
# DANSKAMMER ENERGY CENTER

## Case No. 18-F-0325

## 1001.10 Exhibit 10

## Consistency with Energy Planning Objectives

## Contents



## Table



## Figures

# Exhibit 10: Consistency with Energy Planning Objectives

## 10(a) Consistency with Energy Policies and Long-Range Energy Planning Objectives and Strategies

The New York State Energy Planning Board (SEPB) issued its most recent State Energy Plan in 2015 (the 2015 SEP), guided by the statutory requirements of Article 6 of the New York Energy Law. NYSERDA released its first biennial report to the SEP in 2017.

Overall, the SEP envisions an energy sector that is more environmentally sustainable (in terms of reductions in both greenhouse gases and local pollutants), while also maintaining reliability and resilience and improving affordability for New York residents and businesses. As stated in the 2015 SEP,

*[Reforming the Energy Vision] REV will guide the required capital investment to effectively address the State's energy challenges and in so doing, develop a cleaner, smarter, modernized, resilient, and more reliable grid, which in turn will help power New York's evolving high-tech economy*.[1]

The introduction to the 2015 SEP summarizes the multiple priorities of the plan: "The 2015 New York State Energy Plan…is a comprehensive roadmap to build a clean, resilient and affordable energy system for all New Yorkers."[2]

This Exhibit addresses the consistency of the proposed Danskammer Energy Center (the Project) with the 2015 SEP. Although not required by 16 NYCRR § 1001.10, this Exhibit also discusses the Project's consistency with other state energy objectives and long-term goals and targets, including those set forth in the Climate Leadership and Community Protection Act (CLCPA). The Project would result in the deactivation of the existing steam turbine units of the Danskammer Generating Station, located in NYISO's Hudson Valley zone (Zone G), and replace it with a maximum 600 net megawatt (MW) combined-cycle gas turbine (CCGT) plant. The Project is consistent with the 2015 SEP's overarching intention to "build a clean, resilient and affordable energy system for all New Yorkers." The Project will contribute to a cleaner grid and will reduce emissions of greenhouse gases and local air pollutants by displacing generation from less efficient, higher-emitting power plants. It will contribute to reliability and resiliency by providing

[1] New York SEPB, "The Energy to Load," New York State Energy Plan (the "2015 SEP"), Volume 1 , at 13 (2015).
[2] 2015 SEP, Vol. 1 at 4 (emphasis in original).

reliable and flexible generating capacity to meet challenges created by an aging generation fleet and growing deployment of intermittent renewables. It will contribute to affordability by generating power at a lower cost with superior efficiency, displacing generation by more costly facilities and therefore, reducing electricity system prices and production costs.

The 2015 SEP begins by describing the key challenges and opportunities facing New York's energy sector. These include: Affordability, Environmental Imperatives, Reliability, Updating the Utility Business Model, Environmental Justice, and Clean and Reliable Transportation. It identifies a set of guiding principles, which include: Market Transformation, Community Engagement, Efficiency, Private Sector Investment, Innovation and Technology, and Customer Value and Choice. Finally, the 2015 SEP sets forth three explicit targets to be achieved by 2030: a 40-percent reduction in greenhouse gas emissions from 1990 levels, 50 percent of New York's electricity generation to be derived from renewable sources, and a 600-trillion British thermal units (BTU) increase in statewide energy efficiency.[3] The Project's consistency with the three central goals is detailed below, and its contributions to the other challenges and principles listed in the 2015 SEP are described throughout the remaining responses in this Exhibit 10.

The Project is consistent with the central goals of the 2015 SEP:

***40-percent reduction of GHG emissions by 2030***: The 2015 SEP states that "reducing GHG emissions from the energy sector – power generation, industry, buildings, and transportation – is critical to protecting the health and welfare of New Yorkers."[4] As set forth more fully below, the Project will have a much lower $CO_2$ emissions rate than the existing Danskammer Generating Station it replaces, and will reduce total greenhouse gas emissions regionally by displacing operation of less efficient generating units in the Bulk Power System.

The Project will replace the existing Danskammer Generating Station, which employs steam turbine technology, through the use of modern CCGT technology, allowing it to generate power at a much lower heat rate (the rate of fuel energy input per electrical energy output, a measure of a power plant's efficiency) and emission rates per unit of production. The expected annual average net heat rate of the Project at maximum output is approximately 6,633 BTU/kilowatt-hour (kWh) and 7,540 BTU/kWh at minimum output, while the four units of the existing Danskammer Generating Station have a capacity-weighted heat rate of 10,626 BTU/kWh at maximum output

[3] 2015 SEP, Vol. 1 at 45.
[4] 2015 SEP, Vol. 1 at 45.

and 13,268 BTU/kWh at minimum output. By reducing the amount of fuel needed to produce a given amount of power, the Project will generate power at a significantly lower rate of $CO_2$ emissions. The Project has an expected rate of $CO_2$ emissions of 0.40 tons per megawatt-hour (MWh) at maximum summer output, while the existing Danskammer Generating Station had a realized $CO_2$ emissions rate of 0.80 tons per MWh in 2018.

The Project will reduce total system-wide greenhouse gas emissions by displacing generation from less efficient units. The Project will be among the most efficient gas-fired generators in New York. In 2018, fossil fuel generators in the New York Independent System Operator (NYISO) power market emitted 30 million tons of $CO_2$ and produced 57 terawatt-hours of generation, for an average $CO_2$ emissions rate of 0.53 tons per MWh.[5] At its summer full-output heat rate, the Project will have a $CO_2$ emissions rate of approximately 0.40 tons per MWh. Because less efficient thermal generators tend to have both higher variable costs and higher $CO_2$ emissions rates, the marginal heat rate of the NYISO system is likely well above the average emissions rate of 0.53 tons per MWh. Fossil steam turbine plants in NYISO emitted 7.7 million tons of $CO_2$ in 2018 while generating 12 terawatt-hours, for an average $CO_2$ emissions rate of 0.63 tons per MWh.[6] Production cost modeling performed for Exhibit 8 of this Application estimates that regionwide[7] emissions of $CO_2$ will decline by 332,825 tons with the Project in service.[8]

The New York Public Service Commission (the Commission) has previously acknowledged the role of new, highly efficient generation assets in limiting greenhouse gas emissions. In granting a Certificate of Public Convenience and Necessity to Cricket Valley Energy Center, LLC for the construction of a 1,000-MW combined-cycle gas-powered generating facility, the Commission stated that "regarding greenhouse gases, natural gas is less carbon intensive than other fossil fuels and natural gas-fired combined cycle combustion turbines are generally considered among the most efficient in converting fossil fuel to energy."[9] The Commission also noted that while a new, efficient generating project may itself produce significant emissions due to its high utilization,

[5] This was calculated from EPA Continuous Emissions Monitoring System (CEMS) data for the year 2018.
[6] This was calculated from EPA Continuous Emissions Monitoring System (CEMS) data for the year 2018.
[7] Regionwide includes NYISO, PJM, ISO-NE and Ontario wholesale power markets.
[8] *See* Application Exhibit 8 – Electric System Production Cost Modeling.
[9] Case 11-E-0593, *Petition of Cricket Valley Energy Center*, Order Granting Certificate of Public Convenience and Necessity and Establishing Lightened Ratemaking Regulation at 14 (issued February 14, 2013) ("Cricket Valley Order").

its effect on the system as a whole is to reduce emissions: "Although the project will be a major source of air emissions, carbon dioxide production regionwide is expected to decrease."[10]

It is important to note that because of the complex and interconnected nature of regional wholesale power markets, the Project may have the effect of displacing generation and greenhouse gas emissions from other power plants located both inside and outside New York. Because the warming effects of greenhouse gases are global in nature and do not depend on the location of the emissions, New York's net imports of electricity from other regions also contribute to its climate footprint. According to the state's 2016 Greenhouse Gas Inventory, imports of electricity account for 12 percent of total electricity sector $CO_2$ emissions.[11] To the extent that it also displaces out-of-state generation by reducing net imports of electricity, the Project will contribute to the goal of reducing New York's overall energy sector GHG emissions contained in the SEP and other State policies. The Commission acknowledged this effect in its Cricket Valley Order, where it stated that "carbon dioxide emission would increase slightly in New York due to an increase in in-state generation but would decrease across the region."[12]

The CLCPA passed by New York's legislature and signed into law in July 2019 would require even larger reductions of greenhouse gas emissions than those contemplated by the SEP, mandating establishment of a 40-percent reduction of statewide greenhouse gas emissions relative to 1990 levels by 2030 and an 85-percent reduction by 2040.[13] For the reasons described in this section, the Project is consistent with the State's commitment to significantly mitigate New York's greenhouse gas emissions, as it will have the immediate impact of reducing power sector $CO_2$ emissions on a regional basis relative to an alternative without the Project by displacing output by less efficient and higher-emitting generators. Improvement in the efficiency of the existing generation fleet through private investment, as represented by the Project, will help bring New York closer to its emissions reduction goals at no incremental cost to ratepayers.

