Article VII Application

Canisteo Wind Transmission Facility

Case No. 19-T-__

Exhibit E-4

Engineering Justification

Invenergy

ENGINEERING JUSTIFICATION

This Exhibit addresses the requirements of 16 NYCRR § 88.4.

Introduction

The purpose of and need for the Transmission Facility are directly tied to the purpose and need of the Canisteo Wind Farm (DPS Case Number 16-F-0205), as the proposed substations and transmission line are intended to convey the wind-generated electric power from the Wind Farm to the Bulk Power System. Because of the relationship between the two projects, this exhibit describes the purpose and need of constructing and operating both the Wind Farm and Transmission Facility (hereafter referred to as the Project).

The proposed Project consists of 122 turbine sites in Steuben County, New York and has a rated power output of 290.7 MW. Also included are access roads, energy collection systems (ECS), a Collection Substation, and a POI Switchyard at NYSEG's Bennett Substation. Engineering evaluation indicated that Bennett Substation in the Town of Hornellsville is the preferred location for interconnecting the Project thanks to an open bay on the existing 115 kV bus and access to the New York State Transmission System (NYSTS). Wind turbine native output voltage is 69 kV which is stepped up to 34.5 kV via a padmount transformer at each turbine. From there, the underground ECS conductors combine and carry electricity to the Collection Substation. Since Wind Farm voltage is designed for 34.5 kV the Collection Substation must be designed and built to safely step up the wind farm voltage from 34.5 kV to 115 kV, and match the bus bar voltage at Bennett Substation and associated POI Switchyard. The Collection Substation and POI Switchyard are electrically connected by the 14.6 mile, 115 kV transmission line following a route described in more detail in Exhibit E-1. This route was designed to minimize the distance between POI Switchyard and Collection Substation and related energy losses while considering other factors such as land control, topography, and environmental impacts.

Benefits

The Project is a beneficial addition to the electric generation capacity of the State as it helps the State achieve the goals of the 2015 State Energy Plan and related State energy policies to increase renewable energy generation and reduce carbon emissions. In total, the Project is estimated to produce enough energy each year for 170,000 homes in New York assuming each household consumes 6000 kWh of electricity per year[1]. The Project also will improve fuel diversity within the State by increasing the electric generating capacity from renewable wind power. In so doing, it will reduce overall demand for fossil fuels and ease fuel delivery constraints in the State. Zero-emission wind energy facilities like the proposed Project can displace the electricity generated from conventional power plants, thereby reducing emissions of conventional air pollutants such as sulfur and nitrogen oxides which contribute to the formation of acid rain and ground-level ozone, mercury, lead, particulate matter, and other toxins that impact human health; and carbon dioxide which is linked to global climate change. On a long-term basis, increasing the production of wind generated power will reduce the need to construct and operate new fossil fueled power plants and avoid water consumption associated with energy generation at these facilities.

The information contained in this Application and in the Article 10 Application for Canisteo Wind Farm (DPS Case Number 16-F-0205), addresses the Project's potential impact on the environment (see Exhibit 4:

[1] Calculated from U.S. Energy Information Administration data for 2016

Environmental Impact). Although some adverse environmental impacts will occur, they will be minimized by following practicable general avoidance and minimization measures, as well as thorough site-specific mitigation measures. By implementing the numerous avoidance and minimization activities outlined in these Applications, the Project is expected to result in positive, long-term overall environmental benefits which will more than offset the adverse environmental effects that cannot otherwise be avoided or mitigated.

The Project will have a positive impact on socioeconomics including increased construction and permanent employment, increased revenues to local municipalities, and purchases of products and services in the local community which are discussed further in Exhibit 6. Approximately $5 million annually will be directly conveyed to landowners through lease and easement agreements, and to schools and municipalities through payment-in-lieu-of-tax and host community agreements. Additional investments will be made in local roads and infrastructure to ensure travel routes can handle the Project construction traffic and support operations and maintenance activities. Lastly, the wind generated electricity is not subject to variable fuel costs like thermal facilities and can provide low cost, reliable energy production to the NYS wholesale electricity market.

Based on the results of the System Reliability Impact Study (SRIS) released on January 31, 2018 the Project is not anticipated to have any adverse effects on the New York power grid assuming the following conditions:

1) The POI Switchyard and related system upgrades are engineered, designed, constructed, tested, and commissioned by a NYSEG approved contractor following NYSEG standards, design approval, and with NYSEG supervision.
2) Palmiter Road to Andover 115 kV Line 932 is configured as normally-closed
3) The Project will follow all NYISO and NYSEG operating procedures including day ahead and real time operational procedures and limits

Proposed Date of Completion

The Applicant currently plans to place the Project in service in late 2020. Based on this in-service time-frame, major Project components would be expected to arrive onsite starting in 2020.

