Article 10 Application

Canisteo Wind Farm

Case 16-F-0205

Steuben County, New York

1001.8 Exhibit 8

Electric System Production Modelling

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Invenergy

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Exhibit 8 Electric System Production Modelling

CWE hired Leidos Consulting, Inc. (Leidos) to model the future NYS bulk electric system for scenarios with and without the Facility. Leidos' report (the Report) is provided at the end of this Exhibit and is summarized in the following sections.

8.a Computer-Based Model and Results

Leidos performed the analysis using the ProMod computer-based modelling tool and inputs on which Leidos and CWE consulted with John Cary of the New York Department of Public Service (DPS) in July of 2018.

Leidos modelled the Project and the NYS electric system for expected conditions for 2023 with the following assumptions:

- Indian Point Nuclear Plant is retired.
- Cricket Valley generation is in-service.
- Nine Mile Point, Ginna, and Fitzpatrick nuclear plants are in-service.
- Eight Point and Baron wind farms are not in service.
- Hydroelectric imports from Quebec are similar to historic levels by time of day and season.
- Vermont Green Line, Champlain Hudson Power Express, West Point, Poseidon, and Empire State Connector not in-service.
- National Grid 345-kv upgrades from Massena to Cogen not in-service.
- The Facility's net capacity factor and electric capability are as specified by CWE but with a uniform profile assumed to be the same for all wind plants in the region.

Results from the model are presented in the Report and summarized below.

8.a.1 Air Emissions

Table 2 in the Report shows the predicted emissions from New York electric generators both with and without the Facility. With the Facility operating, annual SO2, NOx and CO2 air emissions are predicted to decrease by 2.7%, 1.0%, and 0.5%, respectively.

8.a.2 Spot Prices

Table 3 in the Report shows the predicted annual average, minimum, and maximum zonal spot prices for electricity both with and without the Facility. With the Facility operating, the all-hours annual average spot price in Zone C is predicted to decrease by 0.55 $/MWh, and the load-weighted average for the entire state is predicted to decrease by 0.28 $/MWh.

8.a.3 Capacity Factor

Table 8 of the Report shows the annual net capacity factor for the Facility both with and without the hours that the Facility may not be able to run due to predicted "curtailment" by the NYISO.

This exhibit has been redacted to remove trade secrets and confidential information.

8.a.4 On-Peak and Off-Peak Generation

Table 9 of the Report shows the Facility's expected average generation for on-peak and off-peak hours for every month of the year. Table 8-1 shows the Facility's expected capacity factor by month of these on-peak and off-peak hours. Note that PSL 1001.8 (a)(4) requests "capability factors" which CWE interprets to be the same as "capacity factor," i.e., the percentage of the Facility's maximum capacity that is generated.

Table 8-1. Annual and Monthly On-Peak and Off-Peak Capacity Factors

Month	Season	Average On-Peak Generation, MW	Average Off-Peak Generation, MW	On-Peak Capacity Factor	Off-Peak Capacity Factor
Jan	Winter	[redacted]	[redacted]	[redacted]	[redacted]
Feb	Winter	[redacted]	[redacted]	[redacted]	[redacted]
Mar	Winter	[redacted]	[redacted]	[redacted]	[redacted]
Apr	Shoulder	[redacted]	[redacted]	[redacted]	[redacted]
May	Shoulder	[redacted]	[redacted]	[redacted]	[redacted]
Jun	Summer	[redacted]	[redacted]	[redacted]	[redacted]
Jul	Summer	[redacted]	[redacted]	[redacted]	[redacted]
Aug	Summer	[redacted]	[redacted]	[redacted]	[redacted]
Sep	Summer	[redacted]	[redacted]	[redacted]	[redacted]
Oct	Shoulder	[redacted]	[redacted]	[redacted]	[redacted]
Nov	Shoulder	[redacted]	[redacted]	[redacted]	[redacted]
Dec	Winter	[redacted]	[redacted]	[redacted]	[redacted]
Annual	na	[redacted]	[redacted]	[redacted]	[redacted]

Note: Capacity factors are calculated assuming a maximum project generating capacity of 290.7 MW.

8.a.5 Production Output

Table 8 of the Report shows the Facility's monthly and average annual production in MWh.

8.a.6 Production and Production Duration Curves

Figure 1 of the Report shows predicted hourly production from the Facility for the year modeled.

8.a.7 Production Duration Curves

Figure 2 of the Report is a production duration curve for the Facility of the year modeled.