**50 percent renewable energy by 2030**: The Project is consistent with and supportive of New York's goal to increase the share of renewable energy in its electricity supply mix. Although the Project is not itself a renewable energy source, it will improve the ability of New York's electricity

[10] Cricket Valley Order at 4.
[11] New York State Energy Research and Development Authority (NYSERDA), "New York State Greenhouse Gas Inventory: 1990-2016" at S-3 (July 2019). This estimate includes emissions from Electricity and Net Imports of Electricity.
[12] Cricket Valley Order at 15.
[13] CLCPA amendment to Environmental Conservation Law at § 75-0107

system to reliably and cost-effectively support large amounts of renewable energy by replacing the existing Danskammer Generating Station with a repowered facility that can operate in a more flexible manner. The Project will replace the existing Danskammer Generating Station, which uses steam turbine technology and has limited operational flexibility, with state-of-the-art CCGT technology that has a faster ramp rate, faster start-up time, and greater operational flexibility. These advantages include significantly more competitive fuel efficiency even when turned down to minimum load; as noted previously, the expected annual average heat rate of the Project at minimum load is 7,540 BTU/kWh, compared to 13,268 BTU/kWh for the existing Danskammer Generating Station. These capabilities will allow the Project to operate complementarily with intermittent renewables, such as wind and solar, by efficiently operating at different output levels to accommodate varying net load throughout the day, while being able to quickly increase or decrease output in response to net load ramps, and supplying ancillary services to mitigate uncertainty surrounding renewable output. The Project will replace the existing Danskammer steam turbine units, which do not have these capabilities.

The importance of flexible, dispatchable supply for integrating intermittent renewable energy is well established. A 2016 study by the National Bureau of Economic Research found that, in 26 OECD[14] countries, from 1990 to 2013, a 1-percent increase in the share of fast-reacting fossil technologies (including combined-cycle gas plants) was associated with a 0.88-percent increase in the deployment of renewable energy capacity over the long term, concluding that "renewable energy and fast-reacting fossil fuel technologies appear as highly complementary and should be jointly installed to meet goals of cutting emissions and ensuring stable supply."[15]

A report by the National Renewable Energy Laboratory (NREL) on the challenges of integrating intermittent renewables lists flexible generation sources as a key method for successful integration. NREL noted that the presence of wind and solar generation causes fossil generators to turn on and off or modify output frequently to accommodate changes in variable generation,

[14] The Organization for Economic Co-operation and Development ("OECD") is an intergovernmental economic organization with 36 member countries, founded in 1961 to stimulate economic progress and world trade.

[15] Verdolini, Vona, and Popp, "Bridging the Gap: Do Fast Reacting Fossil Technologies Facilitate Renewable Energy Diffusion?," National Bureau of Economic Research Working Paper 22454 at 26 (July 2016).

and that such "cycling" is costly for generators that were not designed with a focus on flexibility.[16] Intermittent resources also create a need for supply that can quickly and reliably accommodate net load ramps, as discussed in the response to Section 10(b) of this Exhibit 10.

NREL also noted that thermal steam plants have limited flexibility for accommodating renewable output because their thermal inertia limits the ability to ramp up or down quickly.[17] Steam turbine plants make up a large portion of current NYISO generation capacity, comprising 12.7 gigawatts (GW) (28 percent) of statewide nameplate capacity and 7.1 GW (41 percent) of capacity in the Lower Hudson Valley (LHV) (zones G-J) region.[18] By replacing an existing steam turbine facility with a new CCGT designed to have much lower start-up costs, greater efficiency while operating at minimum generation levels, and a faster and controllable ramp rate, the Project will facilitate accommodation of intermittent renewable energy with lower costs and emissions than the existing NYISO generation fleet can provide.

It is important to emphasize, in addition to these benefits, that the Project will not inhibit New York from achieving its goal for the deployment of renewable energy or increase the actual cost to ratepayers of doing so. Renewable resources, such as wind and solar, which have very low or zero variable costs in real time, are dispatched in the wholesale power market prior to gas-fired generators, which embed the cost of fuel and other variable expenses in their energy market bids. As a result, the Project will not displace generation by wind, solar, and hydropower sources. Production cost modeling performed for Exhibit 8 of this Application found no reduction of wind, solar, or hydropower output in New York as a result of modeling the Project in service.[19] A large increase in the penetration of new wind and solar in the NYISO market will tend to reduce generation by the Project, which will be dispatched only when real time wind and solar output are not sufficient to satisfy electricity demand. As such, the completion of the Project will not "lock in" any quantity of fossil fuel generation or emissions.

While the Project will reduce energy market prices for all other generators by displacing less efficient thermal generation, it will not increase the full costs to ratepayers of deploying a given quantity of wind and solar, which are recovered through a combination of market revenues and

[16] Bird, Milligan, and Lew, "Integrating Variable Renewable Energy: Challenges and Solutions," NREL Technical Report NREL/TP-6A20-60451 at 3 (2013) (the "NREL Report").
[17] NREL Report at 8.
[18] This was calculated from the nameplate capacity value of Existing Generating Facilities listed in NYISO's 2019 NYISO Load and Capacity Data Report ("2019 Gold Book").
[19] See Exhibit 8 – Electric System Production Cost Modeling.

Renewable Energy Credits (RECs) paid by load-serving entities and ultimately assessed to ratepayers. State policy does not mandate that a reduction of energy prices should be avoided through restricting upgrades to the efficiency of the generation fleet; rather, the 2015 SEP lists affordability to consumers as a key concern. The Project is expected to be financed using entirely private capital, so that no significant financial resources otherwise available to the State would need to be diverted from the renewable energy goals in the 2015 SEP to the Project.

The CLCPA, adopted in 2019, requires more rapid deployment of renewable energy than the current goals under the SEP. The CLCPA mandates establishment of a program to require that electric load in New York be served 70 percent by renewable sources by 2030 and 100 percent by zero emissions sources by 2040.[20] The importance of flexible, dispatchable supply to complement large penetrations of intermittent renewable energy described in this section is equally, if not more, valid in the context of a larger renewable penetration than the 50 percent envisioned by the SEP. With a larger penetration of renewables, the need for dispatchable generation to balance variability of intermittent resources will likely be of even greater concern. As discussed below in Section 10(b) on the reliability role of the Project, the NYISO has emphasized the need for such resources in its *2019 Power Trends* and draft *Reliability and Market Considerations for a Grid in Transition* in which it reports: "the primary future challenge arises from the variability and unpredictability of wind and solar generation resources and the potentially large quantities of each. As the penetration of those technologies increases, the grid will need responsive and flexible resources that provide operating reserves capacity available to service load when wind and/or solar generation output is insufficient for periods that may range from minutes to several days."[21] These reports were issued prior to the adoption of the CLCPA, in the context of the current 50-percent Clean Energy Standard. While the NYISO has yet to issue a formal analysis of needs presented by the CLCPA, it is likely that the value of flexible dispatchable resources will be even greater given a more ambitious target for renewables in New York.

The CLCPA requires the Commission to establish a program to require that the statewide electrical demand system will be zero emissions by the year 2040, subject to modification based on consideration of impacts on safe and adequate electric service in the State under reasonably foreseeable conditions.[22] As the technology and market landscape evolves over the next two

[20] CLCPA amendment to Public Service Law at e
[21] NYISO, "Reliability and Market Considerations For a Grid in Transition," at 4 (May 2019) ("NYISO Grid in Transition White Paper").
[22] CLCPA at § 4

decades, the precise composition of the State's electric supply infrastructure most consistent with achieving statewide zero emission demand by the year 2040 cannot be predicted with certainty and will likely involve developments or technologies that are not foreseen or not commercially viable today. For example, it is technically possible for the Project to utilize or be converted to utilize alternative emissions-free fuels, such as renewable natural gas or hydrogen fuel, if such sources or other alternative fuels become commercially and economically available in the future. The Project is, therefore, consistent with the State's long-term targets for renewable and zero-emissions electricity contained in the CLCPA, as the Project will operate complementarily with intermittent renewable resources in the foreseeable future and continue to offer reliability and other services as required by the unforeseeable needs of the grid in the long term. Because the Project is expected to be financed entirely with private capital, financial risk associated with the long-term value of the Project to the State's power system will accrue exclusively to the Project's owners and investors.

