transition station would be visible from Hempstead Bay, except areas north of Tappen Beach. Buildings directly around the Shore Road location and trees along the shores of Hempstead Bay would likely prevent visibility of the transition station to residential areas; however, the

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transition station would likely be visible from North Hempstead Beach Park and Beach Hill Colony across the bay.

The transition station at Northport Power Station would be visible from areas north, north northwest, and north northeast.

The transition station at Davenport Park would be visible from areas southeast in the Long Island Sound.

The transition station at JFK Marina and Park Parking would have the greatest visibility; however, most of this visibility would be from the Hudson River.


The Northgate and Southgate substations (T035) are roughly 20 acres each. The Northgate substation is mostly surrounded by trees, which would likely provide some visibility protection; however, it would likely be visible from the Taconic Parkway. The Southgate substation is more exposed and would be visible from residential buildings from the south to the southeast.

4.10.2.2 Wetland and Mitigation

Barrett Substation and Longshore Substation in T035 is surrounded by NYSDEC Tidal Wetlands. The NYSDEC would require compensatory mitigation for permanent impacts to wetlands. The cost of which will depend on the proposed impacts but could be on the order of \$250,000/acre with a mitigation ratio that could be as high as 3 to 1. In addition, any compensatory mitigation will require 5 years of monitoring to ensure that there is 85% survival of the plantings. The cost estimates for compensatory mitigation have been included in the independent cost estimates for the applicable projects.

4.10.2.3 Contaminated Sites

Depending on the past use of the site, these developed areas may be more likely to have subsurface soil contamination. Propel proposal T053 proposes an AC/DC converter station adjacent to the existing Northport substation. The proposed converter station is shown where aerial imagery depicts a large above-ground storage tank farm. Subsurface contamination would be very likely here.

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Phase 1 and/or 2 Environmental Site Assessments would be conducted early in the design phase and would be expected to be resolved within the timeframe of the Article VII process. If subsurface contamination is found, it would likely require negotiation with the current owner to determine which entity will be financially responsible and who will address the contamination to allow the converter station to be constructed. This could impact the project schedule.

4.10.3 Terrestrial Transmission Routing

SECo reviewed the routing of the transmission lines of each project to determine the number of miles and percent of the project's total mileage that would be crossing through Environmental Justice ("EJ") Areas. Additional consideration may be required for routing through these areas. The table below shows the milage crossing through the EJ Areas for each project.

Routing through EJ Areas

Proposal	Routing through EJ Areas (miles)	Routing through EJ Areas (% of total mileage)
T035- LS Power	10	15
T036- NextEra Core 1	23	22
T037- NextEra Core 2	30	29
T038- NextEra Core 3	29	21
T039- NextEra Core 4	28	17
T040- NextEra Core 5	22	18
T041- NextEra Core 6	23	17
T042- NextEra Core 7	30	5
T043- NextEra Enhanced 1	39	15
T044- NextEra Enhanced 2	47	14
T047- Propel Base 1	17	22
T048- Propel Base 2	22	26
T049- Propel Base 3	18	20
T051- Propel Alt 5	20	19
T052- Propel Alt 6	47	30
T053- Propel Alt 7	31	17

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4.11. Replacement of Infrastructure

The review team identified where the Developers have proposed to replace aging infrastructure. The review team does not believe that there is a significant advantage to any of the proposals related to replacement of aging infrastructure.

4.11.1. Replacement of Infrastructure – Transmission Lines


The following table is a summary of the overhead transmission line mileages to be replaced for each proposal.

LS Power T035	NextEra T036-T044	Propel T047-T053
None	T044 (Enhance 2) Transmission Line component 225, Buchanan to Ramapo 7.4 miles existing 138kV line rebuilt /upgrade to 345kV with proposed 2 bluebird ACSS conductor per phase	None

4.11.2. Replacement of Infrastructure – Substations

The proposals submitted by the three Developers do not have significant plans for replacement of existing substation infrastructure. The most significant impact would be LS Power's proposal to rebuild the Barrett 138 kV substation, which has been identified as a potential NUF and will be identified in the System Impact Study ("SIS"). The review team does not believe that the replacement of aging infrastructure distinguishes the proposals from each other. Below is a comparison listing of the substations where equipment is being proposed for replacement or could be replaced due to NUFs required for the reliable interconnection of the project.

Substation	LS Power T035	NextEra T036-T044	Propel T047-T053
Barrett	SIS to identify the NUF at the station	No replacement of existing equipment	No replacement of existing equipment
Elwood	No replacement of existing equipment	Replace (1) 138kV 80MVAR reactor	No replacement of existing equipment
Holbrook	No replacement of existing equipment	No replacement of existing equipment	Replace existing 138kV switch 1322 with a new PASS CB

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Substation	LS Power T035	NextEra T036-T044	Propel T047-T053
Newbridge	No replacement of existing equipment	Retire 138kV breakers 1410, 1420 & 1480	Replace existing 138kV breaker with (2) new PASS CB's
Rainey	No replacement of existing equipment	No replacement of existing equipment	T047, T049, T051 & T052 – Replace (2) existing 345kV CB's 1E & 6E with (4) PASS CB's T048 & T053 – Replace (1) existing 345kV CB 1E with (2) PASS CB's
Shore Rd	No replacement of existing equipment	No replacement of existing equipment	Replace existing 138kV CB 1380 with new 138kV CB


4.12. Design Verifications - Substations

The review team compared the proposed bus arrangement for the substations that were submitted with the Developers' proposals. A substation design assessment table considered the type of bus arrangements proposed, number of lines, number of transformers, breakers, PARs, and reactors for each substation. This assessment also notes any design concerns and operational or constructability issues that were found during this review. Below is a summary to highlight the more significant findings from the substation assessment that was completed for each Developer.

4.12.1. Barrett Substation

All three Developers are building a new substation at Barrett, but each made different assumptions regarding what will be constructed for the interconnection of the Empire Wind II project and interconnection of their proposed facilities to the system.

- LS Power:**
 LS Power assumed that the existing Barrett substation will be rebuilt into a 6-bay breaker-and-a-half ("BAAH") configuration. This new substation will provide three 138 kV terminal positions to connect to LS Power's proposed Longshore substation. Longshore substation will include three 345/138 kV transformers. Barrett substation rebuild has been identified as a potential NUF by the Developer. Hence, the actual


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design and non-binding estimate of cost for NUFs to interconnect the lines from the proposed Longshore station will be identified in the SIS.