8.a.8 Effects on Must-Run Resources

Table 6 of the Report shows the annual generation from co-generation, hydropower, nuclear and wind facilities in Zones A, B and C for the scenarios with and without the Facility. Table 8-2 summarizes these results for select generators near the Facility.

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Table 8-2. Effect of the Project on Must Run Generators in Zones A, B, and C

Project	Owner	Technology	Capacity (MW)	In-Service Date	Plant Age in 2021 (yrs)	Generation without the Facility (GWh/yr)	Generation with the Facility (GWh/yr)	Difference
Lewiston	NYPA	hydro	240.0	1961	57	145.4	145.8	0.3%
Robert Moses	NYPA	hydro	2,675.0	1961	57	14,188.8	14,188.7	0.0%
Fitzpatrick	Excelon	nuclear	813.0	1975	43	7,204.6	7,204.6	0.0%
NMP1	Excelon	nuclear	613.0	1965	53	4,880.2	4,880.2	0.0%
Ginna1	Excelon	nuclear	580.0	1970	48	4,403.6	4,403.6	0.0%
Bliss	Noble	wind	100.5	2008	10	342.50	342.2	-0.1%
Cohocton + Dutch Hill	TerraForm	wind	125.0	2009	9	429.00	424.8	-1.0%
Sheldon	Invenergy	wind	112.5	2009	9	369.10	360.7	-2.3%
Howard	Innogy	wind	55.4	2011	7	188.60	188.4	-0.1%
Orangeville	Invenergy	wind	94.4	2014	4	316.90	316.9	0.0%
Wethersfield	Noble	wind	125.0	2009	9	430.20	430.2	0.0%

Notes:

1. Generation is from the Leidos modelling of the NYS Bulk Power System in 2023 using the ProMod computer program and the assumptions described in this Exhibit.

8.b Digital Copies of Model Inputs

CWE will forward computer file(s) with model inputs by email to DPS staff.

CANISTEO WIND ENERGY CENTER ELECTRIC SYSTEM PRODUCTION MODELING REPORT

INVENERGY LLC

formerly part of SAIC

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leidos

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EXECUTIVE SUMMARY

Leidos was engaged by Invenergy LLC ("Invenergy") to model the impacts of its Canisteo Wind Energy Center ("the Project") on the New York state electric power system as required by Section 1001.8 of the New York Siting Board regulations.

The Project is a 290.7 MW wind farm proposed for installation in Steuben County, NY interconnecting to the 115-kV Bennett bus in the New York State Electric and Gas ("NYSEG") transmission system.

Leidos modelled the NYISO electric system with and without the Project using the PROMOD analysis package to simulate economic dispatch in the calendar year 2023, the first full calendar year the Project is expected to be operating. Impacts were assessed by comparing the following between the two cases run: 1) output of local generators 2) Locational Marginal Prices (LMP), 3) statewide power plant emissions and 4) imports from Canada. Additionally, Project output was assessed for congestion related curtailment.

The study found that adding the Project reduced NYISO load-weighted LMPs by $0.28/MWh; net NOX, SOX, and CO2 emissions by 1.1%, 2.7%, and 0.5% respectively; and Canadian imports over 3%. The Project is predicted to experience low curtailment of roughly 0.3% of its annual expected output. A small number of wind projects had small output reductions with the addition of the Project.

STUDY APPROACH

Leidos studied the impact of the Canisteo wind project on the electric power system by performing detailed simulations of the NY future energy system with and without the Project in operation for the year 2023, the expected first full year of commercial operation for the Project. The analysis was performed using PROMOD nodal market modeling software, which incorporates extensive details in generating unit operating characteristics, transmission grid topology and constraints, and market system operations to support economic transmission planning.

Developers of new generation projects often have their projects studied with PROMOD and other nodal market simulation software, such as GE MAPS, in order to capture the full impact of the projects on system commitment and dispatch as constrained by congestion on transmission flowgates. The change in nodal prices, reflecting impact in energy, congestion, and marginal losses, requires modeling the full bus-branch transmission topology within the simulation. The standard approach to measure the change is to compare economic results between two simulations of the power system, the only modeling changes between the simulations being the generation project placed in service. Leidos has used that same approach here to assess impacts of the Project on the New York wholesale electric power system. Quality assurance checks were carried out to ensure that the results align reasonable electric market outcomes.