**600 trillion Btu increase in statewide energy efficiency**: The 2015 SEP states that "energy efficiency results in lower energy bills and is the single most cost-effective tool in achieving clean energy objectives."[23] While the Project is a generation resource and not a demand-side efficiency measure, it is fully consistent with the focus on efficiency contained in the 2015 SEP. The Project will have an annual average heat rate at maximum output of 6,633 Btu/kWh, a significant reduction from the 8,834 Btu/kWh 2018 weighted average for fossil generation in NYISO.[24] Because marginal generation in eastern New York is overwhelmingly provided by gas-fired units in the NYISO market, marginal units are likely to be less efficient (therefore, higher-cost) units. Hence, the Project will improve the efficiency of New York's electricity system in converting fuel to power in order to serve electricity load, allowing a given amount of demand to be supplied using less fuel, producing fewer emissions, and at a lower cost.

Finally, while the 2015 SEP and State policy in general have emphasized the importance of renewable and distributed energy sources, it does not exclude the operation of central power stations and acknowledges that such facilities will continue to play an important role in the foreseeable future. The 2015 SEP states that "continued investment in the maintenance, repair and upgrade of the State's generation and transmission systems is an essential component in

[23] 2015 SEP, Vol. 1 at 45.
[24] This was calculated from EPA Continuous Emissions Monitoring System (CEMS) data for the year 2018.

improving New York's infrastructure reliability and resiliency."[25] The 2015 SEP acknowledges the importance of replacing aging generation infrastructure in the context of protecting reliability and resiliency: "there will continue to be a need for investments in central generation as well, as more than 60 percent of New York's existing power generating capacity is more than 35 years old."[26] Volume 2 of the SEP also discusses plant retrofits as a positive environmental strategy: "other non-regulatory methods of encouraging retrofitting of older electric generating facilities with modern pollution control equipment could also help to lower emissions from these facilities."[27] As these statements make clear, investment in central power plants, particularly the upgrade or repowering of aging units that improve their reliability and environmental impact, are a component of the State's energy strategy as detailed in the 2015 SEP. In a 2015 Order regarding transmission line projects meeting a public policy need, the Commission similarly stated,

> *REV is intended to achieve State policy goals of fostering a reliable, cost effective and environmentally sound power sector through actions that drive system wide efficiency at the supply, bulk power and demand sides of the power system. The future envisioned by REV is that distributed energy resources deployed locally will help customers become efficient and dynamic electric users…Additionally, the Commission recognizes that large scale central generation…can continue to be operated and new investments can be made to compliment the distributed resources.*[28]

The Project is consistent with the 2015 SEP in that it will retrofit an existing power station to improve its contributions to reliability, affordability, environmental impact, and other goals of the State policy, as described in detail throughout the remaining responses.

**10(b) Impact on Reliability**

The Project will supply a maximum 600 net MW of reliable capacity toward meeting New York's resource adequacy requirements. The replacement of the existing Danskammer Generating Station by the Project will result in a net increase in capability of approximately 84.4 MW in summer and 88.9 MW in winter. This increase in generating capacity will contribute to the

[25] 2015 SEP, Vol. 1 at 13.
[26] 2015 SEP, Vol. 1 at 13.
[27] SEP, Vol. 2 at 32.
[28] Case 12-T-0502 et al., *Proceeding on Motion of the Commission to Examine Alternate Current Transmission Upgrades*, Order Finding Transmission Needs Drive by Public Policy Requirements at 26 (issued December 17, 2015).

resource adequacy of the NYISO bulk power system. NYISO performed a System Reliability Impact Study (SRIS) for the Project in accordance with the Applicable Reliability Standards set forth under Attachment X of the NYISO Open Access Transmission Tariff. The SRIS concluded that the Project will not adversely impact the reliability of the New York State Transmission System, provided the Project will be operated in accordance with all NYISO requirements and that the Project and associated interconnection facilities will be designed in accordance with the Applicable Reliability Standards.[29]

The Project will contribute to reliability in New York by providing capacity that supports long-term electricity system resource adequacy, in a context where a large amount of existing capacity is at risk of retirement in the coming years. NYISO is responsible for reliable operation of New York's power grid and for the planning of the power system to maintain long-term reliability.[30] According to NYISO,

> *…[a] growing amount of New York's gas-turbine and fossil fuel-fired steam-turbine generation capacity is reaching an age at which, nationally, a majority of similar capacity has been deactivated. In 2019, 1,166 MW of steam-turbine generating capacity in New York State is 62 years old or older — an age at which, nationally, 95% of such capacity has ceased operations. For gas turbines, 2,331 MW of generating capacity in New York State is 47 years old or older. Nationally, 95% of generating capacity using this technology has deactivated by this age. By 2029, more than 8,370 MW of gas-turbine and steam-turbine generating capacity in New York could reach an age at which nationally 95% of these types of generation capacity have deactivated.* ***While there have been significant additions to New York's generating capacity since 2000, power plants age like all physical infrastructure. The need to maintain, upgrade, or replace aging generation infrastructure requires renewed attention.***[31]

The Project will support long-term reliability in the event that a greater-than-expected number of generator retirements occur. According to the NYISO's 2019-2028 Comprehensive Reliability Plan (CRP),

---

[29] New York Independent System Operator, "NYISO Review of the System Reliability Impact Study for Danskammer Energy Center Project Interconnection Queue #791,"( July 23, 2019).
[30] NYISO, "What We Do", accessed September 28, 2019, https://www.nyiso.com/what-we-do.
[31] NYISO, "Power Trends 2019 – Reliability and a Greener Grid," at 16 (2019) ("NYISO 2019 Power Trends") (emphasis in original).

> *…while the NYISO concludes that long-term reliability needs have been satisfied in this cycle of the Reliability Planning Process, the margin to maintain reliability could narrow or be eliminated over the ten-year study period based upon changes in assumptions. Potential risk factors, such as generator unavailability, generator deactivations, external control area capacity sales, delay in proposed resource additions or transmission plans, or higher load levels, could potentially lead to transmission security or resource adequacy violations.*[32]

The CRP notes that reliability of the New York Control Area (NYCA) could be adversely affected if additional generating units beyond those already contemplated in the 2018 Reliability Needs Assessment become unavailable or retire, and that there are risk factors affecting existing generation capacity including financial viability, compliance with emission requirements, and operation of aging units. NYISO specifically cites declining reliability and retirement risk of aging generators as a concern: "as generators age and experience more frequent and longer duration outages, the costs to maintain the assets increase. This may drive aging generation into retirement."[33] The reliable capacity provided by the Project will support the continued reliability of the grid in the event that such risks materialize, while simultaneously reducing system costs and emissions.

The old age of the generation fleet is especially pronounced in downstate New York. In the LHV capacity zone (NYISO zones G-J), as of September 2019, of the oil- and gas-fired nameplate capacity, there are 1,581 MW that are at least 60 years old; 4,680 MW that are at least 50 years old; and 9,243 MW that are at least 40 years old. Oil- and gas-fired generators above ages 60, 50, and 40 correspond to 9.1 percent, 26.9 percent, and 53.2 percent of total existing nameplate capacity in the LHV, respectively.[34] If the retirement of Indian Point Units 2 and 3 (a combined 2,311 MW) and the completion of the currently under-construction Cricket Valley Energy Center (1,020 MW) are assumed, the percentage of units aged at least 60, 50, and 40 years in the LHV increases to 9.8 percent, 29.1 percent, and 57.5 percent, respectively. As generating units reach old age, their forced outage rate tends to increase and the probability that they will require major repairs or replacement tends to increase.

---

[32] NYISO, "2019-2028 Comprehensive Reliability Plan," at 4 (July 16, 2019) ("NYISO CRP").
[33] NYISO CRP at 10.
[34] This was calculated from the nameplate value of Existing Generation Facilities in the 2019 NYISO Gold Book.

A proposed rule issued by the New York State Department of Environmental Conservation limiting the nitrogen oxide ($NO_x$) emissions from simple cycle and regenerative combustion turbines may further reduce installed capacity in the region.[35] According to analysis performed in NYISO's 2019-2028 CRP, this regulation could affect an estimated 3,335 MW of existing nameplate peaking capacity, of which 1,758 MW is located in NYISO Zone J (a part of the LHV capacity zone in which the Project will be located).[36] A net reduction of installed capacity in the LHV region as a result of these regulations would further increase the reliability value of the Project.