- NextEra:
NextEra plans on building a new Barrett substation consisting of a 4-bay 138 kV BAAH GIS. The two existing 138 kV Barrett – Valley Stream lines will be broken into and looped into the proposed Barrett GIS.
- Propel NY:
Propel NY assumes that a new 5-bay 138 kV BAAH substation will be built to facilitate the interconnection of the Empire Wind II project and the two existing Barrett – Valley Stream 138 kV lines will be broken into and looped into that 5-bay BAAH substation. Under that assumption, Propel NY's projects include installing a new Barrett substation consisting of two or three 345/138 kV transformers and tying into the 345 kV system at either East Garden City, Tremont, or a new Eastern Queens substation, as outlined in the individual proposals. During the site visit, the review team observed that there is insufficient space to replace the existing breaker 1330 with a double PASS breaker (T048) since there is a large lattice dead end structure that would interfere with this installation.

4.12.2. Buchanan Substation:

- LS Power:
The existing Buchanan substation was not impacted by the LS Power proposal.
- NextEra:
The existing Buchanan substation was not impacted by NextEra's proposals T036-T041. However, proposals T042-T044 include a new HVDC converter station that is being added to the northeast of the existing substation in the area of the existing transmission lines. Proposal T042 also shows a proposed 345 kV BAAH GIS being built between the HVDC station and existing Buchanan station. Proposal T044 shows a proposed 345kV BAAH GIS being built along with the addition of two 345 kV PARs north of the proposed GIS building. Based on the current proposed size of the PARs, these cannot be manufactured and the PARs will need to be either two three-phase units or three single-phase units. There is also a concern that there are no by-pass switches shown for the PARs and none of these proposed designs address how the


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transmission lines would be relocated.

- Propel NY:
The existing Buchanan substation was not impacted by the Propel NY proposals.

4.12.3. Dunwoodie Substation


- LS Power:
The existing Dunwoodie substation was not impacted by the LS Power proposal.
- NextEra:
NextEra's proposals T036-T044 propose a 345 kV BAAH GIS added north of the substation in the adjacent 345 kV transmission ROW. The one-line diagram provided shows how NextEra would be tying into the existing substation. However, the proposal does not illustrate how the transmission lines would be modified to tie into the proposed GIS building. Also, the proposed GIS is located under three 345 kV existing transmission lines causing clearance issues. The site visit confirmed that the approximate clearance from grade to the 345 kV overhead lines in the ROW is about 40 feet so there is not adequate clearance for constructing the proposed GIS facilities while the transmission lines are in service. Therefore, the construction of the GIS would require long-term outages. This may also require long simultaneous outages of both lines to Pleasantville. Based on this information, the review team determined that NextEra's proposals at Dunwoodie could have significant constructability issues.
- Propel NY:
Propel NY proposes the addition of a 345 kV GIS breaker with proposals T052 & T053. The site visit revealed that the proposed Plot Plan shows the GIS addition for the line terminal between breakers 3 and 4 instead of between breakers 6 and 8 as shown on the one-line diagram. The review team determined that there is insufficient space to install a breaker and line terminal between breakers 6 and 8 without major modifications to the existing facilities. However, extending the GIS bus and adding a breaker between breakers 3 and 4 could be accomplished; however, existing oil and SF6 gas equipment would need to be relocated.

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4.12.4. East Garden City Substation

- LS Power:
The existing East Garden City substation was not impacted by the LS Power proposal.
- NextEra:
NextEra's proposals T036-T044 propose a 345 kV BAAH GIS north of the existing East Garden City ("EGC") substation, where an existing office building currently resides. Based on the provided site plans, it appears that the proposed substation may infringe on access to the rear of the adjacent office buildings that may require purchasing that property or entering into other arrangements. The drawings provided also show a PAR being installed that, based on the feedback from a manufacturer, a PAR of the proposed size cannot be manufactured. As a result, the PAR would need to be either two three-phase units or three single-phase units. To accommodate the additional equipment, more space would be required at this location for the installation of the PARs. Also, for proposals T036, T038, T043 and T044, where two PARs of this size are shown, the review team determined that there is a significant concern that the site will no longer be large enough for the additional equipment arrangement and, therefore, require the acquisition of the adjacent properties.

The proposed route for the underground cables that tie the existing 345 kV PARs to the proposed GIS is along the west side of the substation heading north. During the site visit, the review team observed that there is a double circuit overhead 138kV (Lines 361 and 362), an overhead distribution circuit, and communication circuit along the west side of the substation. There is also a large double circuit lattice structure for the Lines 361 and 362 located in the northwest corner of the substation adjacent to a building. Due to these interferences, the review team determined that it will be very difficult to install the 345 kV cables through this area. The proposed route for the underground cables to tie the existing 345 kV transformers to the proposed GIS and the 138kV cable to the proposed PAR are exiting towards the east and then turning north. It will be difficult to exit the substation to the east since the cables will need to cross three gas lines (30", 20", 8"), one 138 kV pipe-type cable (Line 463), and 8" water lines that run North-South along the east side of the station.

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Propel NY:

Propel proposals T047-T049 and T051-T053 show a proposed 345kV BAAH AIS located on vacant property adjacent to the existing EGC site. This property was recently purchased by LILCO.


During the site visit it was noted that all of 138 kV transmission lines (462, 463, 465, 262) that are to be intercepted and tied into the proposed substation are oil-filled, pipe type cables. Tying into these types of cables requires managing the oil pressure and transitioning to EPR, which adds an additional level of complexity to the construction. The extent of work required will be dependent on the cable's condition and age. In addition, the location of the proposed 345kV reactor will interfere with a main cable trench and access road. The provided plot plan incorrectly shows the location of the existing Y49 line exit. Therefore, the proposed 345 kV reactor (T048, T053) will extend further to the west than shown. As a result, it may not fit within the fenced area of the substation. this reactor would also be installed under the double circuit overhead (Lines 361 and 362), distribution, and communication circuits.

4.12.5. Farragut Substation

- LS Power:
The existing Farragut substation was not impacted by the LS Power proposal.
- NextEra:
The existing Farragut substation is not impacted by proposals T036 and T040-T042. However, all other NextEra proposals show a proposed 345 kV BAAH GIS being built on a platform that is situated over the East River. The review team concluded that the proposed design presents a major concern that trying to build on this site, extending into the East River, could present significant constructability and permitting challenges.
- Propel NY:
The existing Farragut substation was not impacted by the Propel NY proposals.

4.12.6. Jamaica Substation:


- LS Power:
The existing Jamaica substation was not impacted by the LS Power proposal.

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- NextEra:**

NextEra’s proposals T036-T044 show a proposed 138 kV circuit breaker and associated GIB being installed on the roof of an existing building with other electrical equipment. Though there is existing equipment currently installed on the roof of this building, the review team is concerned that the existing building/roof may not be able to support this additional equipment and costly reinforcement will be required. The design also violates Con Edison’s design principles 2, 3 and 5. Specifically, the site visit revealed that breakers 6 and 8 are located across from each other and share the same cross bus to tie to the main bus. Therefore, there is not adequate space to add an additional breaker and line terminal at this location as shown on the proposed plot plan. Further, the proposed modifications to the plot plan do not show the equipment being tied to the correct electrical location. The proposed plan shows the transmission is to be routed down the side of the building. However, there is an access door to the building, a concrete block building for the station’s deluge system, and other conduits and equipment mounted on the outside wall that will interfere with the installation of the transmission cable. The most likely means for mitigation would be to build a facility on an adjacent property.
- Propel NY:**

Propel NY’s proposals T048 and T053 require forced cooling to be added to the lines to increase their capability. However, the required cooling equipment is not shown on the substation plans, and there may not be adequate space at Jamaica station to add the required equipment.