Leidos' study approach included the following steps:

(1) Assumptions development: Expected electric power system parameters for the 2023 study year were established based on appropriate public sources, including the 2018 Load & Capacity Data "Gold Book" ("Gold Book") published by the New York Independent System Operator ("NYISO") and the 2017 Congestion Assessment and Resource Integration Study ("CARIS") also published by NYISO. As part of this step, Leidos and Invenergy discussed with the New York Department of Public Service ("DPS") staff key assumptions such as hydroelectric import

volumes, presence of new generators currently in the NYISO queue but not yet built, presence of proposed transmission projects, and generation from nuclear units.

(2) Base Case simulations: the initial nodal market simulation was performed for the 2023 study year without the Canisteo wind project included. Quality assurance checks were carried out on the Base Case results to validate data accuracy through a general comparison of results against historical operations.

(3) Canisteo Case simulation: A second nodal market simulation was performed for the 2023 study year that included the Project in operation. The Project was modeled with an hourly wind profile and in accordance with the design parameters provided by Invenergy. Assumptions used for these inputs are presented in Appendix A.

(4) Impact Analysis: The Canisteo Case simulation was compared to the Base Case simulation to assess the impact of the Project on system operations, costs, and emissions. The resulting differences in economic and environmental results in the Project simulation are wholly driven by the wind generation injected by the Project.

The PROMOD simulation results provided key metrics that were used to assess the impact of the Project. These metrics include:

Locational Marginal Prices ($/MWh): Average, minimum, and maximum Locational Marginal Price ("LMP") for each NYISO zone.

Emissions Production (tons): Total volume of emissions produced by NYISO generation units for sulphur dioxide ("SO_2"), nitrogen oxide ("NO_x"), and carbon dioxide ("CO_2").

Annual Generation in NYISO (GWh) – Total delivered generation from producers in NYISO zones D and E, with separate results for wind, hydropower, co-generation, nuclear (all NYISO nuclear), as well as Canadian imports.

These three metrics were reported directly from PROMOD simulation results and provided the basis for assessing the impact of the Project to New York. In addition, the performance of the Project in the Canisteo Case was monitored, including production metrics and curtailment.

MODELING ASSUMPTIONS

Leidos derived modeling assumptions from public sources, including the 2018 Gold Book, CARIS 2017 assumption documents, and study assumptions for the 2018 Reliability Needs Assessment ("RNA") published in the spring of 2018.

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Table 1
New York Electric System Modeling Assumptions

Generation	• Existing generation capacities based upon 2016 Gold Book • New / future generation was based upon 2018 RNA, except where DPS provided guidance on specific plants; generation projects currently under Article 10 review were included only if the project's application was compliant and approved: o Jericho Rise Wind Farm was modeled online. o Cassadaga Wind Farm assumed to be online by 2023. o Cricket Valley assumed to be online by 2023. o Baron Wind assumed to not be in service. o Eight Point Wind assumed to not be in service. o Galloo Island assume to not be in service. o Number Three assumed to not be in service. o Bull Run Wind Farm assumed to not be in service. o Ball Hill Wind Farm assumed to not be in service. o Dunkirk Re-powering Project assumed to not be in service • Ginna and Fitzpatrick nuclear units remaining online through the study. • Nine Mile Point nuclear units remaining online through the study. • Indian Point nuclear plant (all units) retired prior to 2023. • All wind generation bids into the market at -$35/MWh. Leidos assumes this bid value as the negative of the approximate true-up value of the federal wind production tax credit. Older wind generators that began commercial operation in 2013 or earlier may no longer qualify for the federal production tax credit in 2023 and might bid higher than -$35/MWh, however the more conservative assumption is that all wind generators bid into the market at the same level. • External generation in PJM, ISONE, HQ, MISO from Leidos assumptions, based upon continued economic transmission modeling work in those regions
Fuel & Emissions	• Fuel and emissions price forecasts based upon CARIS 2017 • RGGI price at $7.20/ton per CARIS 2017
Market modeling	• The power systems adjacent to NYISO are represented as operating systems committing and dispatching generation to meet demand. The amount of power imported and exported between NYISO and these systems is an economic result from the 2023 market simulation. The import and export amounts are not a fixed input assumption. The NYISO imports and exports resulting from the 2023 simulation benchmarked to be reasonably close to historical values. • Hurdle rates for NYISO import/export to adjacent systems are based upon CARIS 2017 assumptions.