The Project will also contribute to reliability in New York by repowering an existing facility to operate with greater flexibility in an environment where intermittent renewable resources such as wind and solar energy play an increasing role. Intermittent renewables are a key component of the State's energy strategy as outlined in the 2015 SEP and other State policies, but they also pose a challenge for system operators tasked with maintaining grid reliability. In its draft white paper "Reliability and Market Considerations for a Grid in Transition," issued in May 2019, the NYISO states unequivocally

> *…the primary future challenge arises from the variability and unpredictability of wind and solar generation resources and the potentially large quantities of each. As the penetration of those technologies increases, the grid will need responsive and flexible resources that provide operating reserves capacity available to service load when wind and/or solar generation output is insufficient for periods that may range from minutes to several days.*[37]

There are multiple requirements for securing reliability given a large expansion of intermittent renewable energy. First, there is a need for overall capacity levels (or resource adequacy) that can be reliably committed to satisfy demand at any time in order to comply with NERC reliability criteria, including in periods when output of intermittent renewables is low. According to NYISO,

> *…as intermittent resources like wind and solar expand across the bulk power system, the IRM [Installed Reserve Margin] percentage will need to increase because intermittent resources*

[35] New York State Department of Environmental Conservation, "Proposed Subpart 227-3, Ozone Season Oxides of Nitrogen ($NO_x$) Emission Limits for Simple Cycle and Regenerative Combustion Turbines", https://www.dec.ny.gov/regulations/116131.html.
[36] NYISO CRP at 14.
[37] NYISO, "Reliability and Market Considerations For a Grid in Transition," at 4 (May 2019) ("NYISO Grid in Transition White Paper").

*do not contribute an equivalent amount of capacity to reliably meet peak demand as dispatchable resources. Policymakers will need to be cognizant that the intermittency of renewable resources requires that flexible and controllable capacity be available to meet load in the absence of sufficient renewable energy production.*[38]

For example, on the peak demand day of August 29, 2018, wind and solar generation in the NYISO system reached 1,100 MW and 780 MW, respectively, by noon, but had declined due to a combination of resource output and transmission to 445 MW and 410 MW, respectively, at the time system demand peaked at 4 PM (see Figure 10-1).[39]

Second, there is a need for capacity that is flexible enough to perform "load following" of more variable net load patterns, respond to short-term fluctuations and ramps in net load, and insure against forecast uncertainty associated with intermittent renewable energy. NYISO considers resource flexibility to be one of the overarching principles essential to sustaining reliability on a renewable-intensive grid.[40] According to NYISO,

*…as the penetration of those [wind and solar] technologies increases, the grid will likely need more load-following capability, and possibly more fast-response and flexible resources that provide operating reserves to address expected and unexpected changes in net load.*[41]

NYISO considers key attributes of flexible resources needed to reliably integrate intermittent renewables to include "the ability to respond rapidly to dynamic system conditions, provide controllable ramping capability with fast response rates, and the ability to startup and shutdown quickly and frequently in response to system needs."[42] The Project will repower the existing Danskammer Generating Station to improve performance in each of these areas. The Project will have an estimated ramp rate of 13 MW per minute from a hot start (within 8 hours of its last shutdown), allowing it to change output by approximately 130 MW within 10 minutes and provide its full 600 net MW output of the facility in less than an hour. By contrast, the combined four units of the existing Danskammer Generating Station have a ramp rate of approximately 9 MW within an hour after grid synchronization, and require approximately 11 hours of pre-boiler firing before being able to provide electricity to the grid. The Project will, therefore, provide more flexible load-

[38] NYISO 2019 Power Trends at 23.
[39] NYISO 2019 Power Trends at 28.
[40] NYISO 2019 Power Trends at 46.
[41] NYISO Grid in Transition White Paper at 5-6.
[42] NYISO 2019 Power Trends at 46.

following capability, and will also have the ability to participate in the operating reserves and frequency regulation ancillary services markets, whereas the existing Danskammer Generating Station cannot.

The reliability benefits provided by the Project are complementary, not redundant, to other policies that are being pursued by the State. Notably, the Commission issued an Order in 2018 establishing targets for 1.5 GW of energy storage capacity to be installed by 2025 and 3.0 GW by 2030.[43] While energy storage resources also play a key role in the integration of renewables, the NYISO has stressed that a broader portfolio of flexible resources, including those that are not duration-limited, is needed:

> *Battery storage can contribute to meeting operational needs and is often discussed as a necessary tool to balance the intermittent nature of renewable resources. However, battery storage is insufficient to fully meet peak demand, even at penetration levels envisioned by policymakers over the next decade, due to technological constraints limiting their contribution to meeting the full duration of peak demand periods. To balance lower capacity factor, intermittent resources, and shorter-duration resources like energy storage, bulk power system operators will require a full portfolio of resources that can be dispatched in response to any change in real-time operating conditions to maintain bulk power system reliability. The ability to dispatch resources to reliably meet ever-changing grid conditions and serve New York's electric consumers will always be paramount.*[44]

**10(c) Impact on Fuel Diversity**

The Project will use natural gas as its primary fuel and will be dual-fueled with the capability to use ultra-low sulfur diesel (ULSD) oil as a back-up fuel. The ability to generate electricity using ULSD instead of natural gas, when required, will support the resiliency of New York's electricity system during periods of extreme winter weather when gas supplies may become constrained.

While New York's power generation is derived 41 percent from gas-fired plants today,[45] the total share of gas-fired generation is expected to decline over time as renewable and distributed resources enter service in increasing quantities under the 2015 SEP, Clean Energy Standard,

[43] Case 18-E-0130, *In the Matter of Energy Storage Deployment*, Order Establishing Energy Storage Goal and Deployment Policy, (issued December 13, 2019).
[44] NYISO 2019 Power Trends, p. 29
[45] Potomac Economics, "2018 State of the Market Report for the New York ISO Markets," at 6 (May 2019).

and other State policies. Because many renewable resources such as wind and solar generate power at a very low or zero marginal cost in real time, these sources will displace generation by gas-fired plants. However, as discussed in Section 10(b) of this Exhibit, efficient and flexible gas generation, in conjunction with other measures such as energy storage and demand response, will play an important role in providing complementary services to maintain reliability as wind and solar penetration grows. The Project may, therefore, constitute useful fuel diversity in the energy future envisioned by the 2015 SEP and other State policies due to its operational flexibility, and high efficiency, whereas the existing Danskammer Generating Station will be significantly more challenged to do so.

**10(d) Impact on Regional Requirements for Capacity**

The Project will be located in the transmission-constrained LHV capacity region of the NYISO bulk power system, encompassing NYISO zones G through J. The LHV capacity zone was created in 2013, in recognition of the need for local generation capacity to be maintained to ensure reliability due to peak demand in excess of transmission import capability.[46] As of the 2019-2020 Capability Year, NYISO has established a Locational Capacity Requirement (LCR) requiring that sufficient generation capacity to meet 92.3 percent of peak demand in LHV be maintained locally.[47] LHV is one of four capacity zones in NYISO – the others are Long Island, New York City, and NYCA (encompassing the entire state). A statewide IRM is determined by the New York State Reliability Council, while the LCRs of the other three "localities" are determined by NYISO. The Project will supply capacity to satisfy both the LCR of the LHV zone and the statewide IRM.

The Project will reduce regional requirements for capacity needed to maintain reliability by increasing the average reliability of the NYISO generation fleet. Both the IRM and the LCRs are affected by the expected unavailability of generation capacity, as measured by the equivalent forced outage rate (EFORd) of conventional generators and the average output during peak hours of intermittent resources.[48] If the average expected unavailability of the generation fleet increases,

[46] FERC Case No. ER13-1380-000, "Order Accepting Proposed Tariff Revisions and Establishing a Technical Conference," Docket No. ER13-1380-000 (August 13, 2013).
[47] NYISO, "Locational Minimum Installed Capacity Requirements Study for the 2019-2020 Capability Year," (January 17, 2019).
[48] NYISO Installed Capacity Manual at 6-7 (September 2019).

the IRM or LCR of the area will also increase to reflect the fact that a larger amount of installed capacity must be procured to reliably meet peak demand, and vice versa.[49]

The Project will reduce the average unavailability of the generation fleet in the LHV locality and the broader NYCA region. In the summer 2019 capability season, NYISO employed an average ICAP/UCAP conversion ("derating") factor of 5.14 percent for LHV and 8.79 percent for NYCA, based on historical and expected generator availability. Analysis performed by NYISO in 2019 suggests that the historical average EFORd of steam turbine plants in NYISO is 7.96 percent, whereas the average availability of existing combined-cycle plants is 3.72 percent.[50] The expected EFORd of the Project upon entering service is approximately 2.5 percent. Hence, the statewide IRM and the LHV LCR will be reduced as a result of the Project entering service, due to the greater reliability of the new Project compared to existing capacity.

