Cassadaga Wind Project

Case No. 14-F-0490

1001.8 Exhibit 8

Electric System Production Modeling

EXHIBIT 8 ELECTRIC SYSTEM PRODUCTION MODELING

(a) Computer-based Modeling Tool

The analyses presented in this section of the Application have been developed using GEMAPS. The Applicant consulted with the NYSDPS to develop an acceptable input data set to be used in the simulation analyses, including modeling for the Applicant's proposed facility and inputs for the emissions analysis. Portions of the data provided below are proprietary and/or Critical Energy Infrastructure (CEII) and must be filed under a protective agreement. The data that is proprietary, which are typically retained as trade secrets, will be provided to DPS under separate cover. The Applicant will seek the requisite trade secret protection for this information pursuant to NY Public Officer's Law Section 87(2)(d) and 16 NYCRR 6-1.4.

(1) Estimated Statewide Levels of Greenhouse Gas Emissions

Table 8-1, below, lists the estimated statewide levels of SO2, NOx, and CO2 emissions, in short tons, with and without the Cassadaga Wind Project for the 2019 year.

Table 8-1. Statewide Greenhouse Gas Emissions With and Without the Facility

Emissions (Short Tons)	Without Cassadaga Wind Project	With Cassadaga Wind Project
SO2	3,023.05	2,690.89
NOx	9,981.90	9,753.84
CO2	20,249,623.20	20,095,706.20

(2) Estimated Prices Representative of all NYISO Zones

Table 8-2 lists the estimated minimum, maximum, and average annual spot prices representative of the NYISO Zones within the New York Control Area, both with and without the proposed Facility for the studies 2019 year.

Table 8-2. Estimated Annual Spot Prices Representative of NYISO Zones within the New York Control Area

NYISO Zone	Without Cassadaga Wind Project			With Cassadaga Wind Project		
	Minimum Spot Prices	Maximum Spot Prices	Average Annual Spot Prices	Minimum Spot Prices	Maximum Spot Prices	Average Annual Spot Prices
NYZAA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
NYZBA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
NYZCA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
NYZDA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
NYZEA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
NYZFA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
NYZGA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
NYZHA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
NYZIA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
NYZJA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
NYZKA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

(3) Estimated Capacity Factor

A 8760 hourly generation profile was developed using on site met tower measurements that Based on the observed time period of the measurements compared to a nearby long-term reference station, the observed mast data is adjusted to represent a long-term average at the positions to reduce the variability with time. From this validated and long-term adjusted distributions at each turbine position, the overall wind farm gross production is calculated based on the specific turbine power curve and the turbine specific wind distribution. For the purposes of this and other analyses presented in this section, the Gamesa G114 2.1 MW turbine was used to create the generation profile. Typical losses assumptions for availability, environmental, curtailment and any other potential sources of energy losses are then taken from the gross production to yield a long term net energy yield and capacity factor. Based on the results of this analysis, the proposed Facility is anticipated to have a capacity factor of [redacted]%[1].

[1] A capacity factor of [redacted]% is based on use of the Gamesa G114 2.1 MW for 2014 wind production data. Elsewhere in this Application, a 36% capacity factor is assumed, which is an approximation based on the Applicant's expectations for a NY wind project.

(4) Estimated Annual and Monthly Output Capability Factors

Table 8-3 below provides the monthly as well as the 2019 annual on-peak and off-peak MWhr output capability factors for the proposed Facility.

Table 8-3. Monthly and Annual On-Peak and Off-Peak Output Capability Factors for the Proposed Facility

Month	On Peak		Off-Peak	
	MWhr output	Capacity Factor (%)	MWhr output	Capacity Factor (%)
1	[redacted]	[redacted]	[redacted]	[redacted]%
2	[redacted]	[redacted]	[redacted]	[redacted]%
3	[redacted]	[redacted]	[redacted]	[redacted]%
4	[redacted]	[redacted]	[redacted]	[redacted]%
5	[redacted]	[redacted]	[redacted]	[redacted]%
6	[redacted]	[redacted]	[redacted]	[redacted]%
7	[redacted]	[redacted]	[redacted]	[redacted]%
8	[redacted]	[redacted]	[redacted]	[redacted]%
9	[redacted]	[redacted]	[redacted]	[redacted]%
10	[redacted]	[redacted]	[redacted]	[redacted]%
11	[redacted]	[redacted]	[redacted]	[redacted]%
12	[redacted]	[redacted]	[redacted]	[redacted]%
Annual	[redacted]	[redacted]%	[redacted]	[redacted]%