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Transmission	• Transmission topology based upon MMWG Eastern Interconnect Summer Peak 2021 case with updates to model 2023 transmission system. • Per the findings of the Q519 System Reliability Impact Study ("SRIS") for the project, the following was assumed regarding network topology: o Andover Switch closed (Palmiter Road to Andover 115 kV line in service) o Required 115 kV system upgrades implemented, as identified in the SRIS • NYISO upgrades based upon 2018 Gold Book and 2017 CARIS. Upgrades in other systems based on approved transmission plans for those ISOs. Leidos includes only transmission projects that are have full regulatory approval to be built and have an in service date before 2023. As a result, the following major projects under development are modeled or not modeled in the base and Canisteo scenarios: <u>Modeled</u> o Empire State Line Project <u>Not Modeled</u> o Vermont Green Line o Champlain Hudson Power Express o West Point o Poseidon o Empire State Connector o Various 345kV transmission reinforcement projects • The new PJM/NYISO Wheel Replacement Protocol is modeled with zero operational background flow in 2023 as per NYISO/PJM Joint Operating Agreement

The database underlying the assumptions was created using the ABB "Simulation-Ready Data" product database as a starting point. This energy market database is tailor-made for PROMOD nodal software, containing data for forecasted demand, forecasted fuel prices, detailed generating unit characteristics, transmission system configuration, and other information. ABB compiles the database from a wide variety of dependable sources, including detailed generation data from the Environmental Protection Agency's Continuous Emissions Monitoring System (CEMS) database, load forecasts from FERC 714 form filings and various regional publications, transmission constraint data from FERC 715 forms and RTO documents. Leidos carries out validation activities to verify data accuracy and enhances the data in some areas such as modeling of wind generation and adding recently approved transmission projects.

In the Canisteo Case, The Project was modeled with a capacity of 290.7 MW with a point of interconnection ("POI") at the Bennett 115kV bus. The annual energy output modeled was 858.7 GWh, which equates to a [redacted]% capacity factor. The hourly profile modeling the Canisteo production was derived from the Eastern Wind Integration ("EWITS") dataset published by the National Renewable Energy Laboratory. Invenergy provided Leidos with a diurnal wind profile for the Project, however Leidos utilized the EWITS profile in the market simulation in order to keep the Canisteo hourly production synchronized with all other wind farms in the study. This approach ensures that the impact of regional high wind events on the transmission system is properly captured in the modeling.

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RESULTS AND CONCLUSIONS

The impact of Canisteo on the New York system is summarized in Tables 2 through 8, which show the results from the Base Case and Canisteo Case simulations.

The Project will reduce net emissions from New York generators. Table 2, below, shows the reduction of overall emissions from New York power plants for NOx, SO2, and CO2.

Table 2
New York Electric System Emissions

	Emissions (Tons)		Emissions Change
Effluent	Base Case	Canisteo Case	Delta
NOx	12,337	12,205	-132
SO2	3,398	3,305	-92
CO2	36,078,668	35,895,631	-183,037

The impact of the Project on nodal market prices is summarized in Tables 3 through 5, below. As shown by Table 3, construction of the Project is estimated to reduce the load-weighted LMP across NYISO by $0.28 /MWh. The reduction is driven largely by the reduced generation by natural gas power plants in winter months when gas prices are highest. This analysis does not account for the additional effect of reduced gas demand on natural gas prices. The lower power prices would be experienced mostly in the upstate NYISO zones in and near where the Project is proposed.

Table 3
Annual Average LMP Summary (All Hours)

NYISO Zone	LMP Base Case ($/MWh)	LMP Canisteo Case ($/MWh)	LMP Delta ($/MWh)
A	[redacted]	[redacted]	[redacted]
B	[redacted]	[redacted]	[redacted]
C	[redacted]	[redacted]	[redacted]
D	[redacted]	[redacted]	[redacted]
E	[redacted]	[redacted]	[redacted]
F	[redacted]	[redacted]	[redacted]
G	[redacted]	[redacted]	[redacted]
H	[redacted]	[redacted]	[redacted]
I	[redacted]	[redacted]	[redacted]
J	[redacted]	[redacted]	[redacted]
K	[redacted]	[redacted]	[redacted]
Load-weighted NYISO	[redacted]	[redacted]	-0.28

This exhibit has been redacted to remove trade secrets and confidential information.

Below, tables 4 and 5 show the maximum and minimum LMP across all 8760 hours of the 2023 simulation year for each NYISO zone, respectively.