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4.12.7. Millwood Substation:

- LS Power:**
 LS Power's proposal at Millwood is to build a 345 kV GIS and HVDC station, called Northgate substation, adjacent to the existing Millwood substation. Based on views from Google Earth imagery, there appears to be solid rock to the north of the existing Millwood substation where the proposed station is to be built. Costs for rock removal and driveway have been included in the independent estimate to address constructability issues. The site visit determined that access within the ROW will be a major issue as an existing 345 kV line crosses the existing access road and the two lines are very low. Moreover, there are concrete blocks blocking the ROW with no access for vehicles. Both of the two Millwood — Buchanan and Millwood — Pleasant Valley lines exit the Millwood substation on double circuit poles. In order to tie these into the proposed Northgate GIS, extended outages of the doublecircuit lines would be required.
- NextEra:**
 The existing Millwood substation was not impacted by the NextEra proposals.
- Propel NY:**
 The existing Millwood substation was not impacted by the Propel NY proposals.

4.12.8. Newbridge Road Substation:


- LS Power:**
 The existing Newbridge substation was not impacted by the LS Power proposal.
- NextEra:**
 NextEra's proposals T036-T044 show an existing 138 kV bay being removed and a 345 kV BAAH GIS being built in the northwest corner within the existing fenced area. The review team noted that this work would require long-term outages of the 345/138 kV transformers and distribution transformer. The site visit revealed that this bay area is elevated approximately 10' above the rest of the station. The proposed GIS building extends beyond this elevated area requiring additional grading and a retaining wall. Also, the GIS building will interfere with an existing oil pump building and an underground oil tank.

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- Propel NY:
Propel NY proposals T047, T049, T051, and T052 show the replacement of existing circuit breaker 1460 with two PASS circuit breakers, which is intended to provide for a stuck breaker contingency for Lines 465 and 461. During the site visit, the review team determined that there are two underground cables (Lines 463 and 465) crossing this area that may interfere with the breaker's foundation.

4.12.9. Northport Substation:


- LS Power:
The existing Northport substation was not impacted by the LS Power proposal.
- NextEra:
Northport substation is not impacted by proposals T036 and T037. However, all of NextEra's other proposals propose to retire an existing 138 kV circuit breaker for Line 672 and to construct a 138 kV BAAH GIS on utility property southeast of the existing yard. Also, for proposals T038-T040, NextEra proposes to install two 345/138 kV transformers and a reactor to the northwest of the existing substation. Instead of the two 345/138 kV transformers, proposals T041-T044 propose a HVDC station. A concern with the HVDC installation is that there is no design showing how the three 138 kV lines from the GIS will be tied together to connect to the HVDC system. The independent estimate includes allowance for a new ring bus. The underground cables running the length of the existing substation from the proposed transformers to the proposed GIS will be crossing several 12'-16' deep tunnels that run from the plant to the discharge area across the substation. Some tunnels are located only 5'-6' below grade. These may cause interference with installing the proposed cables.

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- Propel NY:
Propel proposals T047-T049 and T052 do not impact the existing Northport substation. However, proposal T051 proposes to relocate the existing 138 kV circuit breaker 1460 and install a 138 kV PAR and two PASS breakers at the south end of the existing substation extending into the existing parking lot. Project T053 proposes a 345-138kV BAAH GIS on utility property south of the existing substation and a HVDC station on utility property which is southwest of the existing substation. The site visit revealed that the site proposed for the HVDC is an active oil tank farm used as a back-up source for the power plant. Therefore, the review team has concluded that this site is not available. It will be difficult to install the new 138 kV underground cables running to the proposed PAR since it will cross several 12'-16' deep tunnels that run from the plant to the discharge area. Some tunnels are only 5'-6' below grade. Also, the underground termination would be installed next to breaker 1450, which is the location of one of the tunnels.

4.12.10. Rainey Substation:

- LS Power:
The existing Rainey substation was not impacted by the LS Power proposal.
- NextEra:
NextEra's proposals T036-T044 propose a 345 kV BAAH GIS adjacent to the existing Rainey substation. Based on the NextEra's one-line diagrams, the intertie locations going back to the existing Rainey substation would resolve the stuck break contingency for breaker 1E. The site visit revealed that there is insufficient space to install line terminations between breakers 1E and 2E or between breakers 1W and 2W. There are also several interferences for routing the underground cable through the yard to the proposed GIS, such as three tunnels running between Rainey and Ravenswood Plant, oil containment, and cable trenches. Con Edison is also in the process of installing a transformer, PAR, and line terminal—all of which would interfere with the proposed cables from the Rainey yard to the GIS.
- Propel NY:
Propel NY proposals T047, T049, T051, and T052 show the replacement of existing circuit breakers 1E and 6E with four new PASS circuit breakers, which resolves the stuck breaker contingency for both breakers. Proposals T048 and T053 show the

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replacement of only circuit breaker 1E with two new PASS circuit breakers, which would resolve the stuck breaker contingency for this breaker alone.


4.12.11. Ruland Road Substation:

- LS Power:

LS Power's proposal is to build a 345 kV GIS and HVDC station, called Southgate, adjacent to the existing Ruland Rd substation. Their proposal also includes a 138 kV two-bay BAAH AIS to the west side of the 138 kV existing substation on existing utility property. The site visit revealed that the two proposed 138 kV bay additions will interfere with an overhead 138 kV strain bus to banks #2 and #4, an overhead 69kV line running from the 69 kV yard to air core reactors located in the 138 kV yard, and an underground 138 kV cable (Line 567). Also, the plot plan shows the underground connection between the proposed Southgate to Ruland Rd terminating in the incorrect line terminal position.

- NextEra:

NextEra's proposals T036 and T039-T042 propose a 138 kV BAAH GIS being built on adjacent property to the northeast of the existing substation. The projects also propose an AIS bus arrangement with two 345/138 kV transformers and a 345 kV shunt reactor east of the GIS. Proposals T037, T038, T043, and T044 show these same facilities and a similar configuration with the addition of a 345 kV PAR. None of these proposed designs, however, address how the transmission lines are being transitioned to the 138 kV GIS switchgear. Based on feedback from a manufacturer, the proposed size of the PAR cannot be manufactured. Accordingly, the PARs would need to be either two three-phase units or three single-phase units. The site visit revealed that there is insufficient space to add a breaker and line terminal position between breaker 1420 and the main bus. Major modifications to the existing infrastructure would be required to accommodate this installation.

