For November 2, 2020 TPAS Recommendation
For November 12, 2020 OC Approval

Large Generating Facility - Interconnection System Reliability Impact Study Scope

Queue #1022: *EI Glenwood Landing* Project

1. Purpose

The purpose of this Interconnection System Reliability Impact Study ("SRIS" or "Study") is to evaluate the impact of the proposed interconnection of EI Glenwood Landing ("Project"), which is being developed by Equinor Wind US LLC ("Developer"), to the New York State Transmission System ("NYSTS"). The Study will be performed in accordance with Attachment X of the NYISO Open Access Transmission Tariff ("OATT").

The Project will be located in Nassau County, NY. The proposed Point of Interconnection ("POI") will be at the Long Island Power Authority ("LIPA") Shore Road 345 kV Substation. The Connecting Transmission Owner ("CTO") is LIPA.

The Project, as proposed, is a wind generation plant consisting of one hundred and fourteen (114) 12 MW offshore wind turbines. The Project will connect using two (2) 320 kV HVDC cables to an onshore converter station located close to the Shore Road 345 kV Substation. The Project is expected to have a maximum[1] potential generating capacity of 1,300 MW during summer and winter periods.

The Project has a proposed In-Service Date of December 2026, Initial Synchronization Date of March 2027 and Commercial Operation Date of November 2027.

The Project is mutually exclusive project to Q#1016, Q#1017, Q#1020, and Q#1021,which are also being developed by the Developer, and only two out of these five projects can move forward together to a Class Year Study.

The Study will assess the impact of the Project on the base case power system including ConEd as an Affected System. It will provide a list of the facilities (CTO Attachment Facilities and System Upgrade Facilities) required to reliably interconnect the Project, and non-binding good faith estimates of cost and time to construct those facilities.

The Study will be conducted in accordance with the Applicable Reliability Standards.

2. Interconnection Plan

[1] For temperature sensitive output projects, the MW values represent the Maximum Summer Peak Net Output that can be achieved between 85 and 95ºF, and the Maximum Winter Peak Net Output that can be achieved between 10 and 35ºF.

The Study will include a description of the proposed facilities and the conceptual design of the interconnection to the system representation. The description will include a breaker one-line diagram depicting the proposed facilities and their integration with the existing facilities.

3. Study Period

The study will be based on the updated NYISO Class Year 2019 ATBA base cases ("Base Cases") that have the 2019 FERC 715 2024 system representation. The Study will be conducted using the steady state, stability, and short circuit Base Cases provided by the NYISO, and will include the representation of proposed projects that have already been cost allocated, up to and including Class Year 2017 (as listed in Appendix A of this scope).

4. Study Area

The Study will identify and evaluate the impact of the Project on the 138 kV and above portions of the NYSTS in the in the following New York load zones: Zone **H** (**Millwood**), Zone **I** (**Dunwoodie**), Zone **J** (**NYC**), and Zone **K** (**Long Island**) that are most likely to be affected by the Project. The Study will also evaluate the impact of the Project on the local 138 kV and below system in the electrical proximity to the POI.

5. Base Case Conditions

The impact of the proposed Project will be evaluated for **summer peak** and **light load** cases for the following base case conditions, and as specified under the subsequent sections of this Scope:

Case 1 - Base Case without the Project. The Base Cases will include the baseline system and the proposed projects listed in Appendix A of this scope. The short circuit Base Case will model all the projects as in-service. The steady state Base Case will normally model all projects in-service and at full output, but may model some projects as out-of-service or less than full output as necessary to establish a feasible base dispatch. Generation will be dispatched in accordance with the NYISO Minimum Interconnection Standard.[2]

Case 2 - Case 1 with the Project modeled as in-service and in generating mode at full output. Unit and facility reactive resources for the Project will be represented. Generation will be re-dispatched in the steady state case, as needed, in accordance with the NYISO Minimum Interconnection Standard.

[2] As defined in the NYISO Transmission Expansion and Interconnection Manual (NYISO TEI Manual).