Table 4
Maximum Hourly LMP Summary

NYISO Zone	LMP Base Case ($/MWh)	LMP Canisteo Case ($/MWh)	LMP Delta ($/MWh)
A	[redacted]	[redacted]	[redacted]
B	[redacted]	[redacted]	[redacted]
C	[redacted]	[redacted]	[redacted]
D	[redacted]	[redacted]	[redacted]
E	[redacted]	[redacted]	[redacted]
F	[redacted]	[redacted]	[redacted]
G	[redacted]	[redacted]	[redacted]
H	[redacted]	[redacted]	[redacted]
I	[redacted]	[redacted]	[redacted]
J	[redacted]	[redacted]	[redacted]
K	[redacted]	[redacted]	[redacted]

Table 5
Minimum Hourly LMP Summary

NYISO Zone	LMP Base Case ($/MWh)	LMP Canisteo Case ($/MWh)	LMP Delta ($/MWh)
A	[redacted]	[redacted]	[redacted]
B	[redacted]	[redacted]	[redacted]
C	[redacted]	[redacted]	[redacted]
D	[redacted]	[redacted]	[redacted]
E	[redacted]	[redacted]	[redacted]
F	[redacted]	[redacted]	[redacted]
G	[redacted]	[redacted]	[redacted]
H	[redacted]	[redacted]	[redacted]
I	[redacted]	[redacted]	[redacted]
J	[redacted]	[redacted]	[redacted]
K	[redacted]	[redacted]	[redacted]

This exhibit has been redacted to remove trade secrets and confidential information.

The impact of the Project on individual must-run generators in NYISO Zones A, B, and C is shown below in Table 6. Must-run generators are defined as co-generation, hydropower, nuclear, and wind types. For the large majority of these generators, the Project had very little or no impact on plant energy production. The Project had a small impact on zone A hydro generation and a curtailment impact on six wind projects in zones A and C, increasing curtailment on five and decreasing curtailment on one, which resulted from 0.1% increase to 2.3% decrease in annual energy output. The net amount of increased curtailment due to the Project was 13.0 GWh, which equates to 0.5% of overall wind output in zones A through C.

Table 6
Annual Must-Run Generation Summary, Zones A, B, and C

			Generation (GWh)		Generation Change	
Generator	Type	Zone	Base Case	With Project	Delta	Delta Pct
Hydraulic Race	Hydro	A	9.5	9.5	0.0	0.0%
Lewiston Niagara (NY)	Hydro	A	145.4	145.8	0.4	0.3%
Moses Niagara	Hydro	A	14188.8	14188.7	-0.1	0.0%
Rochester 2	Hydro	B	36.8	36.8	0.0	0.0%
Rochester 26	Hydro	B	7.7	7.7	0.0	0.0%
Rochester 5	Hydro	B	106.5	106.5	0.0	0.0%
Waterport	Hydro	B	12.1	12.1	0.0	0.0%
Allegheny 8	Hydro	C	87.8	87.8	0.0	0.0%
Allegheny 9	Hydro	C	101.0	101.0	0.0	0.0%
Bennetts Bridge	Hydro	C	90.1	90.1	0.0	0.0%
Granby	Hydro	C	41.7	41.7	0.0	0.0%
Lighthouse Hill	Hydro	C	22.1	22.1	0.0	0.0%
Minetto	Hydro	C	35.4	35.4	0.0	0.0%
Oswego Falls East	Hydro	C	14.0	14.0	0.0	0.0%
Oswego Falls West	Hydro	C	6.9	6.9	0.0	0.0%
Varick	Hydro	C	24.7	24.7	0.0	0.0%
Broome Cnty LF:1	IC Renewable	C	22.7	22.7	0.0	0.0%
Chaffee LF:1	IC Renewable	A	50.8	50.8	0.0	0.0%
High Acres GR:1	IC Renewable	C	58.9	58.9	0.0	0.0%
Hyland LF:1	IC Renewable	B	39.2	39.2	0.0	0.0%
Mill Seat LF:6	IC Renewable	B	39.2	39.2	0.0	0.0%
Model City Energy	IC Renewable	A	39.2	39.2	0.0	0.0%
Modern Inn Egy:1	IC Renewable	A	56.1	56.1	0.0	0.0%
Monroe Comm College Plant	IC Renewable	B	3.0	3.0	0.0	0.0%
Ontario LFGTE:1	IC Renewable	C	68.7	68.7	0.0	0.0%
Seneca Mdws:1	IC Renewable	C	108.8	108.8	0.0	0.0%
Steuben LFG:1	IC Renewable	C	23.4	23.4	0.0	0.0%
J A Fitzpatrick 1	Nuclear	C	7204.6	7204.6	0.0	0.0%
Nine Mile Point 1	Nuclear	C	4880.2	4880.2	0.0	0.0%