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- Propel NY:

Propel NY proposals T047-T049 and T051-T053 propose a 345-138 kV ring bus AIS on adjacent property to the northeast of the existing substation. All substation arrangements for the projects are similar except for the number of circuit breakers and PARs. The proposed layouts do not affect the existing 69 kV and 138 kV transmission lines.

4.12.12. Shore Road Substation

- LS Power:

The existing Shore Rd substation was not impacted by the LS Power proposal.

- NextEra:

NextEra proposals T036-T044 propose to install a 138 kV 250MVAR reactor and circuit breaker to the existing bus arrangement between existing circuit breakers 1350 and 1360. There is space available in the 138 kV yard for the equipment.

- Propel NY:

Propel proposals T047, T049, T051, and T052 propose a 345 kV and 138 kV ring bus GIS on an adjacent property to the west of the existing Shore Road substation. The projects' arrangements are similar except for the number of circuit breakers and reactors. Proposals T048 and T053 propose a transition station on the same parcel of land as all of the other Propel proposals. All proposals also propose replacement of the 138 kV circuit breaker 1380 and a tie position to the proposed 345 kV GIS.


4.12.13. Sprain Brook Substation

- LS Power:

The existing Sprain Brook substation was not impacted by the LS Power proposal.

- NextEra:

NextEra proposals T036-T044 propose an AIS bay at the eastern and western sides of existing Sprain Brook substation. The proposed addition to the western side of the station is within the existing fenced area in an open bay position. However, the addition to the eastern side would require an expansion of the substation in that direction, as well as purchasing of additional property. This proposal presents a major concern because the slope of the terrain in this area drops off significantly from approximately 60 feet at the southern end of the substation to approximately


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90 feet at the northern end of the proposed work area. It has been estimated that a retaining wall system would need to be installed of approximately 1,400 feet long and approximately 60 feet at the south end, while increasing in height heading north to approximately 90 feet tall where NextEra shows the reactor installation. It is also unknown whether a retaining wall of this size could be constructed at this location since it would be within close proximity to a residential neighborhood and access is limited. The installation of a retaining wall requires removal of existing vegetation, is expected to cause significant visual impact and permitting concerns. The site visit revealed that there are rock outcroppings and a significant drop in elevation along the eastern and western side of the substation, which will make it difficult to route an underground line as proposed.

- Propel NY:
Propel NY proposals T047-T049 and T051-T053 show an AIS bay addition at the western side of the existing Sprain Brook substation within the fenced area in an open bay position. They also show the addition of a 345 kV reactor with associated breaker and switches to the north of the existing substation on existing utility property. Proposal T053 also proposes HVDC facilities on property adjacent to the substation. The site visit revealed that there are rock outcroppings and a significant drop in elevation along the eastern and western side of the substation which will make it difficult to route an underground line as proposed. It is anticipated that approximately 90% of the site for the HVDC facilities could encounter rock during excavation and the site might require extensive slope protection. This could have high cost and schedule impact depending on volume of rock excavation and methods used (i.e., blasting likely not allowed in this area)

4.12.14. Tremont Substation


- LS Power:
The existing Tremont substation is not impacted by the LS Power proposal.
- NextEra:
The existing Tremont substation is not impacted by the NextEra proposals.
- Propel NY:
Propel proposals T047-T049 and T051-T053 identified, as potential NUF, a 6-breaker ring bus GIS at the southeastern side of the existing Tremont substation as well as

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the installation of a new control house within the fenced area. While the actual design of the interconnection at the Tremont substation is subject to the Transmission Interconnection Procedures, the review team observed, during the site visit, that the proposed GIS equipment is to be installed at the location of the existing bus connections between Bank 1 and 2 and the tie to the 345 kV X28 line to Sprain Brook. Although drawings are not available to confirm the way the cable termination is installed, it appears the X28 cable runs north under the 345 kV bus work. Therefore, it would cause an interference with the installation of the proposed GIS foundations. Also, the proposed location for the equipment and the new control house would cut off Con Edison's access on the east and north side of the substation. Possible mitigation for these issues would be the yard could be expanded towards the east with the GIS installed in the existing parking lot and access to the substation on the north side of the substation. However, there is a change in elevation and a retaining wall that would need to be addressed through the design of the NUF in the Transmission Interconnection Procedures.

4.12.15. Valley Stream Substation

- LS Power:
The existing Valley Stream substation was not impacted by the LS Power proposal.
- NextEra:
NextEra proposals T036-T044 propose a 345 kV BAAH GIS along with three 345 kV reactors being built at a location across the street and southwest of the existing 138 kV substation. The projects also show three 345/138 kV transformers being installed on commercial property south of the existing substation as well. The site visit revealed that there is insufficient space to add a breaker and line terminal position between breakers 1430 and 1450 as proposed. Major modifications to the existing infrastructure would be required to accommodate this installation. Also, an existing oil pump building would need to be relocated.
- Propel NY:
Valley Stream substation is not impacted by the Propel NY proposals except for transmission work associated with relay upgrades and possible retirement of circuit portions for 901 circuit (T053).


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4.13. Design Verifications – Transmission Lines

Based on a review of the technical materials provided by the Developers, several observations and conclusions can be made regarding the proposed transmission lines. The following summarizes a high-level look at the important aspects of proposed designs.


4.13.1. Proposed T-Line Cable Designs

The following tables show the transmission line cable designs proposed by each Developer. Please note that the names of the substation facilities in the table do not indicate the characterization of the facility listed in the “Characterization of Project Facilities” document posted by NYISO on June 1, 2022.


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Transmission Line and Cable Information for Proposed Projects