**10(e) Impact on Electric Transmission Constraints**

Danskammer will transfer its existing NYISO Capacity Resource Interconnection Service (CRIS) rights of 515.6 MW related to the existing Danskammer Generating Station to the Project. Further, Danskammer is currently a participant in NYISO's 2019 Class Year for its Facilities Study, whereby it is requesting an incremental 84.4 MW of CRIS rights to accommodate the capacity of the Project. Pursuant to NYISO's SRIS for the Project, Interconnection Queue #791, dated July 23, 2019:

> *The results presented in the report indicate that the proposed Project will not adversely impact the reliability of the New York State Transmission System. This conclusion is based on the following understandings and assumptions:*
>
> - *The Project will be operated in accordance with all NYISO requirements, including all applicable NYISO and Transmission Owner day ahead and real time operational procedures and limits. The NYISO will operate the Project in a manner that does not negatively impact the New York State Transmission System.*

[49] See, e.g., New York State Reliability Council, LLC Installed Capacity Subcommittee, "New York Control Area Installed Capacity Requirement for the period May 2019 to April 2020," at 2 (December 7, 2018) (explaining upward and downward drivers of the 2019-2020 Installed Reserve Margin).

[50] NYISO, "Tailored Availability Metric," at 15-16 (May 9, 2019) https://www.nyiso.com/documents/20142/6474763/Tailored%20Availability%20Metric%20050919.pdf/2c86f002-0fe5-b3cb-05d8-f118e4dd392f.

- *The Project and associated interconnection facilities will be designed in accordance with all the Applicable Reliability Standards.*

*The SRIS results and conclusions are based on the studied scenarios and various assumptions related with the study methodologies, system, and Project modeling information provided by the Developer; any Project modeling change can result in different results and possible re-study.*

*Subject to the above, NYISO Staff is satisfied that the Study was performed in accordance with the approved scope and in conformance with the existing Applicable Reliability Standards. Therefore, the NYISO Staff recommends approval of this SRIS.*

According to the same report,

*Developer proposed Elective System Upgrade Facilities (Elective SUFs) to perform terminal upgrades on the two 115 [kilovolt] kV lines from Danskammer to North Chelsea Substations and one 115 kV line from East Walden to Chadwick Lake.*

Any system additional reinforcements identified by NYISO that are necessitated by the Project will be allocated to and paid by Danskammer through the NYISO's Class Year interconnection process.

The Project will relieve transmission congestion between upstate New York and the downstate (LHV) region by supplying low-cost power downstream of several major transmission constraints. The Project is in NYISO's Hudson Valley transmission zone (Zone G), in which prices in the NYISO energy market have historically been at a premium relative to the West, Genesee, North, Mohawk Valley, and Capital zones (zones A through F) due to transmission congestion and losses. Notable transmission constraints between upstate New York and Hudson Valley include the Central East interface between NYISO zones A through E and zone F, and the transmission corridor between zones F and G (including the UPNY/SENY interface and the Pleasant Valley-Leeds 345 kV and Leeds-New Scotland 345 kV constraints). In 2018, Central East accrued the largest share of congestion out of all transmission constraints in NYISO, accounting for 32 percent of the $501 million of NYISO congestion revenues in the day-ahead market.[51]

[51] Potomac Economics, "2018 State of the Market Report for the New York ISO Markets," at A-69 (May 2019).

Congestion across transmission constraints carrying power from western, northern, and central New York to the LHV region is likely to remain significant for the foreseeable future, even after completion of the AC Transmission Projects approved by the NYISO Board in 2019. NYISO's 2018 update of its Congestion Assessment and Resource Integration Study (CARIS), which assesses system congestion and potential transmission needs, included generic representations of the AC Projects in its transmission model and found that Central East remains a significant constraint (measured by demand congestion) even after completion of the AC Projects.[52] The Project will reduce the cost of congestion in the Hudson Valley region by generating power at a lower cost than existing resources in a region of New York that will be impacted by transmission constraints and therefore, will require local generation.

**10(f) Impact on Fuel Delivery Constraints**

The Project is expected to have a lower heat rate than any existing gas-fired generating unit in the NYISO system.[53] As a result, by displacing generation from less efficient plants, the Project will reduce the amount of natural gas required for New York's generation fleet to produce a given amount of power. The actual impact on fuel delivery constraints at any given point in time may vary based on the degree to which generation inside or outside New York is displaced by the operation of the Project, and the corresponding changes in gas pipeline flows.

In New York, the most severe constraints on transport and delivery of natural gas take place during periods of severe cold winter weather. Historically, power generation by oil-fired and dual-fuel units has increased in such periods, as gas prices may increase significantly to reflect high demand from the building heating sector and limitations on pipeline transport capacity. The Project will have dual fuel functionality and will be capable of switching to ULSD fired generation if required to do so by reliability considerations during such periods. Units 3 and 4 of the existing Danskammer Generating Station fire solely on natural gas, while Units 1 and 2 can fire on either No. 6 fuel oil or natural gas. The Project will source natural gas over Central Hudson Gas & Electric's (CHGE) local natural gas transmission/distribution system. CHGE is currently interconnected to four major interstate gas transmission lines: Iroquois Gas Transmission System, Algonquin Gas Transmission Pipeline, Tennessee Gas Pipeline, and Millennium Pipeline. Having

[52] NYISO, "2018 CARIS Phase 2 Base Case Assumptions and Preliminary Results," at 21 (August 8, 2018), https://www.nyiso.com/documents/20142/2175850/2018_CARIS_2_Base_Case.pdf/3352b82c-def8-d320-9c4d-c832152e7b6a.

[53] This was based on 2018 EPA Continuous Emissions Monitoring System (CEMS) data for all natural gas plants in NYISO with at least 1 MWh of generation.

indirect access to four major interstate natural gas pipelines will provide the Project with greater fuel-sourcing flexibility and optimization opportunities. In addition, the low heat rate of the Project compared to other fossil fuel generating units in the NYISO system or the existing Danskammer Generating Station will allow the Project to convert either natural gas or ULSD to power more efficiently when necessary due to fuel-delivery constraints.

### 10(g) Impact on Other Energy Policies or Long-Range Energy Planning Objectives and Strategies

An overview of the compatibility of the Project with the main goals and overall priorities of the 2015 SEP is discussed in the response to Section 10(a) in this Exhibit 10. The Project also contributes to addressing several of the key challenges for New York's energy sector discussed in the SEP, and is in line with the guiding principles in the SEP.

#### *Challenges and Opportunities*

The 2015 SEP lays out several key areas of challenge and opportunity for New York's energy sector. The Project will contribute to addressing several of these challenges and achieving the goals of the 2015 SEP:

**Affordability:** The 2015 SEP emphasizes the need to take measures towards reducing energy costs to benefit ratepayers and the State economy. The 2015 SEP states,

> *…the State needs to maintain its focus on affordability, so energy bills for the State's residential customers constitute a declining percentage of their disposable income, and more competitive industrial rates contribute to the growing mix of attributes that will attract new businesses to, and retain existing businesses in, New York. More needs to be done to lower rates given utility costs are frequently cited as a barriers to business relocation or expansion across the State*.[54]

The Project will directly reduce electric energy prices and total production costs by generating power at lower cost compared to marginal generating units in the NYISO market today. Production cost modeling performed for Exhibit 8 of this Application shows a load-weighted average reduction

[54] 2015 SEP, Vol. 1 at 9-10.

to zonal prices in the NYISO energy market as a result of modeling the Project in service, due to displacement of generation from higher-cost sources and electricity imports by the Project.[55]

The Project is intended to earn revenues solely in the competitive NYISO wholesale power markets. If future market conditions change to the detriment of the Project, financial losses associated with a reduced value of the Project would be borne exclusively by its owners and investors. Hence, the Project will make energy more affordable in New York without imposing any financial risk of becoming a 'stranded asset' to ratepayers.