(5) Estimated Annual and Monthly Production Output

Monthly energy yield averages are determined from the observed wind production profile data in each specific month and long-term adjustments are made to the monthly data set. Based on the long-term adjusted average energy yield for each month, a gross monthly energy distribution for the year can be determined. Monthly specific loss assumptions for availability, environmental and curtailment are then taken from the gross monthly production distribution to yield the 12 estimated monthly productions in MWh. An annual production output is determined from the sum of all monthly net energy yields in MWh.

Table 8-4 provides the monthly net production output, in MWhr, of the proposed Facility as well as the total annual MWhr production.

Table 8-4. Anticipated Monthly and Annual Production Output of the Proposed Facility

Months	Production Output (MWh)
1	[redacted]
2	[redacted]
3	[redacted]
4	[redacted]
5	[redacted]
6	[redacted]
7	[redacted]
8	[redacted]
9	[redacted]
10	[redacted]
11	[redacted]
12	[redacted]
Annual	[redacted]

(6) Estimated Production Curve Over an Average Year

Hourly production of the Facility was calculated using GEMAPS and 8760 hours of wind production profile data provided by the Applicant. Hourly estimates of hourly production and scheduled hourly production in tabular and graphical formats are included in Appendix L. However, this appendix will be filed separately under confidential cover.

(7) Estimated Production Duration Curve Over an Average Year

Tables in Appendix L show the hourly production of the Facility, as well as the hours count for milestones production (production duration only). Also included is a graph that shows the production duration curve for the Facility.

(8) Effect of the Facility on the Energy Dispatch of Existing Must-run Resources

In order to assess the estimated effects of the proposed Facility on the energy dispatch of existing must-run resources (which includes existing wind, hydroelectric, and nuclear facilities, as well as co-generation facilities to

the extent they are obligated to output their available energy because of their steam hosts), a Generation Dispatch Forecasting Analysis was prepared by Electric Power Engineers, Inc. (EPE), which is Appendix L to this Application. However, this appendix will be filed separately under confidential cover.

To conduct the analysis, EPE modeled and ran the NYISO 2019 system, with and without the proposed Facility, and compared the generation dispatch of must run resources with the NYISO service territory between the two scenarios. This comparison was performed using GE's Multi-Area Production Simulation (MAPS) and PowerWorld Corp. Simulator software which is heavily utilized for market studies within the NYISO service territory. The first step in the analysis was to complete a powerflow study to identify any critical constraints in the vicinity of the proposed Facility. EPE then conducted a generation and transmission nodal market study based on 8,760 hours-per-year simulation for the 2019 study year, while taking into consideration system constraints including the critical constraints identified in the powerflow calculations. The analysis simulated the effect of energy schedules from energy resources on must run resources redispatching to reliably serve the grid and avoid curtailment.

Table 8-5 below presents the annual MWhr dispatch of the must run resources for the 2019 study year in the two scenarios (with and without the proposed Facility) that EPE evaluated as part of this study.

Table 8-5. Annual Dispatch of Must Run Resources With and Without the Proposed Facility

Study Year	Scenario	Cogeneneration Must Run (MWhr)	Quick Startup Units* (MWhr)	Nuclear (MWhr)	Hydroelectric (MWhr)	Wind (MWhr)	
						Other Wind (Excluding Cassadaga)	Cassadaga
2019	Without Proposed Facility	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	--
	With Proposed Facility	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

* Quick startup units are flagged as must run in the GE MAPS database. Although these units do not satisfy the definition of must run as stated in the scope of work and as detailed in this report, their generation production is reported.

From Table 8-5 above, it is apparent that the addition of the proposed Facility to the system would have an insignificant impact on the dispatch of the must run generation as defined above. The quick startup units, flagged as must run units in GE MAPS, are also insignificantly redispatched from [redacted] MWhr to [redacted] MWhr after the addition of the proposed Facility.

(b) Digital Copies of Inputs Used in the Above Simulations

Digital copies of the inputs used in the above simulations are confidential, and will be provided to DPS under separate cover.