PROPOSAL		LINE DESCRIPTION (SUBSTATION TO SUBSTATION)		Line Length	Total Line Length	VOLTAGE	NO. OF CKT	CONDUCTOR	
				(Miles)	(Miles)	(KV)	#	TYPE	NO/PH
LS Power	T035	Longshore - Southgate	Underground	21.0	21.0	345	3	4000kcmil XLPE	1
		Southgate - Northgate HVDC	Underground	29.0	45.0	400	3	5000kcmil XLPE	1
			Submarine	16.0				5000kcmil DC	2/Ckt
NextEra	T036 (Core1)	New East Garden City - Sprain Brook	Underground	19.0	27.7	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - Dunwoodie	Underground	18.7	27.4	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New Ruland Rd - Sprain Brook	Underground	24.4	33.1	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - New Valley Stream	Underground	7.1	7.1	345	3	5000kcmil XLPE	1
	T037 (Core2)	New East Garden City - New Bridge Rd	Underground	3.8	3.8	345	2	5000kcmil XLPE	1
			Underground	11.6		138	1	5000kcmil XLPE	1
		New East Garden City - Sprain Brook	Underground	19.0	27.7	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - Dunwoodie	Underground	18.7	27.4	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New Ruland Rd - Sprain Brook	Underground	24.4	33.1	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - New Valley Stream	Underground	7.1	7.1	345	3	5000kcmil XLPE	1
		New East Garden City - New Bridge Rd	Underground	3.8	3.8	345	2	5000kcmil XLPE	1
	T038 (Core3)	New East Garden City - Jamaica	Underground	11.6	11.6	138	1	5000kcmil XLPE	1
		New East Garden City - New Farragut	Underground	21.7	21.7	345	1	5000kcmil XLPE	1
		New East Garden City - Sprain Brook	Underground	19.0	27.7	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - New Valley Stream	Underground	8.2	33.6	345	1	5000kcmil XLPE	1
			Submarine	25.4		345	1	1600mm ² XLPE	2
		New Ruland Rd - Sprain Brook	Underground	24.4	33.1	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - New Valley Stream	Underground	7.1	7.1	345	3	5000kcmil XLPE	1
		New East Garden City - New Bridge Rd	Underground	3.8	3.8	345	2	5000kcmil XLPE	1
		New East Garden City - Jamaica	Underground	11.6	11.6	138	1	5000kcmil XLPE	1
		New East Garden City - New Farragut	Underground	21.7	21.7	345	1	5000kcmil XLPE	1
		New Northport - Pilgrim	Underground	8.4	8.4	138	1	5000kcmil XLPE	1

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				(Miles)	(Miles)	(KV)	#	TYPE	NO/ PH
NextEra	T039 (Core4)	New East Garden City - Sprain Brook	Underground	19.0	27.7	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - New Dunwoodie	Underground	8.2	33.6	345	1	5000kcmil XLPE	1
			Submarine	25.4		345	1	1600mm ² XLPE	2
		New Ruland Rd - Sprain Brook	Underground	24.4	33.1	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New Farragut - Sprain Brook	Underground	3.2	24.9	345	1	5000kcmil XLPE	1
			Submarine	21.7		345	1	1600mm ² XLPE	2
		New East Garden City - New Valley Stream	Underground	7.1	7.1	345	3	5000kcmil XLPE	1
		New East Garden City - New Bridge Rd	Underground	3.8	3.8	345	2	5000kcmil XLPE	1
	T040 (Core5)	New East Garden City - Jamaica	Underground	11.6	11.6	138	1	5000kcmil XLPE	1
		New Northport - Pilgrim	Underground	8.4	8.4	138	1	5000kcmil XLPE	1
		New East Garden City - Sprain Brook	Underground	19.0	27.7	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New Northport- New Dunwoodie	Underground	8.2	33.6	345	1	5000kcmil XLPE	1
			Submarine	25.4		345	1	1600mm ² XLPE	2
		New Ruland Rd - Sprain Brook	Underground	24.4	33.1	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - New Valley Stream	Underground	7.1	7.1	345	3	5000kcmil XLPE	1
		New East Garden City - New Bridge Rd	Underground	3.8	3.8	345	2	5000kcmil XLPE	1
	T041 (Core6)	New East Garden City - Jamaica	Underground	11.6	11.6	138	1	5000kcmil XLPE	1
		New East Garden City - Dunwoodie	Underground	18.7	27.4	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New Ruland Rd - Sprain Brook	Underground	24.4	33.1	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - New Valley Stream	Underground	7.1	7.1	345	3	5000kcmil XLPE	1
		New East Garden City - New Bridge Rd	Underground	3.8	3.8	345	2	5000kcmil XLPE	1
		New East Garden City - Jamaica	Underground	11.6	11.6	138	1	5000kcmil XLPE	1
		New Northport - Pilgrim	Underground	8.4	8.4	138	1	5000kcmil XLPE	1
		New Northport HVDC - New Sprain Brook HVDC	Underground	8.5	33.9	320	1	1200 MW Symmetrical	1
			Submarine	25.4					

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				(Miles)	(Miles)	(KV)	#	TYPE	NO/ PH
NextEra	T042 (Core7)	New East Garden City - Dunwoodie	Underground	18.7	27.4	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New Ruland Rd - Sprain Brook	Underground	24.4	33.1	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - New Valley Stream	Underground	7.1	7.1	345	3	5000kcmil XLPE	1
		New East Garden City - New Bridge Rd	Underground	3.8	3.8	345	2	5000kcmil XLPE	1
		New East Garden City - Jamaica	Underground	11.6	11.6	138	1	5000kcmil XLPE	1
		New Northport - Pilgrim	Underground	8.4	8.4	138	1	5000kcmil XLPE	1
		New Northport HVDC - New Sprain Brook HVDC	Underground	8.5	33.9	320	1	1200 MW Symmetrical	1
			Submarine	25.4					
		Hudson South (OSW Platform #1 and #2) - Buchanan HVDC	Underground	1.5	122.5	320	2	1200 MW Symmetrical	1
			Submarine	121.0					
	T043 (En-hance1)	New East Garden City - Sprain Brook	Underground	19.0	27.7	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - Dunwoodie	Underground	18.7	27.4	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New Ruland Rd - Sprain Brook	Underground	24.4	33.1	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New Farragut - Sprain Brook	Underground	3.2	24.9	345	1	5000kcmil XLPE	1
			Submarine	21.7		345	1	1600mm ² XLPE	2
		New East Garden City - New Valley Stream	Underground	7.1	7.1	345	3	5000kcmil XLPE	1
		New East Garden City - New Bridge Rd	Underground	3.8	3.8	345	2	5000kcmil XLPE	1
		New East Garden City - Jamaica	Underground	11.6	11.6	138	1	5000kcmil XLPE	1
		New Farragut - New East Garden City	Underground	21.7	21.7	345	1	5000kcmil XLPE	1
		New Northport - Pilgrim	Underground	8.4	8.4	138	1	5000kcmil XLPE	1
		New Holbrook - Pilgrim	Underground	11.7	11.7	138	1	5000kcmil XLPE	1
		New Northport HVDC - New Sprain Brook HVDC	Underground	8.5	33.9	320	1	1200 MW Symmetrical	1
			Submarine	25.4		Monopole			
		New Barrett HVDC - New Buchanan HVDC	Underground	4.6	78.2	320	1	1200 MW Symmetrical	1
			Submarine	73.6		Monopole			