**Environmental Imperatives**: Section 10(a) in this Exhibit describes the impact that the Project will have on reducing the greenhouse gas emissions rate of the existing Danskammer Generating Station as well as total regionwide greenhouse gas emissions.

The 2015 SEP stresses the importance of limiting local pollution: "Clean air and clean water are essential to New Yorkers' health and quality of life as well as the State's growing tourism business and other economic development opportunities."[56] In replacing the existing Danskammer Generating Station, the Project will eliminate the current facility's use of once-through cooling system, which uses cooling water from the Hudson River, and will instead incorporate the use of air-cooled condensing equipment. The Project will also employ control equipment intended to minimize pollutant emissions. The emission control technologies proposed for the combustion turbine and duct burner exhaust gases include a dry low-$NO_x$ combustor located within the combustion turbine and a Selective Catalytic Reduction system located within the HRSG to control $NO_x$ emissions. An oxidation catalyst and efficient combustion controls will be used to control emissions of CO and VOC. Emissions of $SO_2$ and particulate matter (PM/PM-10/PM-2.5) will be minimized through the use of low sulfur fuel, as well as efficient combustion controls. A more detailed discussion of emission control technology and practices proposed by the Project can be found in Exhibits 16 and 17 of this Application.

Emissions control measures employed by the Project will reduce its effective rate of $NO_x$ emissions to 0.027 tons per GWh and of $SO_2$ emissions to 0.005 tons per GWh. In 2018, the existing Danskammer Generating Station had a realized $NO_x$ emissions rate of 0.963 tons per GWh and a realized $SO_2$ emissions rate of 0.070 tons per GWh. Due to its low heat rate and emission control technology, the Project will have rates of $NO_x$, $SO_2$, and $CO_2$ emissions that are

[55] *See* Exhibit 8 – Electric System Production Cost Modeling.
[56] 2015 SEP, Vol. 1 at 11.

among the lowest in the NYISO system per MWh of power generated. In 2018, fossil units in NYISO had a realized generation-weighted $NO_x$ emission rate of 0.164 tons per GWh and a realized average $SO_2$ emissions rate of 0.084 tons per GWh.[57] The expected $NO_x$ emissions rate per GWh of power generated is approximately 16 percent of the 2018 NYISO average rate for fossil plants and 3 percent of the existing Danskammer Generating Station's 2018 rate, while the expected $SO_2$ emissions rate per GWH of power generated is approximately 6 percent of the 2018 NYISO average rate for fossil plants and 7 percent of the existing Danskammer Generating Station's 2018 rate. Figures 10-2 and 10-3 illustrate this difference in emissions rates.

Because of its superior efficiency and lower expected variable costs compared to other NYISO generating plants, generation by the Project will tend to displace generation by other facilities with higher emissions rates of $NO_x$, $SO_2$, and $CO_2$, thus reducing total emissions. Production cost modeling performed for Exhibit 8 of this Application found that $NO_x$ emissions decreased by 242 tons in New York and 463 tons regionwide with the Project modeled in service, while $SO_2$ emissions decreased by 161 tons in New York and 437 tons regionwide.[58]

The retrofit or repowering of existing units with high emissions rates to employ modern emissions control technology and to run on natural gas instead of other fossil fuels is a historically successful method to reduce air pollution. Volume 2 of the 2015 SEP demonstrates this process in New York:

> *For the Bethlehem Energy Facility, new gas-burning units with advanced combustion technologies, e.g. dry low $NO_x$ burners and controls such as selective catalytic reduction, have very low $NO_x$ and $SO_2$ emission rates compared to 2004 emission rates for the oil-burning units that they replaced. For the East River energy facility, 2005 emissions rates for $SO_2$ and $NO_x$ from new gas-burning units are significantly lower than those from only moderately older oil-burning units brought online in 1995. Emissions for $CO_2$ were also lower for the new units of both facilities, though the difference was less substantial than for other pollutants. Of the electricity need met by burning of carbon-based fuels, increasing the fraction met by fuels associated with lower emissions versus those with higher emissions (e.g. natural gas versus*

[57] This was calculated from EPA Continuous Emissions Monitoring System (CEMS) data for all fossil generators in the NYISO system.
[58] See Exhibit 8 – Electric System Production Cost Modeling.

*coal) will, in general, decrease health risks.* ***Re-powering or retrofitting older facilities with improved control technologies will reduce emissions and hence reduce health risks***.[59]

On a statewide level, emissions of a variety of pollutants have fallen dramatically in the past two decades, as shown on Figure 10-4. These reductions have been driven in large part by investment in and modernization of the generation fleet through a switch toward natural gas from other fuels and the introduction of emissions control technology on new and retrofitted units. The Project will drive further reductions in pollution by converting the existing Danskammer Generating Station fully to natural gas (two of its four units currently burn No. 6 fuel oil) and installing emissions control technologies that significantly limit $SO_2$ and $NO_x$ emissions.

The Project will support the goal of improving air quality and reducing health risks to New York residents even if a portion of the power generation displaced by the Project is located outside New York. As with $CO_2$, the negative impacts of several other air pollutants are felt by New York residents even if their original source is outside the State. Volume 2 of the 2015 SEP states

*…out-of-state sources of electricity can have associated health risks for New York's residents. For example, the majority of mercury deposited in New York comes from coal plant emissions from energy facilities to the Southwest, upwind of the State. Similarly, levels of regional pollutants such as fine particulates, ozone, $NO_x$, and $SO_2$ in New York have significant components derived from transport from the Midwestern states*.[60]

The neighboring PJM wholesale electricity market, from which New York imports significant amounts of electricity, has higher emission rates of $NO_x$, $SO_2$, and $CO_2$ due to a much larger share of coal in its generation mix. Hence, the Project will have a positive impact on reducing air pollution and health risks to New Yorkers by reducing both local and out-of-state generation by higher-emitting sources.

**Environmental Justice:** By reducing costs and pollution from the power sector, the Project will benefit New York's low-to-moderate income residents and communities affected by environmental justice concerns. The 2015 SEP states,

[59] SEP, Vol. 2 at 73 (emphasis added).
[60] 2015 SEP, Vol. 2 at 75.

*Environmental Justice communities have been disproportionately impacted by air pollution from fossil fuel power generation facilities and transportation infrastructure that historically have often been sited in these communities. In addition, low- to moderate-income (LMI) consumers pay a disproportionate share of their income toward the cost of energy*.[61]

In addition to reducing overall regional emissions of air pollutants, the Project will also generate power with much lower emissions than nearby generators in its own region of New York. As discussed in Exhibit 28, construction and operation of the Project are not anticipated to result in any significant and adverse disproportionate impacts in the EJ areas located within the Project's Impact Study Area (ISA). In 2018, the five existing fossil steam turbine and gas turbine power plants in NYISO's Hudson Valley zone (Zone G) generated 1,081 GWh of electricity and produced 864 tons of $NO_x$ emissions and 871 tons of $SO_2$ emissions, an average rate of approximately 0.8 tons per GWh of $NO_x$ and 0.8 tons per GWh of $SO_2$.[62] At its expected $NO_x$ emission rate of 0.03 tons per GWh of $NO_x$ and 0.01 tons per GWh of $SO_2$,[63] the Project will be able to produce 1,081 GWh of energy with total $NO_x$ emissions of 29 tons and total $SO_2$ emissions of 6 tons. Even if running at 100-percent utilization and producing 5,250 GWh, an unlikely scenario given expected power market conditions, the Project would produce approximately 141 tons of $NO_x$ and 27 tons of $SO_2$. While the actual generating units that will be displaced by the Project depend on future energy market conditions, this comparison highlights the contrast between the emissions rate of the Project and aging generators in the Hudson Valley (including the existing Danskammer Generating Station).

[61] 2015 SEP, Vol. 1 at 14.

[62] This is based on EPA Continuous Emissions Monitoring System (CEMS) data for ten generating units at the Bowline Point, Danskammer Generating Station, Roseton Generating Station, Hillburn and Shoemaker facilities.

[63] This was calculated using the expected summer heat rate of 6,754 Btu/kWh, $NO_x$ rate of 0.00796 pounds per million Btu (lbs./MMBtu), and $SO_2$ emissions rate of 0.00152 lbs./MMBtu for the Project at full output with both base and duct capacity in operation.