Failure to complete the transmission line will delay the commercial operation date and resulting environmental, economic, reliability and other benefits of the Wind Farm. Because the Transmission Facility is being installed solely to service the Wind Farm, no other impacts to systems are expected if the Applicant fails to commence construction by the 2020 date.

System Studies

E-4.4.1 System Reliability Impact Study

Interconnection of the Facility is being studied under NYISO queue request #519. Under this request, the NYISO is studying an interconnection of 290.7 MW to the NYSEG 115 kV Bennett Substation. An SRIS was completed on January 31, 2018 and is included as Appendix E-4a. The study includes power flow, transfer, stability and short circuit analyses. The 2020 summer peak base case came from the NYISO Class Year 2015 ATBA. Information in the SRIS is considered confidential and proprietary and contains critical energy infrastructure information. Accordingly, it will not be made publicly available.

Power Flow Analysis

The power flow analyses in the SRIS evaluated 2020 summer peak, winter peak, and light load cases under normal operating (system-intact) conditions (N-0), single-element contingencies (N-1), and multiple contingency (N-1-1) scenarios, in which all the single contingencies studied in the steady state analysis are preceded by a prior outage. All analyses were conducted with Line 932 out-of-service between Palmitier Road and Andover Substation, as is currently the normal operating regime, and with the line in service.

The N-0 power flow analysis found that the Facility would not cause any thermal loading violations under winter peak conditions. Under light load conditions, violation of thermal loading occurred on the Bath-Howard 115 kV Line with Line 932 out of service, which could be resolved by bringing the line into service. For summer peak conditions, thermal loading violation also occurred on the Bath-Howard 115 kV Line with Line 932 out of service, which could be remedied by bringing the line into service in addition to re-dispatching another generator. No voltage violations were identified for any seasonal conditions with or without Line 932 in service.

The N-1 power flow analysis found that the Facility caused thermal violations on the Bath-Howard 115 kV Line under summer peak, winter peak and light load with both Line 932 open and closed. The analysis found that in addition to re-dispatching another generator, the overloads could be mitigated completely by reducing the Facility output by 100 MW under summer peak conditions with Line 932 out-of-service and 45 MW with Line 932 in-service. Similar results were observed for light load conditions, while less output reduction was needed for winter peak conditions. However, the study also identified upgrades that would address the thermal overloads and allow the Project to operate without curtailment. Some voltage violations were identified in each seasonal condition, but these could be mitigated by either adjusting the switched shunts or using the same re-dispatch conditions identified to relieve thermal constraints.

The N-1-1 power flow analysis found that the Facility caused thermal and voltage violations under summer peak with both Line 932 open and closed. The analysis found that in addition to re-dispatching another generator, the overloads could be mitigated completely by reducing the Facility's output by 185 MW with Line 932 out-of-service and 160 MW with Line 932 in-service. However, the study also identified upgrades that would address the thermal overloads and allow the Facility to operate without curtailment.

Based on the results, the SRIS has identified closing Line 932 (i.e., bringing it into service in the normal operating scenario) and other terminal equipment upgrades to increase the line ratings as elective upgrades.

Transfer Analysis

The SRIS shows that addition of the Facility increases the normal and emergency thermal transfer limits at the Dysinger East, West Central, and Volney East interfaces by between 58 and 147 MW with Line 932 out of service. Closing Line 932 slightly increases some of these transfer limits. The SRIS also studied voltage transfer limits and found that thermal transfer limits are more controlling for all interfaces. Therefore, the SRIS concludes that there will not be any adverse impact on transfer capacities due to addition of the Facility.

Stability and Short-Circuit Analyses

Dynamic simulations were performed for Summer Peak and Light Load system conditions for the year 2020 with the proposed wind farm in service. The stability analysis found that the New York State transmission system remained positively damped for all contingencies tested. The local transmission system contingency stability analysis found issues under certain contingencies that were attributable to the Facility in the case with Line 932 out of service; however, with Line 932 in service, there were no stability criteria violations attributable to the Facility. Finally, critical clearing time testing showed no adverse impacts to the system due to the Facility. Thus, the SRIS showed that Facility does not adversely impact system stability provided that Line 932 is in service.

The SRIS also included short-circuit analyses and fault current calculations based on cases prior and subsequent to the addition of the Facility with and without the National Grid 932 Line in service. The result showed that the Facility increases the fault current at the Bennett 34.5 kV bus with Line 932 open or closed. NYSEG's analysis found that Bennett 53762 breaker is over-dutied pre-Facility. NYSEG is responsible for this breaker and already has plans to replace it. However, the Facility would result in the GB-62 Breaker at Bennett being over its capability and will therefore need to be replaced by CWE. With this required upgrade, it is concluded that the Facility would not have a significant adverse impact on the reliability due to short-circuit scenarios.

E-4.4.2 Facilities Study

Based on SRIS results, the Project is continuing under the Standard Large Facility Interconnection Procedures and began a Facilities Study in 2018. Part 1 of the Facilities Study is under review and the Project is entered in the 2018 Class Year.