
# DANSKAMMER ENERGY CENTER

## Case No. 18-F-0325

## 1001.8 Exhibit 8

## Electric System Production Modeling

## Contents



## Tables



## Appendix

# Exhibit 8: Electric System Production Modeling

### 8(a) Computer-Based Modeling Tool, Methodology and Assumptions

The simulation analyses presented in this Exhibit 8 of the Application were developed by ICF Resources, LLC, on behalf of Danskammer, using a computer-based modeling tool, ABB PROMOD IV. PROMOD is an industry standard production cost modeling software and is the modeling software agreed upon by Danskammer Energy, LLC and the signatory parties to the Stipulation for Exhibit 8 ("Stipulation 8"). PROMOD considers generating unit characteristics, forced outages, transmission topology and constraints, and market system operations to simulate security-constrained economic dispatch of generating units.

The analysis described in this Exhibit 8 analyzed the impacts of the proposed Danskammer Energy Center (the Project). The Project would deactivate the existing steam turbine units of the Danskammer Generation Station, located in the New York Independent System Operator's (NYISO's) Hudson Valley zone (Zone G), and replace it with a maximum 600 net megawatt (MW) combined-cycle gas turbine plant.

The typical approach to modeling the system impacts of a proposed facility is to first run a simulation without the facility, the "Base Case," and then to run a second simulation with the facility included, the "Change Case." ICF followed this methodology with the simulation year being 2024. The four units of the existing Danskammer Generation Station were modeled in-service in the Base Case and removed from service in the Change Case, to reflect replacement by the Project.

ICF developed modeling assumptions using public sources, and in consultation with the New York State Department of Public Service (NYSDPS). The primary sources for model inputs were the 2019 NYISO Load & Capacity Data "Gold Book," 2018 NYISO Congestion Assessment and Resource Integration Study (CARIS) Phase 2 Assumptions (2018 CARIS 2), and the United States Environmental Protection Agency (EPA) Continuous Emissions Monitoring Systems data. Table 8-1 below summarizes the key assumptions for this study.

**Table 8-1. PROMOD Modeling Assumptions**

| Parameter | Modeling Assumption |
|---|---|
| **Modeling Year** | 2024 |
| **Peak Load** | 2019 Gold Book Baseline Forecast of Non-Coincident Peak Demand, including impacts of energy-saving programs and behind-the-meter generation |
| **Load Shape** | 2002 Load Shape, as used for 2018 CARIS 2 |
| **Energy Demand Forecast** | 2019 Gold Book Baseline Forecast of Annual Energy, including impacts of energy-saving programs and behind-the-meter generation |
| **Fuel Price Forecast** | CARIS Phase 2 fuel forecasts, applied monthly |
| **Emissions Price Forecast** | 2018 CARIS 2 Emission Price Forecasts |
| **Generating Unit Capacities and Heat Rates** | Default ABB PROMOD database generator parameters |
| **Generator Emissions Rates** | Plant-level emissions rates reported to EPA Continuous Emissions Monitoring System |
| **New Units** | Updated as per 2019 Gold Book, and 2018 CARIS 2 Base Case Assumptions and Preliminary Results. Includes CPV Valley, Cricket Valley, Copenhagen Wind, Arkwright Summit, and Cassadaga Wind. |
| **Retirements** | Updated as per 2019 Gold Book, and 2018 CARIS 2 Base Case Assumptions. Indian Point units 2 and 3 and Cayuga modeled as retired. |
| **External Commitment and Dispatch Hurdle Rates** | Updated as per 2018 CARIS 2 Base Case Assumptions |
| **Thermal Interface Limits** | Updated as per "NYISO Operating Study Summer 2019" by NYISO |
| | Updated as per "NYISO Operating Study Winter 2018-19" by NYISO |
| **Transmission Upgrades** | Updated as per 2018 CARIS 2 Base Case Assumptions. Public Policy Transmission “AC Projects” modeled in service. |
| **System Representation in Simulation** | ABB PROMOD Eastern Interconnect database, with Hydro-Quebec imports to NYISO modeled on a fixed hourly schedule. |

ICF used the ABB PROMOD Eastern Interconnect database as its starting point and implemented simulation assumptions approved by NYSDPS, as summarized in the table above.

Based on consultation with NYSDPS staff, new renewable capacity was included on the basis of projects having received Article 10 approval at the time modeling assumptions were developed. On this basis, the Cassadaga Wind project was modeled as in service.

ICF modeled the recently approved Segment A and Segment B AC transmission projects (T027 + T019) in-service, after consulting with NYSDPS staff. This upgrade was modeled as increasing transfer capability on the UPNY-SENY interface by 1,850 MW, Central East interface by 875 MW, and the UPNY-ConEd interface by 375 MW. The B and C lines, which connect Consolidated Edison in NYISO Zone J and PSEG in PJM, were modeled as in-service, as per the 2018 CARIS Phase 2 Base Case Assumptions.

### *(1) Estimated Statewide and Regional Levels of $SO_2$, $NO_x$ and $CO_2$*

Table 8-2 below presents the impact of the Project on emissions in New York State and the Northeast Region (PJM, ISO-NE, and Ontario). Due to the interconnected nature of the NYISO grid and neighboring markets, the addition of this Project in NYISO impacts generation in other regions. Regional power sector emissions of $NO_x$, $SO_2$, and $CO_2$ decreased in the Change Case. $NO_x$ and $SO_2$ emissions declined in the Change Case by 242 tons (3 percent) and 161 tons (12 percent), respectively from plants located in New York, and by 463 tons (0.2 percent) and 437 tons (0.1 percent), respectively, on a regionwide basis.[1] Emissions of carbon dioxide declined by 333,000 tons (0.1 percent) on a regionwide basis (inclusive of New York), despite increasing by 322,000 tons from plants located in New York.