**Table 10-1. Comparison of $NO_x$ and $SO_2$ Emissions from Existing Steam Turbine Facilities in NYISO Hudson Valley Zone**

| Plant | 2018 Generation (GWh) | $NO_x$ Emissions (tons) | $SO_2$ Emissions (tons) |
|---|---|---|---|
| Roseton Generating Station | 547 | 504 | 764 |
| Bowline Point | 501 | 325 | 105 |
| Danskammer Generating Station | 33 | 32 | 2 |
| Shoemaker | 0 | 2 | 0 |
| Hillburn | 0 | 1 | 0 |
| **2018 Hudson Valley ST+GT Total** | **1,081** | **864** | **871** |
| **Project Estimate – 2018 Hudson Valley ST+GT Generation Level** | **1,081** | **29** | **6** |
| **Project Estimate – 100% Capacity Factor** | **5,250** | **141** | **27** |

The Roseton Generating Station alone, which is located within 1 mile of the Project, generated 547 GWh of power and emitted 504 tons of $NO_x$ and 764 tons of $SO_2$ in 2018, and the existing Danskammer Generating Station generated an additional 33 GWh and emitted 32 tons of $NO_x$ and 2 tons of $SO_2$. Hence, the Project will be able to produce power with dramatically lower rates of $NO_x$ and $SO_2$ emissions than older and less efficient fossil generation located in the Hudson Valley region as a whole and in the immediate vicinity of the Project, even if overall, the output capacity of the Project is increased as compared to the existing Danskammer Generating Station.

***Guiding Principles***

The Project is in line with the Guiding Principles of the energy strategy advanced by the 2015 SEP:

**Efficiency**: As described in Section 10(a) of this Exhibit, the Project will support the 2015 SEP's focus on improving efficiency by generating an equivalent amount of power using less fuel than any other existing fossil power plant in New York.

**Private Sector Investment**: The 2015 SEP emphasizes the role of private capital in achieving the State's energy sector goals.[64] The Project will be developed and financed entirely using

[64] SEPB, p. 20

private capital and its revenue will be derived from market-based compensation in the competitive NYISO wholesale power market.

The Project constitutes beneficial private sector investment because it will support the goals of the 2015 SEP while all financial risk is borne by the Project's owners and investors, not ratepayers or the State. In the event that the Project suffers a loss of competitiveness in the NYISO market in the future, financial losses associated with reduced value of the Project will accrue exclusively to the Project's owners and investors.

The Commission has previously acknowledged that merchant projects are beneficial because they may produce value while risk is borne by private investors. In granting a Certificate of Environmental Compatibility and Public Need under the Article VII process to the Bayonne Energy Center, the Commission stated that "the BEC is a merchant project. No ratepayer funding is being sought. Therefore, any and all favorable impacts – reliability, economic or environmental – benefit New York without imposing additional risk on electric ratepayers."[65]

**Market Transformation**: The 2015 SEP emphasizes the need for regulatory reforms, initiatives, and programs focused on transformation of the State's energy markets towards "a new, integrated, and self-sustaining private sector-driven clean energy market," and has identified market transformation as a guiding principle.[66] Transformation of the NYISO wholesale electricity market is also underway, prompted by consideration of what market rules and structures would lead to an efficient and reliable power system given the goals for renewable energy and lower emissions determined by the State.

NYISO has launched several initiatives to investigate how its market design should evolve in the context of the State's energy goals. These measures include the Integrating Public Policy study conducted in collaboration with the State in 2017, the development of a Grid in Transition white paper and solicitation of stakeholder comments in 2019, and numerous specific market design proposals. NYISO has concluded that in a wholesale power market with a large share of intermittent renewable energy, the ability to provide flexibility to the power system will be highly

[65] Case 08-T-1245, "Order Adopting The Terms Of A Joint Proposal And Granting Certificate of Environment Compatibility And Public Need, With Conditions, And Clean Water Act §401 Water Quality," at 13 (November 12, 2009).
[66] 2015 SEP, Vol. 1, at 18.

valuable, and that existing market rules may not appropriately compensate for this service.[67] Hence, NYISO is considering market enhancements that would more closely tie market compensation to the needs of a highly renewable grid, such as increased procurement of operating reserves as renewables enter service and enhancement of shortage pricing to reward generators for being available when needed most.[68]

NYISO favors an approach in which markets for ancillary services and real-time shortage pricing will play a growing role in sustaining generation capacity needed for reliability over conventional capacity market revenues.[69] NYISO has also proposed to implement a carbon pricing system (in addition to the price of carbon allowances under the Regional Greenhouse Gas Initiative, of which New York is a member), to align the wholesale energy market with the State's goal to reduce greenhouse gas emissions.[70]

The Project will be well equipped to participate in a wholesale market that places a growing premium on flexibility and/or emissions reduction, unlike the existing Danskammer Generating Station, due to its superior expected heat rate, ramp rate, startup time, and minimum load capabilities as described under Sections 10(a) and 10(b) of this Exhibit 10. In this sense, the Project represents a market-based response to the needs expressed by the State in its 2015 SEP and to the NYISO's market design efforts intended to harmonize state policy with the wholesale market. While the final outcome of NYISO's market design proposals is uncertain, such risk-taking by private investors is a key part of effective competitive markets. Volume 2 of the 2015 SEP notes that "EJ stakeholders have raised concerns that the payments generators receive through capacity markets can create a strong disincentive to retire less efficient, higher-emitting generating capacity, even within the context of proposed repowering projects."[71] While the existing Danskammer Generating Station already receives NYISO capacity market revenues, the repowering envisioned by the Project would enhance its ability to competitively participate in other markets. The Project, therefore, demonstrates how the potential for market transformation can play a role in aligning private capital investment with the State's goals, as envisioned by the 2015 SEP.

---

[67] NYISO Grid in Transition White Paper at 17-18.
[68] NYISO 2019 Power Trends at 50.
[69] NYISO Grid in Transition White Paper at 55.
[70] NYISO, "IPPTF Carbon Pricing Proposal", prepared for the Integrating Public Policy Task Force (December 7, 2018).
[71] 2015 SEP, Vol. 2 at 119.

**Community Engagement:** While this principle in the 2015 SEP was focused more on community engagement by the State to local communities and vice versa, and not necessarily community engagement by a project developer, Danskammer has engaged in extensive community engagement as part of this Project, as described in Exhibit 2.

### 10(h) Alternatives Analysis

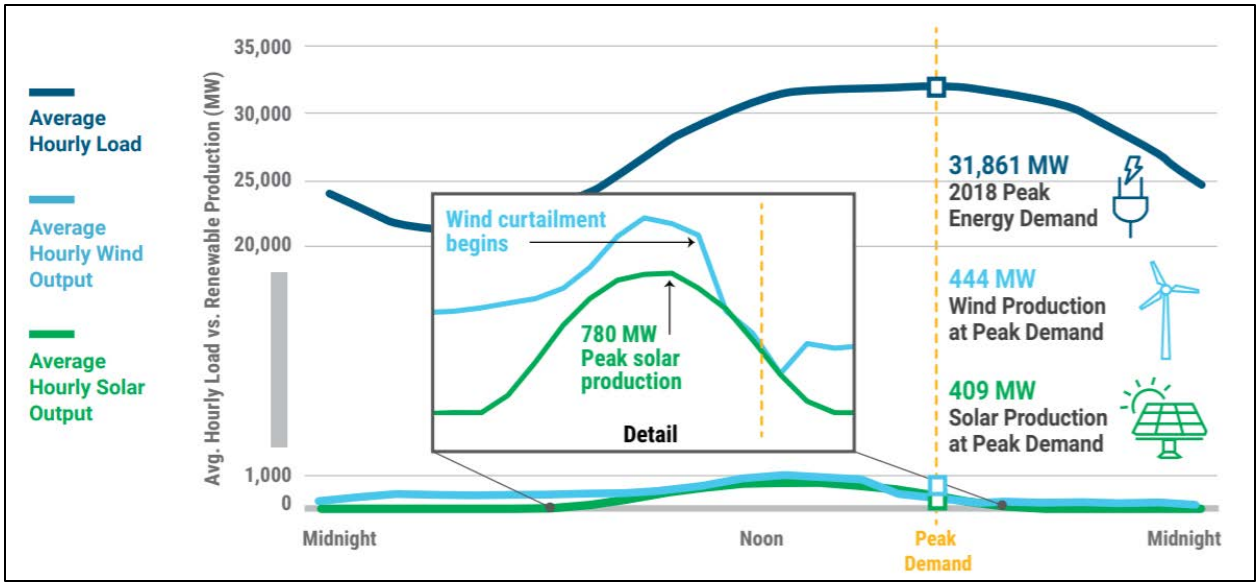
An analysis of the comparative advantages and disadvantages of reasonable and available locations on the properties owned by, or under option to, Danskammer, is provided in Exhibit 9 of the Application. As discussed in Exhibit 9, the location of the Project on the Project Site is the preferred location in order to take advantage of existing infrastructure located at the Site and to avoid or minimize potential environmental impacts. The no action alternative would not help the State achieve the goals in the 2015 SEP to reduce greenhouse gas emissions and to facilitate the development of renewable energy resources.