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Ginna 1	Nuclear	B	4403.6	4403.6	0.0	0.0%
Amer Ref Niagara:2	ST Renewable	A	89.2	89.2	0.0	0.0%
Covanta Niagara:GEN1	ST Renewable	A	89.2	89.2	0.0	0.0%
Bliss Windfield	Wind	A	342.5	342.2	-0.3	-0.1%
Cassadaga Wind	Wind	A	413.3	413.7	0.4	0.1%
Cohocton Wind Farm	Wind	C	306.7	304.3	-2.4	-0.8%
Dutch Hill Wind Farm	Wind	C	122.6	120.5	-2.1	-1.7%
High Sheldon Windfarm	Wind	C	369.1	360.7	-8.4	-2.3%
Howard Wind Project	Wind	C	188.6	188.4	-0.2	-0.1%
Orangeville Wind Farm	Wind	C	316.9	316.9	0.0	0.0%
Wethersfield Windpark	Wind	C	430.2	430.2	0.0	0.0%

With the Canisteo project in operation, New York is less dependent upon power imports from external markets. As stated previously, NYISO imports and exports are an economic result from the 2023 market simulation and not a fixed input assumption. Table 7 shows that net imports into the New York system from external markets is reduced by 688 GWh with the Project online.

Table 7
NYISO Imports Summary

	Annual Net Imports (GWh)			
Source	**Base Case**	**With Project**	**Delta**	**Delta (%)**
Hydro Quebec	8,225	8,178	-48	-0.6%
Ontario	7,872	7,677	-195	-2.5%
PJM	7,331	6,860	-470	-6.4%
ISO-NE	4,595	4,620	25	0.5%
Total	**28,023**	**27,335**	**-688**	**-2.5%**

This exhibit has been redacted to remove trade secrets and confidential information.

Exhibit 8 specifies that Project generation capability be summarized annually and monthly by on peak, off peak, and shoulder periods. Table 8 provides a monthly summary and annual totals for the modeled energy production from the Project and resulting delivered production and curtailment from the nodal market simulation, the monthly capacity factor for the Project in terms of energy production and energy delivered is also provided. Table 9 shows the average and maximum delivered production over the hours of each month, shown for overall, on peak, and off peak periods. On peak and off peak periods refer to time of day, while shoulder period generally refers to low load months in the spring and fall such as March, April, October, and November. The Project curtailment level was low at 1.0% of the total energy production, averaged over the entire year.

Table 8
Canisteo Wind Project Generation Summary

	Total Energy Production (MWh)	Total Delivered Production (MWh)	Total Project Curtailment (MWh)	Total Energy Production Capacity Factor (%)	Total Delivered Production Capacity Factor (%)	Project Curtailment (%)
Jan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Feb	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Mar	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Apr	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
May	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jun	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jul	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Aug	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sep	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Oct	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Nov	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dec	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Annual	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

This exhibit has been redacted to remove trade secrets and confidential information.

Table 9
Canisteo Wind Project: Monthly Average and Maximum Generation Summary

	Average Production (MW)	Average Production Off-Peak (MW)	Average Production On-Peak (MW)	Hourly Maximum Production (MW)	Hourly Maximum Production Off-Peak (MW)	Hourly Maximum Production On-Peak (MW)
Jan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Feb	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Mar	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Apr	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
May	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jun	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jul	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Aug	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sep	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Oct	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Nov	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dec	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Annual	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

This exhibit has been redacted to remove trade secrets and confidential information.