**Table 8-2. Emissions Summary**

| Region | Emissions (Short Tons) | Base Case | Change Case - With Project | Delta |
|---|---|---|---|---|
| New York | $NO_x$ | 7,540 | 7,298 | (242) |
| | $SO_2$ | 1,387 | 1,227 | (161) |
| | $CO_2$ | 26,832,605 | 27,154,390 | 321,786 |
| Northeast | $NO_x$ | 229,696 | 229,233 | (463) |
| | $SO_2$ | 293,487 | 293,050 | (437) |
| | $CO_2$ | 469,985,745 | 469,652,920 | (332,825) |
| Note: Northeast Region is inclusive of NYISO, in addition to the PJM, ISO-NE, and Ontario bulk power systems. | | | | |

[1]Including the NYISO, PJM, ISO-NE and Ontario wholesale power markets.

Figures 8-1 and 8-2 of Appendix 8-1 show the distribution of generation displaced by the Project, calculated as net generation in the Change Case minus net generation in the Base Case. Total demand was modeled at the same levels in the Base Case and Change Case. As a result, when generation by the Project is accounted for, the change in total generation between the Base Case and Change Case is negligible. Figure 8-1 shows that approximately 67 percent of generation displaced by the Project in the Change Case was located in the NYISO bulk power system, with the remainder located primarily in the neighboring systems of ISO-NE and PJM. Figure 8-2 shows approximately 92 percent of generation displaced by the Project in the Change Case was from natural gas-fired generators, while approximately 8 percent was from coal-fired generators. Generation by coal-fired facilities tends to have higher rates of $CO_2$, $SO_2$, and $NO_x$ emissions than generation by natural gas-fired facilities per unit of electric energy.

### *(2) Estimated Prices for NYISO Zones*

Table 8-3 of Appendix 8-1 shows that the average annual spot prices in all NYISO zones decreased in the Change Case. The load weighted zonal locational marginal price declined in the Change Case by $0.30 per megawatt-hour (MWh) ([redacted]).

### *(3) Estimated Capacity Factor for Project*

The Project's all-hours capacity factor is estimated to be [redacted] percent. The on-peak and off-peak capacity factors are estimated to be [redacted] percent and [redacted] percent, respectively. The maximum 600 net MW Project generated [redacted] MWh of energy in the Change Case.

Table 8-4 of Appendix 8-1 shows the annual and monthly all-hours generation and capacity factor of the Project in the Change Case.

### *(4) Estimated Output Capability Factors for the Project*

Table 8-5 of Appendix 8-1 shows the annual and monthly on-peak and off-peak capacity factors for the Project.

### *(5) Estimated Average Annual and Monthly Production Output*

The Project's net generation in 2024 is estimated to be [redacted] MWh with a capacity factor of [redacted]. Table 8-6 of Appendix 8-1 summarizes the monthly production output of the Project.

### *(6) Estimated Production Curve over an Average Year*

Figure 8-3 of Appendix 8-1 shows the Project's monthly production curve in the Change Case. Maximum output is observed during the summer months.

### *(7) Estimated Production Duration Curve for the Project*

Figure 8-4 of Appendix 8-1 shows the Project's estimated production duration curve in the Change Case.

### *(8) Estimated Energy Dispatch of Existing Must-Run Resources*

Table 8-7 below summarizes the impact of the Project on must-run facilities, defined for this study as existing wind, solar, nuclear, and hydroelectric facilities, as well as certain thermal facilities with minimum generation levels. The Project is found to result in a reduction of approximately 136 gigawatt-hours (GWh) of generation by thermal generators with minimum generation levels, and no reduction in generation by hydroelectric, wind, solar, or nuclear facilities.

**Table 8-7. New York Statewide Generation from Must-Run Facilities**

| Region | Base Case without Project - GWh | Change Case with Project - GWh | Delta |
|---|---|---|---|
| Thermal | 9,696 | 9,560 | (136) |
| Hydroelectric | 26,253 | 26,253 | (0) |
| Wind | 4,434 | 4,436 | 1 |
| Solar | 397 | 397 | - |
| Nuclear | 26,454 | 26,454 | - |
| NYISO | 67,234 | 67,099 | (135) |

## 8(b) Digital Copies of Inputs Used in Simulations

Danskammer has provided, subject to a request for confidential treatment of trade secret information pursuant to section 87(2)(d) of the Public Officers Law and section 6-1.4 of the Commission's regulations, digital copies of all inputs used in the simulations referenced in this Exhibit 8.

# APPENDIX 8-1

# SUPPORTING INFORMATION

*This document contains confidential commercial information, trade secrets, or proprietary information, and/or critical infrastructure information and/or information that is statutorily exempt, as such is entitled to confidential treatment under Section 87(2) of the New York State Public Officers Law and the Commission's Rules and Regulations (16 NYCRR 6-1).*

*An unredacted version of this document has been submitted under separate cover pursuant to 16 NYCRR § 6-1.4.*