POSEIDON TRANSMISSION 1, LLC
POSEIDON PROJECT

EXHIBIT E-4 – ENGINEERING JUSTIFICATION

PREPARED PURSUANT TO SECTION 88.4
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EXHIBIT E-4 – ENGINEERING JUSTIFICATION

E-4.1 Relation to Existing Networks

The Applicant has requested Firm Withdrawal Rights for 525 MW from PJM for the purposes of injecting 500 MW of power into the NYISO Zone K, specifically the Long Island Power Authority (LIPA) service territory. The Poseidon Project utilizes HVDC Light technology to provide capacity, energy and ancillary services to Zone K.

The point of withdrawal from PJM is the PSEG Deans 500kV Substation located in South Brunswick, Middlesex County, New Jersey. The HVDC Converter Station will be located on property immediately adjacent to the substation and will be connected to the 500kV bus via 3 phase 500kV AC cables which will be approximately 1,500 feet long. The Applicant has site control for the converter station property via a Purchase Option Agreement with the current owner.

The conversion from AC to DC will occur at the New Jersey Converter Station in preparation for delivery to Long Island via an HVDC Land and Submarine Cable Route. The DC power will be transmitted through 2 cables, a Plus (+) and Minus (-) at 200kV DC. The first portion of the route will be via municipal roads and ROW’s underground for a distance of approximately 21.6 miles where it will transform to a submarine cable system in route to Long Island (Zone K) for approximately 39.2 miles. On Long Island the HVDC Land Cable Route proceeds underground terminating at the New York Converter Station located on Ruland Road, Town of Huntington, Suffolk County and will be approximately 16.6 miles long. The Cable System will include 2 fiber optic cables for the purpose of monitoring the Converter Station and Cable System performance called SCADA (Supervisory Control and Acquisition of Data).

The HVDC power will be converted back 138 kV AC power at the New York Converter Station. The power will then be delivered to the LIPA 138kV Ruland Road Substation located approximately 3,000 feet from the Converter Station property. The Applicant has site control of the Converter Station property via a lease option agreement with the current owner. Delivery to the Ruland Road Substation will be provided by 2 three phase 138kV common circuit underground AC cables.

The diagram below (Figure E4-1) depicts the interconnection and its relationship to other transmission facilities. A detailed one line diagram (Figure E4-2) is also provided for the Long Island interconnection.

Details of the design and installation of the Converter Station equipment are provided in Exhibit E-2. The converter stations and cable systems will be designed, manufactured and installed by ABB Corporation (ABB). All structures will be constructed in accordance with the National Electric Safety Code and ANSI standards. AC interconnections will be designed and constructed under the direction of LIPA. Final details of the interconnections will be in accordance with the requirements of the NYISO System Reliability Impact Studies.

E-4.2 Reliability and Economic Benefits

The Converter Stations and Cables will be designed, manufactured, installed and tested by ABB. ABB has over 70 HVDC and HVDC Light installations worldwide including the 330 MW Cross Sound Cable project interconnecting NYISO’s Zone K with New England ISO which is currently in operation. Design of the project will meet or exceed all reliability, protection and control requirements and criteria of the Northeast Power Coordinating Council (NPCC), Mid Atlantic Coordinating Council (MACC), the NYISO, PJM and connected transmission owners. All critical auxiliary equipment, controls, protections, metering and communications will use redundant systems to maximize availability and reliability.

All Cables will be a combination of copper and aluminum conductor with solid dielectric XLPE insulation. Installation details are provided in Exhibit E-3.

The Cable System will be installed with fiber optic cable to provide constant monitoring of the systems operation. The fiber optic will detect potential failures before they occur by sensing heat and identifying...
failure locations. In the unlikely event a cable is damaged there are established procedures for emergency repair of the cable. Spare cable as well as converter station critical parts will be kept in inventory in both the Long Island and New Jersey Converter Station locations in support of emergency repairs.

Optimal interconnection points have been selected in both New Jersey and Long Island. The Deans 500kV substation provides energy for export from multiple sources, technologies and fuels and at a significant discount to Zone K energy prices. The details of the economics are provided in a Market Report provided in Exhibit 6.