Figures 1 and 2 show the hourly production curve chronologically over the study year and a duration curve sorting highest output to lowest output over hours of the year,

Figure 1
Canisteo Wind Project Hourly Production Curve – Chronological (MW)

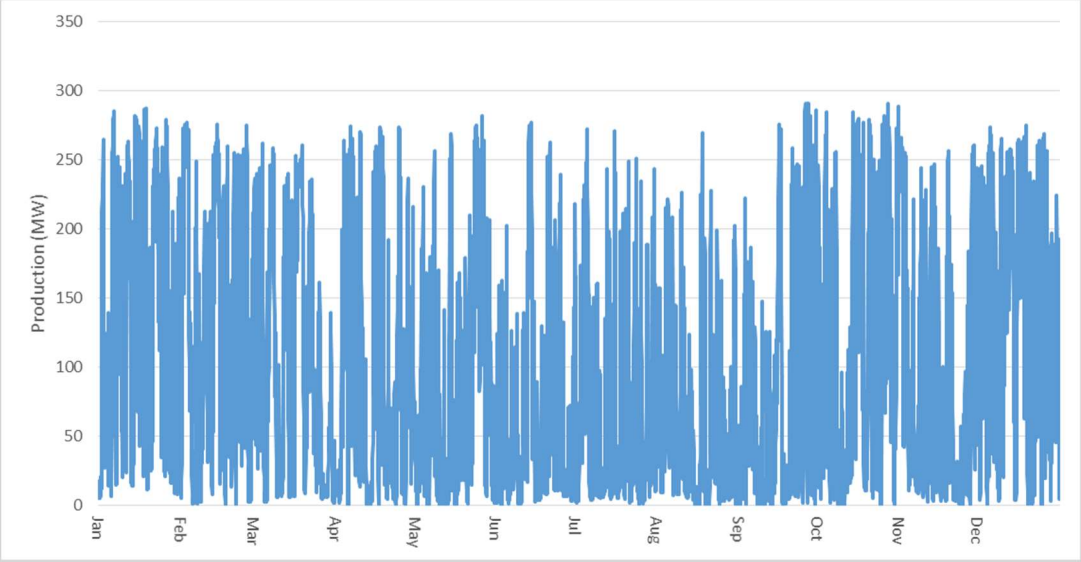
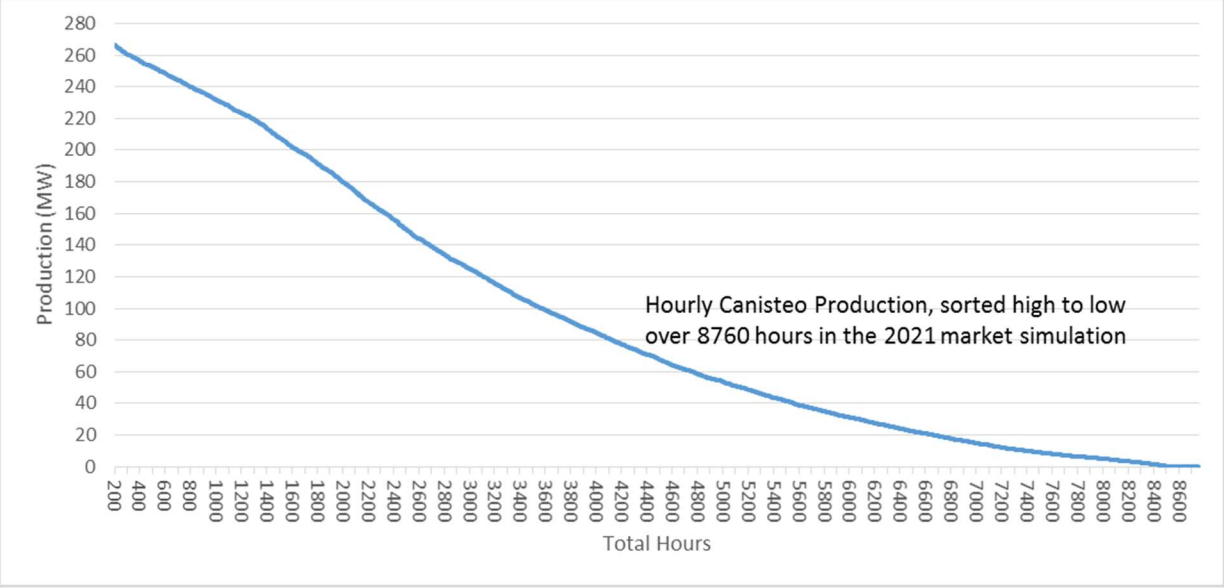


Figure 2
Canisteo Wind Project Hourly Production – Duration Curve (MW)



This exhibit has been redacted to remove trade secrets and confidential information.

APPENDIX A

Production cost model market input assumptions are provided in a separate Excel spreadsheet “Canisteo Production Cost Market Assumptions – Leidos.xlsx.”