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				(Miles)	(Miles)	(KV)	#	TYPE	NO/PH
NextEra	T044 (Enhance2)	New East Garden City - Sprain Brook	Underground	19.0	27.7	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New East Garden City - Dunwoodie	Underground	18.7	27.4	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New Ruland Rd - Sprain Brook	Underground	24.4	33.1	345	1	5000kcmil XLPE	1
			Submarine	8.7		345	1	1600mm ² XLPE	2
		New Farragut - Sprain Brook	Underground	3.2	24.9	345	1	5000kcmil XLPE	1
			Submarine	21.7		345	1	1600mm ² XLPE	2
		New East Garden City - New Valley Stream	Underground	7.1	7.1	345	3	5000kcmil XLPE	1
		New East Garden City - New Bridge Rd	Underground	3.8	3.8	345	2	5000kcmil XLPE	1
		New East Garden City - Jamaica	Underground	11.6	11.6	138	1	5000kcmil XLPE	1
		New Farragut - New East Garden City	Underground	21.7	21.7	345	1	5000kcmil XLPE	1
		New Northport - Pilgrim	Underground	8.4	8.4	138	1	5000kcmil XLPE	1
		New Holbrook - Pilgrim	Underground	11.7	11.7	138	1	5000kcmil XLPE	1
		New Jamaica - Corona	Underground	5.9	5.9	138	1	5000kcmil XLPE	1
		New Northport HVDC - New Sprain Brook HVDC	Underground	8.5	33.9	320	1	1200 MW Symmetrical Monopole	1
			Submarine	25.4					
		Hudson South (OSW Platform #1 and #2) - Buchanan HVDC	Underground	1.5	122.5	320	2	1200 MW Symmetrical Monopole	1
			Submarine	121.0					
Propel NY	T047 (BS1)	Barrett to East Garden City	Underground	8.8	8.8	345	1	4000kcmil XLPE	1
		East Garden City to Tremont	Underground	23.5	23.5	345	1	4000kcmil XLPE	1
		Ruland Road to East Garden City (Upgrade)	Underground	0.6	0.6	345	1	4000kcmil XLPE	1
		East Garden City to Shore Road	Underground	10.3	10.3	345	1	4000kcmil XLPE	1
		Ruland Road to Shore Road	Underground	17.8	17.8	345	1	4000kcmil XLPE	1
		Shore Rd - New Rochelle - Sprain Brook	Submarine	10.2	18.3	345	1	1400mm ² XLPE	2
	T048 (BS2)		Underground	8.1				4000kcmil XLPE	1
		Barett to Tremont	Underground	25.7	25.7	345	1	4000kcmil XLPE	1
		Syosset to Shore Road	Underground	11.3	11.3	138	1	4000kcmil XLPE	1
		Ruland Road to Shore Road	Underground	17.8	17.8	345	1	4000kcmil XLPE	1
		Shore Rd - New Rochelle - Sprain Brook	Submarine	10.2	18.3	345	1	1400mm ² XLPE	2
			Underground	8.1				4000kcmil XLPE	1
		Lake Success - Jamaica (uprate	Underground	11.0	11.0	138	1	4000kcmil XLPE	1

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				(Miles)	(Miles)	(KV)	#	TYPE	NO/PH
Propel NY	T049 (BS3)	Barrett to East Garden City	Underground	8.8	8.8	345	2	4000kcmil XLPE	1
		East Garden City to Tremont	Underground	23.5	23.5	345	1	4000kcmil XLPE	1
		Ruland Road to East Garden City (Upgrade)	Underground	0.6	0.6	345	1	4000kcmil XLPE	1
		East Garden City to Shore Road	Underground	10.3	10.3	345	1	4000kcmil XLPE	1
		East Garden City to Shore Road	Underground	10.3	10.3	138	1	4000kcmil XLPE	1
		Ruland Road to Shore Road	Underground	17.8	17.8	345	1	4000kcmil XLPE	1
		Shore Rd - New Rochelle -Sprain Brook	Submarine	10.2	18.3	345	1	1400mm2 XLPE	2
			Underground	8.1				4000kcmil XLPE	1
	T051 (AS5)	Barrett to East Garden City (SCT)	Underground	8.8	8.8	345	1	4000kcmil XLPE	1
		East Garden City to Tremont	Underground	23.3	23.3	345	1	4000kcmil XLPE	1
		Ruland Road to East Garden City (Upgrade)	Underground	0.6	0.6	345	1	4000kcmil XLPE	1
		East Garden City to Shore Road (SCT)	Underground	10.3	10.3	345	1	4000kcmil XLPE	1
		Ruland Road to Shore Road	Underground	17.8	17.8	345	1	4000kcmil XLPE	1
		Shore Rd - New Rochelle -Sprain Brook	Submarine	10.2	18.3	345	2	1400mm2 XLPE	2
			Underground	8.1				4000kcmil XLPE	1
		Syosset to Shore Road (SCT)	Underground	11.3	11.3	138	1	4000kcmil XLPE	1
		Syosset to Greenlawn and	Underground	2.6	2.6	138	1	4000kcmil XLPE	1
	T052 (AS6)	Barrett to East Garden City (345)	Underground	8.8	8.8	345	1	4000kcmil XLPE	1
		East Garden City to Tremont (345 SCT)	Underground	23.5	23.5	345	1	4000kcmil XLPE	1
		East Garden City to Shore Road (345 SCT)	Underground	10.3	10.3	345	1	4000kcmil XLPE	1
		Ruland Road to Shore Road (345)	Underground	17.8	17.8	345	1	4000kcmil XLPE	1
		Shore Rd - New Rochelle -Sprain Brook	Submarine	10.2	18.3	345	1	1400mm2 XLPE	2
			Underground	8.1				4000kcmil XLPE	1
		Syosset to Shore Road (138 SCT)	Underground	11.3	11.3	138	1	4000kcmil XLPE	1
		Syosset to Greenlawn and	Underground	2.6	2.6	138	1	4000kcmil XLPE	1
		Eastern Queens - East Garden	Underground	11.7	11.7	345	2	4000kcmil XLPE	1
		Eastern Queens - Dunwoodie	Underground	21.0	21.0	345	1	4000kcmil XLPE	1
		901 Intercept to Eastern Queens	Underground	0.5	0.5	138	1	4000kcmil XLPE	1
		903 Intercept to Eastern Queens	Underground	2.0	2.0	138	1	4000kcmil XLPE	1
		901-Eastern Queens to Valley	Underground	6.0	6.0	138	1	4000kcmil XLPE	1
		Lake Success - Jamaica (uprate)	Underground	11.0	11.0	138	1	4000kcmil XLPE	1
	T053 (AS7)	Ruland Road to East Garden City (Upgrade)	Underground	0.6	0.6	345	1	4000kcmil XLPE	1
		Barett to Tremont (345 SCT)	Underground	25.7	25.7	345	1	4000kcmil XLPE	1
		Syosset to Shore Road (138 SCT)	Underground	11.3	11.3	138	1	4000kcmil XLPE	1
		Ruland Road to Shore Road (345)	Underground	17.8	17.8	345	1	4000kcmil XLPE	1
		Shore Rd - New Rochelle -Sprain Brook	Submarine	10.2	18.3	345	1	1400mm2 XLPE	2
			Underground	8.1				4000kcmil XLPE	1
		Barrett to Eastern Queens (345)	Underground	11.0	11.0	345	2	4000kcmil XLPE	1
		Eastern Queens (Brinkerhoff) to	Underground	21.0	21.0	345	1	4000kcmil XLPE	1
		Northport - New Rochelle - Sprain Brook HVDC	Submarine	26.0	34.1	320	1	5900kcmil XLPE	1
			Underground	8.1				5900kcmil XLPE	1
		901 Intercept to Eastern Queens	Underground	0.5	0.5	138	1	4000kcmil XLPE	1
		903 Intercept to Eastern Queens	Underground	2.0	2.0	138	1	4000kcmil XLPE	1
		901-Eastern Queens to Valley	Underground	6.0	6.0	138	1	4000kcmil XLPE	1
		Lake Success - Jamaica (uprate)	Underground	11.0	11.0	138	1	4000kcmil XLPE	1