### 10(i) Conclusion

A statement as to why the Project and its preferred location are best suited, among the alternatives identified, to promote the public health and welfare, including minimizing the public health and environmental impacts related to climate change, is provided in Exhibits 2(e) and 9 of this Application.

# EXHIBIT 10

# FIGURES




**Source:** NYISO 2019 Power Trends at 20.

**Figure 10-1. Intermittent Resource Contribution to Load on 2018 Peak Day (August 29)**

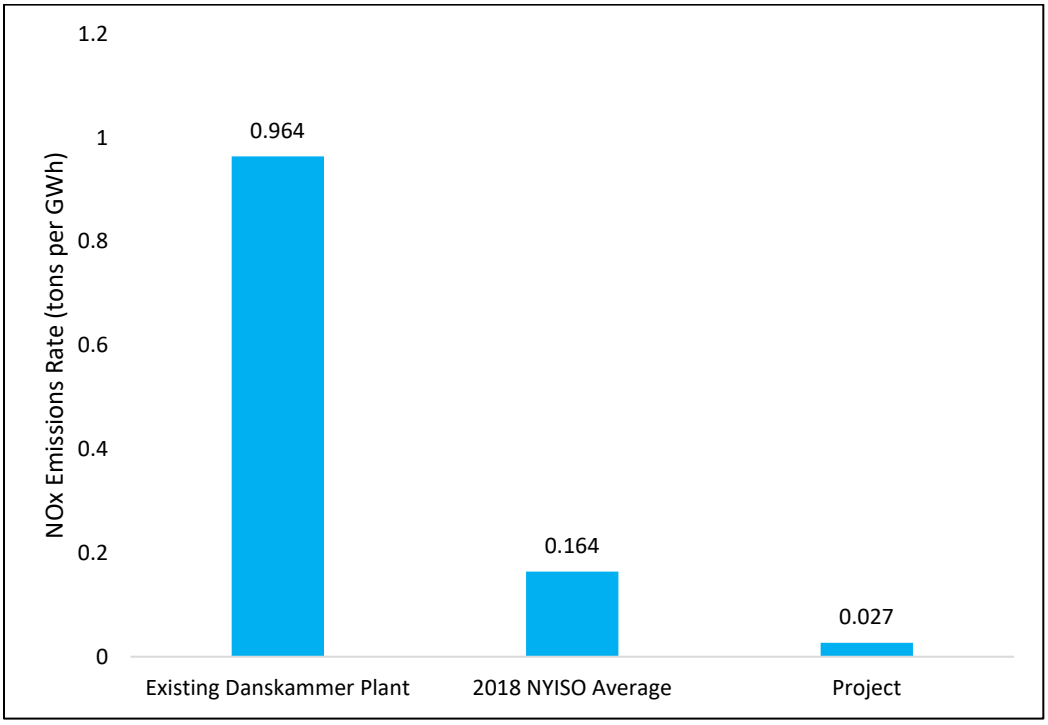



**Figure 10-2. Project $NO_x$ Emissions Rate vs. Existing Facility and 2018 NYISO Fossil Average**

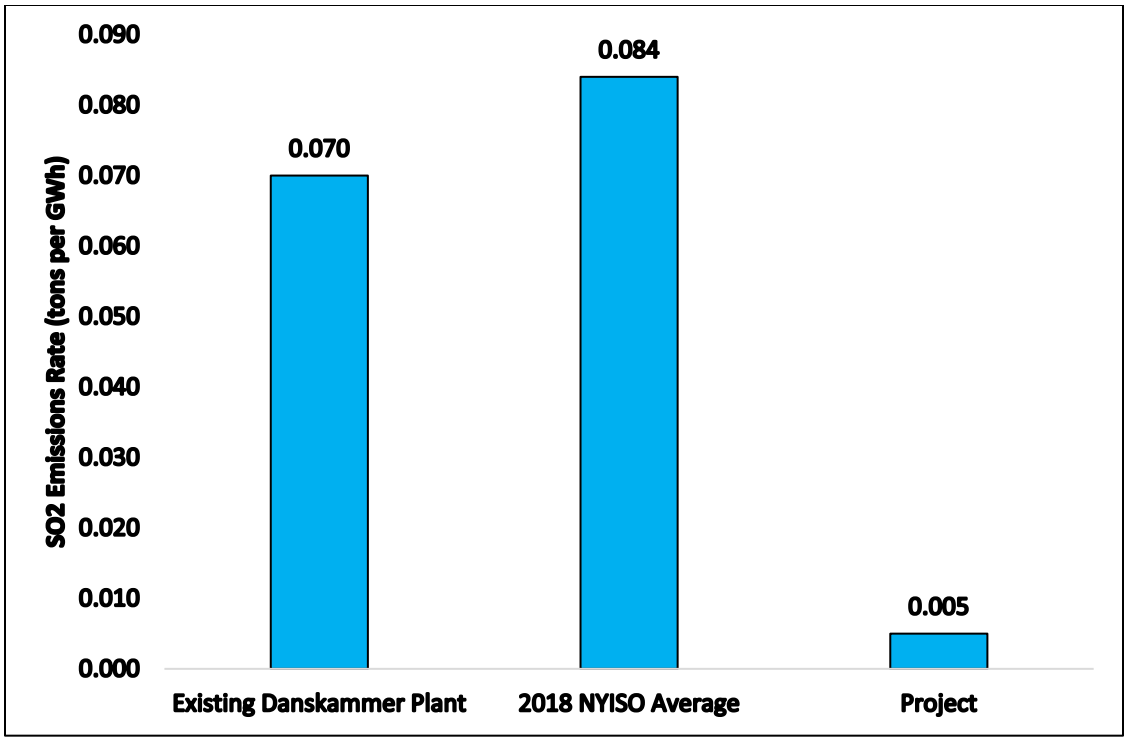
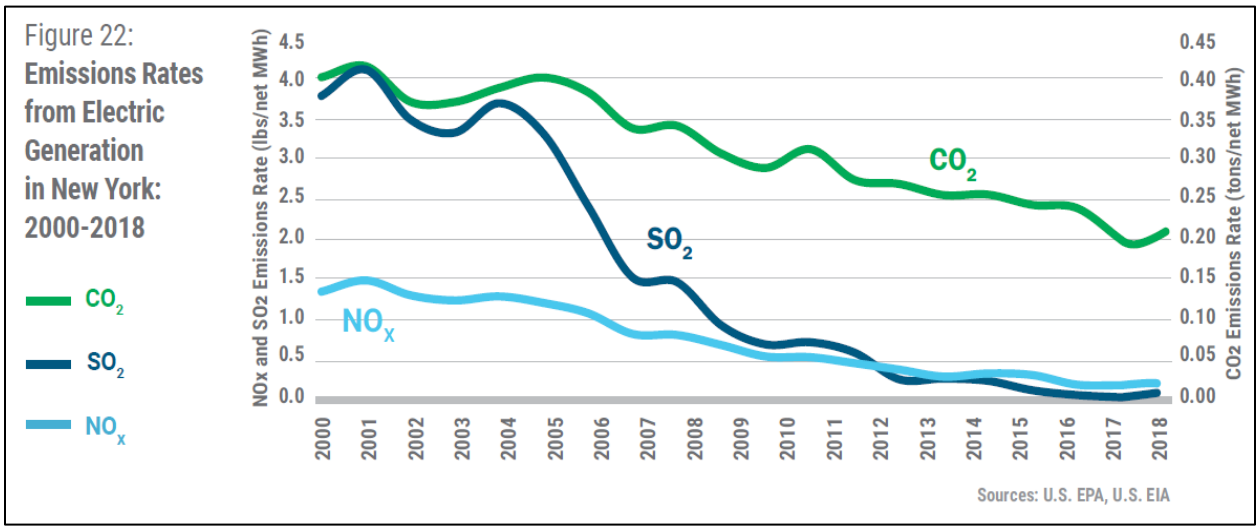



**Figure 10-3. Project SO2 Emissions Rate vs. Existing Facility and 2018 NYISO Fossil Average**




**Source:** NYISO

**Figure 10-4. Decline of Emissions Rates from NYISO Generators**