6. Analysis

Thermal, voltage, stability and short circuit analyses will be conducted to assess the performance of the base system conditions within the Study Area, with and without the Project, in accordance with Applicable Reliability Standards, guidelines and study practices. Modifications to Base Cases, during analyses, will be documented in the Study Report.

6.1 Steady State Analyses: N-0 and N-1

Thermal and voltage steady state analyses, using PSS/E or a comparable load flow program, will be conducted for **summer peak** and **light load** cases, pre-contingency and also for relevant Design Criteria Contingencies conditions, and will be limited to the Study Area.

Thermal limits will be assessed under both Normal Criteria and Emergency Criteria, using normal ratings pre-contingency and applicable post-contingency ratings (*e.g.*, Long-Term-Emergency, LTE, ratings or Short-Term-Emergency, STE, ratings).

Voltage limits will be assessed, pre- and post-contingency, using the applicable voltage limits.

6.2 Steady State Analyses: N-1-1

The Study will evaluate a limited selection of N-1-1 contingencies around the POI. Steady state (summer peak) steady-state analyses will be performed based on the N-1-1 contingency descriptions provided by the CTO(s) and/or the NYISO.

6.3 Bus Flow Analysis

Bus Flow Analysis, using PSS/E or a comparable load flow program, will be conducted for **summer peak** and **light load** cases, and will determine the thermal adequacy of the major existing and proposed equipment (bus work, circuit breakers and disconnect switches) at the POI station.

6.4 Transfer Assessments

The transfer assessment will determine the incremental impact of the project on the Normal and Emergency transfer limits of the LIPA Import interface (opened and closed definitions, as applicable) in accordance with Applicable Reliability Standards, Guidelines and NYISO study practices. The transfer limits will be evaluated in the predominant north-to-south direction, unless otherwise specified. Sufficient analyses will be conducted to determine the most limiting of the thermal, voltage, or stability limits under summer peak load conditions.

6.5 Extreme Contingency Assessment

The Study will evaluate the **summer peak** system performance under representative Extreme Contingencies within the Study Area, discuss significant steady-state and stability analyses, showing the post-fault conditions in the Study Area, and report on pre- and post-Project system response for the most severe contingencies, as specified in the NERC TPL-001-4 (nerc.com), the NPCC Directory # 1 (npcc.org), and also in the NYSRC Reliability Rules (nysrc.org).

6.6 NPCC A-10 Testing

The Study will review the NPCC Bulk Power System (BPS) classification of existing and proposed stations within the proximity of the Project to identify any existing or new stations that could be classified as BPS due to the addition of the Project. This testing will be performed for **summer peak** cases, and in accordance with the latest NPCC A-10 criteria (npcc.org).

6.7 Short Circuit Analysis

Short circuit analysis will be performed, using ASPEN, to evaluate the impact of the Project on system protection and adequacy of existing circuit breakers, other fault current interrupting devices, and related equipment. All Project impacts of 100 A or more will be identified.

This analysis will be performed in accordance with the NYISO Guideline for Fault Current Assessment (Attachment I of the NYISO Transmission Expansion and Interconnection Manual), and in accordance with Connecting Transmission Owner and Affected System(s) criteria, to the extent such criteria are recognized as Applicable Reliability Standards.

6.8 Stability Analysis

Stability analysis, using PSS/E v33, will be performed for **summer peak** and **light** load conditions to determine the impact of the Project on system performance within the Study Area. This analysis will evaluate the performance of the system for Design Criteria Contingencies and will address issues including, but not limited to, transient stability, dynamic stability (*i.e.*, damping), critical clearing time, coordination of protection and control systems, and performance of any Special Protection Systems that may be affected. These analyses will explicitly consider the voltage and frequency ride-through capabilities of the facility.

6.9 Reactive Power Capabilities

The reactive power capability of the Project will be verified to ensure it meets or exceeds the CTO's requirements over the full range of active power output and for the full range of Point of Interconnection bus voltage (0.95 - 1.05 p.u.). This verification shall be based on documentation which shall be provided by the Interconnection Customer, and shall consider the reactive gains and losses of all relevant plant equipment, including transformers, collector system cables, and interconnection cables, and shunt capacitor/reactors.