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4.13.2. Proposed Corridors


All the transmission line proposals primarily utilize existing public roadways for underground terrestrial cables and cross waterways utilizing submarine cables. There are few locations where the transmission lines pass through private and incumbent utility real property. The summary of the real estate details the number of private and incumbent utility parcels, total acres, and estimated cost are shown in Section 4.6.2 above. Construction concerns for each of the proposals are identified in the field reports.

The review identified a significant concern regarding the transitions from land cables to submarine cables, especially where multiple cables are used per phase.

LS Power: LS Power has described using two-conductor per circuit submarine cable (5000 kcmil DC) with the same number of cables per circuit used on land sections (5000 kcmil DC). Where the submarine cable transitions to land cable, matching the number of cables permits that the cables can be transitioned between submarine and land utilizing direct-buried joint bays without having above-ground transition substations.

NextEra: There are some significant impacts from the Developer's plan to use two three-core submarine cables (1600 mm²) resulting in two conductors per phase connecting to a single land cable (5000 kcmil) per phase in the areas where the cables transition from submarine to land in New Rochelle (Davenport Park) and Long Island (Tappen beach). Based on our assessment, above-ground transition stations will be required at both transition zones, requiring sizeable permanent above-ground substations that are expected to impact the park on the west and beach area on the east. This increases the risks associated with the conceptual viability of NextEra's design.

Propel NY: The Propel NY proposals indicate submarine cables will transition to land cables using direct-buried joint bays. This requires that there are the same number of conductors on land as there are in the submarine for some distance and then utilize above-ground substations to transition from two cables per phase to a single cable per phase. The description suggests there are two conductors (1400mm²) / phase for the submarine and one conductor (4000kcmil or 5000kcmil) / phase on land. This appears to be done in consideration for visual impact.

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4.13.3. Cable Technologies

All the cable types and applications offered by the Developers have technical viability from the standpoint of available cable technology based on the assumptions stated by the respective Developers. The review of the technical viability of the proposed cable systems recognizes that none of the Developers have done a detailed design that encompasses the nuances of the routes.

4.13.4. EMF

The NYPSC policy limits the electrical and magnetic fields produced by a transmission line. The maximum limits at the edge of the ROW for the electrical field is 1.6 kilovolts per meter (kV/m)¹ and for the magnetic field is 200 milligauss (mG)².

This NYPSC policy was written for overhead line, and the NYPSC has not modified its 1990 interim standard to specify ROWs widths for underground circuits when calculating EMF levels.


However, in PSEG-LI's recent Western Nassau 138 kV underground transmission project, the Article VII Order issued on September 19, 2019 (Case No. 17-T-0752), the Commission accepted the EMF study that demonstrated compliance with its magnetic field of 200 milligauss or less at the edge of the ROW calculated using 25 feet on either side of the conductor centerline.

The review team did not perform detailed EMF calculations. However, Electrical Consulting Engineers completed a screening of the EMF levels and found all circuits to be within the levels specified for the project in Case No. 17-T-0752.

Calculations provided by the Developers are preliminary in nature and will have to be confirmed during detailed engineering design. A detailed engineering design would require several investigations that have not yet been performed including comprehensive survey, route agreement with stakeholders along a route that has not yet been permitted or approved, test pits to locate existing underground utilities, and obstructions that could impact final route selection and duct bank design. The findings might result in design modifications regarding burial depth or duct bank design.

¹ The applicable electric field strength standards established by the PSC are set forth in Opinion No. 78-13 (issued June 19, 1978).

² The magnetic field standards established by the PSC are set forth in the PSC's Interim Policy Statement on Magnetic Fields, issued September 11, 1990. This statement also reaffirmed the electric field strength standards set in Opinion No. 78-13.


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4.13.5. Transmission Line Conductor Ampacity Ratings

Electrical Consulting Engineers' assessment of cable ratings discussed in this report are based on the respective installation design details provided by each of the developers along with knowledge of usual industry practices. In all cases, the respective developers did not appear to perform a thorough detailed design of the cable routes; this is not expected at this stage. A detailed engineering design would require several investigations that have not yet been performed including comprehensive survey, route agreement with stakeholders, soils investigations, test pits to locate existing underground utilities and obstructions that could impact final route selection or existing parallel or crossing power cables that could be affected by mutual heating, and route thermal survey along the route to characterize final design requirements, cable ampacity and cable selection. As this is the case, while developer has performed calculations, they are fundamentally categorized as "preliminary" because there are several activities yet to be completed before a detailed design is complete. Rating assessments were intended to generally verify that the developers' stated cable size would reasonably achieve the stated rating with some spare capacity considered to allow for factors that might reduce the ratings of the cables along the specific design route.

In most cases, the developers only provided generalized information about their cable designs and based on nominal trench conditions, but not detailed manufacturer's catalog cut sheets. Representative data and industry-accepted calculation methods for the respective cable types consistent with industry specifications and standards such as Association of Edison Illuminating Companies (AEIC), IEEE, ICEA, IEC, CIGRE and others was used. This is relevant for considering the electrical parameters, ratings, and other calculations. Given that only nominal or example installation configurations are described by the developers, it is conceivable that each developers' proposed route(s) will include sections that will have more severe limitations than the nominal conditions described in each developer's proposal.

The following table shows a summary of the proposed line lengths, conductor types and conductor ratings for each proposal. No significant concerns were identified with the proposed conductor types and sizes.

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4.13.6. Terrestrial and Submarine Cable Analysis


4.13.6.1. Transmission Line Crossings

The waters surrounding Long Island and New York City contain a large number of existing submarine linear infrastructure, including electric/telecommunication cables, pipelines, and vehicle/railway/subway tunnels. This infrastructure is owned by a combination of private companies, and public entities such as the Metropolitan Transportation Authority (MTA) and Port Authority of New York and New Jersey. Publicly available data from the Office of Coastal Management was used to assess crossings of navigation channels, anchorage areas, pipeline areas, and submarine cable areas. Also, publicly available data for tunnels including the Federal Railroad Administration (NJ Transit), US Census Bureau (Lincoln/Holland/Battery Tunnels), and NYC OpenData (NYC subways) were reviewed to identified potential crossings and interferences. The comparative assessment is intended to give a general order of magnitude of the number of crossings, and the specific number is subject to verification by the developer in a detailed assessment.