On Long Island the Ruland Road 138kV substation is located in the heart of the Long Island Load Center as defined in LIPA’s Transmission & Distribution Planning Criteria and Guidelines:

The Long Island load center is defined as the Eastern Nassau and Western Suffolk area bounded by the Newbridge and Holbrook interfaces, where close to 50% of the LIPA system load is located. Noteworthy in this definition is the substation loads along the Route 110 corridor, in the Brentwood and in the Hauppauge Industrial Park area. Interface exports and imports are defined relative to the flow of energy to and from the load center (interface export is the flow into the load center; interface import is a flow out of the load center). The primary path for bulk power deliveries to LIPA’s load center is across three internal bulk transmission interfaces: Newbridge Road, Northport and Holbrook (Figure E4-3). These paths are used to deliver power from LIPA interconnections

The Ruland Road 138 kV substation is located in the Route 110 corridor referenced above and is optimally located for serving load on Long Island.

The HVDC Light process allows for precise control of the energy transfer with rapid response. The ramp rate capability for the Project will be approximately 50 MW/minute, significantly higher than conventional generation. Energy transfer has bi-directional capability although for this application unidirectional flow is only being considered from PJM to NYISO. It is a feature that may be considered at some point in the future. The HVDC conversion process prevents the transmission line from acting as a new path for short circuit duty between two AC systems, thereby reducing overload and transient impacts on the interconnected systems. HVDC Light offers significant reactive capability providing positive benefits by supplying voltage support. In addition HVDC Light provides black start capability in the event of system blackouts or large disruptions.

A submerged / underground cable interconnected with the adjacent PJM network will pose no new air emission sources, no water consumption or discharges, and less noise, traffic, neighborhood impacts, and land consumption, than new AC generation. The HVDC Light converter station technology requires a very small footprint and can be erected on less than 4 acres minimizing the impact on the surrounding community.

E-4.3 Date of Completion and Impact of Delay

The Applicant is a respondent to the NYPA “REQUEST FOR PROPOSALS No. Q13-5441LW CONTINGENCY PROCUREMENT OF GENERATION AND TRANSMISSION dated April 3, 2013. NYPA has specified a required in service date of June 2016. Delays in the in service date, if the Project is selected, will negatively impact NYPA’s contingency planning and delay the economic and reliability benefits described in this Exhibit and Exhibit 6.

1 LIPA Transmission & Distribution Planning Criteria and Guidelines.
E-4.4 System Impact Studies

The Applicant filed its Interconnection Request with the NYISO on April 27, 2011. A Feasibility Study was completed on September 10, 2012. A copy of the report and attachments are included in Appendix J. The study included steady state analysis (thermal loading and voltage) and short circuit analysis on the LIPA system (not including the PJM system). Analysis was performed on power flow and short circuit models with and without the Project in order to evaluate the Project’s impact on the LIPA transmission system at 69 kV and above.

The study shows that:

- Q363 does not cause new overloads or exacerbate existing overloads that cannot be managed through generation redispatch as allowed under the Minimum Interconnection Standard.
- Q363 does not cause new voltage violations or significantly exacerbate existing violations that cannot be managed through generation redispatch as allowed under the Minimum Interconnection Standard.
- The impact of Q363 on short circuit levels is not expected to require replacement of any circuit breakers.

Poseidon has filed a motion which seeks relief from certain filing requirements prescribed in 16 NYCRR § 88, including a request the requirement that the Application Include a copy of the System Reliability Impact Study in order to be deemed complete. Poseidon executed a System Reliability Impact Study Agreement (SRISA) with the NYISO in July 2013. The SRIS Scope was submitted to TPAS on August 5, 2013 and approved and subsequently submitted to the Operating Committee on August 15, 2013 and approved. The SRIS Scope is included in Appendix K.
Detailed LIPA One Line Diagram of LIPA's Ruland Road 138kV Substation

Poseidon
(NYSISO Queue #363)
Conceptual Oneline must be reviewed for compliance with LIPA's deliverability standard based on future load flow analysis
500MW Total

Note: This conceptual one-line does not reflect any additional reinforcements (such as reactive support, transmission lines, phase shifters, etc.) as well as possible interconnection at 345kV that might be required as a result of the future load flow analysis that is to be performed for the NRHS. As such, this one-line also will likely not meet LIPA's deliverability standard.
LIPA Internal Transmission Interfaces

 Poseidon Transmission 1, LLC
 The Poseidon Project
 Middlesex County, New Jersey to
 Suffolk County, New York
 Source: LIPA, 2010
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Figure E4-3