6.10 Minimum Short Circuit Ratio

Short circuit ratio will be calculated to determine the grid strength at the terminals of the equivalent inverter under normal and contingency conditions. The developer shall confirm that the project can reliably operate, without any form of instability, during the minimum short circuit system conditions identified in the study.

6.11 Voltage Deviation Analysis (Intermittency)

This analysis will consist of both the **summer peak** and the **light load** case. As guided by LIPA, a bus voltage deviation screening test will be performed, considering an appropriate voltage deviation threshold. Active power output from the Project shall be varied over the full range in load flow cases with transmission system capacitor bank status and generator commitment unchanged. Voltage shall be monitored at CTO's buses in the vicinity of the Project's POI, as well as the POI voltage. Any voltage regulation functions to be utilized by the Project will be modeled, including any regulation droop characteristics. The parameters of the voltage regulation function shall be documented.

6.12 Sub-Synchronous Torsional Interaction Screening

Using a short circuit analysis software, a screening study shall be performed to identify Unit Interaction Factors relating the degree of electrical coupling of the Project to synchronous generators interconnected with the LIPA transmission system. Third-level (N-3) contingency conditions shall be considered.

6.13 PARs Impacts

The Project's impact on the Y49, 901L/M, 903 Phase Angle Regulator ("PARs") schedule (the "LIPA Wheel"), and control ranges will be assessed and reported.

6.14 Preliminary Non-Binding Deliverability Analysis

As requested by the Developer, the Study will include a preliminary non-binding deliverability analysis performed under the NYISO Deliverability Interconnection Standard.

7. Modeling Assumptions

7.1 Phase angle regulators ("PARs"), switched shunts, and LTC transformers will be modeled as regulating pre-contingency and non-regulating post-contingency. The Study will use PAR schedules established by the NYISO in coordination with the neighboring ISOs through the NERC and NPCC base case development processes. PARs may be adjusted as necessary to relieve pre-contingency overloads.

7.2 SVC and FACTS devices will be set to zero pre-contingency and allowed to operate to full range post-contingency.

7.3 For evaluating projects located in Long Island (Zone K), the dynamic devices within Long Island area will be offline in both pre- and post- contingency conditions in steady state analysis, while set to zero at dynamic initialization.

8. Evaluation and Identification of Upgrades

If the Study results indicate that the Project, as proposed, would result in violations of Applicable Reliability Standards, analyses will be performed to identify any System Upgrade Facilities or Distribution Upgrades (if applicable) that would be required to meet the NYISO Minimum Interconnection Standard. When such upgrades are identified, sufficient re-assessments (among those identified in this scope) should be performed in order to assure that the upgrades do not cause any adverse reliability impact on the Study Area.

9. Cost Estimates of Facilities and Time to Construct

A description of facilities (*i.e.*, CTO Attachment Facilities and System Upgrade Facilities, if any) required to interconnect the Project to the NYSTS, or the Distribution System (if applicable), and non-binding good faith estimates of cost and time to construct those facilities, will be provided.

10. Report

The Study Report will document the summary of the results relevant to the project impacts, project description, project modeling, study assumptions, criteria and methodology, mitigation solutions and their impact assessment, and conclusions, for each of the analyses identified in this scope.

Appendix A

List of Other Proposed Projects to be Modeled in the Base Case

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Queue Pos.	Owner / Project Name	MW (S|W)
349	Taylor Biomass Energy, LLC / Taylor Biomass	19.0 | 22.5
387	Cassadaga Wind, LLC / Cassadaga Wind	126 | 126
393	NRG Energy, Inc. / Berrians East Repower	508 | 584
396	Baron Winds, LLC / Baron Winds	300 | 300
421	EDP Renewables NA/Arkwright Summit	78.4|78.4
422	NextEra Energy Resources, LLC Eight Point Wind Energy Center	101.2 | 101.2
505	Ball Hill Wind Energy, LLC / Ball Hill Wind	100 | 100
545A	Empire State Line Alternative	N/A
543	Segment B Knickerbocker - Pleasant Valley 345 kV	N/A
556	Segment A Double Circuit	N/A