Crossing of linear infrastructure will likely require approvals from the asset owner, as crossing over an existing asset will impact the owner's ability to maintain and repair a given asset as well as potentially impacting the operational performance where a heat-producing cable crosses another cable system. Failure to receive permission to cross existing linear infrastructure has a potential to result in a specific submarine route not being feasible.

Routes that are within Lower/Upper New York Bay and within the Hudson River cross a large quantity of existing linear infrastructure. Within the East River at the south end of Manhattan before entering the Hudson River, the routes for proposals T039, T043, and T044 cross five Subway tunnels and the Hugh L Carey (Battery) Tunnel. Additionally, the East River has potential shallow bedrock and the tunnels in the East River are in some cases very old and shallow. This could add further complications to crossing these tunnels. If proper burial depths could not be reached while crossing, armoring of the lines could be logistically challenging given the age of some of the tunnels.

In the Hudson River, proposals T039, T042, T043, and T044 cross the Lincoln, Holland, NJ Transit, and multiple Port Authority Trans-Hudson (PATH) tunnels. Additionally, there are numerous pipelines and cables spanning from the Atlantic Ocean (*i.e.*, the New York Bight) all the way up the Hudson River that must be crossed by portions of these projects' routes.

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Further discussion and a table showing a breakdown of Tunnel, Cable, and Pipeline crossings are included in the environmental portion of this report including details of Navigation Channel and Anchorage Crossings.

4.13.6.2. Duct Banks and Manholes


LS Power's and Propel NY's duct bank cross-sectional drawings show no spare conduits, while NextEra included spare conduits in the duct bank.

Propel NY has proposed using conduits installed in granular backfill for areas on Long Island and New Rochelle but with concrete-encased conduits for areas in New York City. LS Power and NextEra proposed concrete-encased conduits. For the following reasons, the independent cost estimate for all projects assumed all conduit will be encased with concrete:

- Concrete encasement is often the standard of construction to minimize or avoid soil subsidence especially where construction will be near or under roadways that are critical infrastructure for the communities through which a new underground transmission circuit will be routed.
- Concrete encasement also provides a barrier to mechanical damage and dig-in in underground utility corridors where other existing underground facilities need to be maintained and future underground facilities could be constructed.
- Furthermore, concrete thermal backfills are known to provide consistent thermal properties over a wider range of moisture levels and, therefore, provide greater resiliency to variations in climate or weather that impact ground water levels and localized soil moisture content.
- Re-using spoils from underground construction also may require stockpiling the material and additional traffic impacts from hauling material between the construction localities or on site.

4.13.6.3. Terrestrial Cable Installations

All the projects propose installing underground transmission lines predominately within existing utility rights-of-way or public thoroughfares. Most of the terrestrial cable installation concerns relate to space constraints for the installation of major road

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crossings requiring Horizontal Directional Drilling (HDD) or Jack and Bore applications and traffic controls and are discussed in detail in the field review portion of this report.


The width of excavation and working space was considered in the field review including installing manholes, off-loading materials from transporting tractor and trailers, construction and installation vehicles accessing a work site, loading out excavated material, etc. Underground utilities that were visible from the route review were identified such as water, sewer, fiber, and gas, storm drains and any overhead obstructions they may present an issue with our preliminary review of the routes. A thorough investigation would need to be completed during detailed engineering using GPR, Pot holing, and availability of utility mapping.

A reliability concern can exist where multiple circuits are contained in the same duct bank. A “dig in” at a location can damage a duct bank and potentially cause an outage on more than one circuit. Some proposals have more multi circuit ducts than others. The Propel NY proposals have the least number of multiple circuits and include double trenches to minimize the amount of risk for this concern. Propel NY proposals T047 and T048 have no double circuit lines. Propel NY proposals T049 and T051 each have one double circuit line with a shared trench and T052 and T053 each have one double circuit line with separate trenches.

Terrestrial cable installations utilize methods including open-cut trenching, pipe-jacking (jack-and-bore), microtunneling, and HDD. Each method will have a corresponding risk and impact on factors such as traffic control, environmental impact, seasonal impact, and permitting. Other factors held constant, longer routes or multiple parallel routes will tend to have greater risk and longer project schedules than shorter routes.

4.13.6.4. Submarine Cable Installations

All the projects propose installing some submarine transmission lines of either HVDC or AC cables that route through the marine waters surrounding New York. The waterways that these cables could cross vary between proposals and include but are not limited to Long Island Sound, Atlantic Ocean, Lower New York Bay, Upper New York Bay, East River, and Hudson River. The proposed installation methods include jet trenching/plow, chain cut trenching, and HDD. When routing in the marine waters surrounding New York there are numerous resources and specially designated areas that must be crossed or routed

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adjacent to, including designated anchorage zones and navigation areas. Approaching or crossing these areas in some cases may have implications to a project's cost or timeline.


LS Power proposes single-conductor cable for their submarine installation whereas both NextEra and Propel NY propose multi-core cables (i.e., conductors wrapped together in a bundle). An advantage of using single-conductor cable for the submarine installation is that in the event of damage or failure, it may be possible to retrieve one phase without disturbing the other phases to make the repair.

It's a very difficult to estimate submarine cable installations without knowing the specifics of how the installation is planned and recognizing that the pricing may vary based on market conditions. Submarine cable installation utilizes specialized cable laying vessels. There are only a limited number of these vessels worldwide and some of the vessels are owned by individual cable manufacturers.

For example, cable laying vessels vary in capabilities and often several vessel types are needed to complete an installation depending on water depth, ground conditions, and debris removal requirements. In addition to the actual installations, they will also need to consider "ancillary" works (e.g., debris removal from the route, crossings of third-party assets, additional protection works such as rock dumping). All these activities are typically considered part of the installation and are often only included as a provisional sum at the bid stage, which is then amended, sometimes significantly, during contract execution. An additional risk exists where a proposed project route will cross an existing submarine facility due to potential permissions required for such crossings.

Once detailed design is completed a Developer will need to work with its supplier/installer and determine the best process for completing the installation. Submarine cable installation concerns apply to all the proposals.

Submarine cables eventually need to reach shore and often require some form of transition to land-based (terrestrial) cable. This transition is required since cables installed in the submarine environment are constructed differently than terrestrial cables. Also, some Developers have indicated that multiple cables per phase will be required on the submarine portion as compared to the land portion. In such a case, some form of transition, usually an above-ground substation, will be required at landing points at both ends of the submarine cable.

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5 Attachments

5.1. Risk Register

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