Prepared for:
Astoria Gas Turbine Power LLC

Prepared by:
AECOM
Rev. June 2021

Draft Supplemental Environmental Impact Statement
Astoria Replacement Project

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Astoria, Queens County, New York

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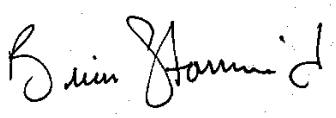

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List of Acronyms

AC	alternating current
ACGIH	American Conference of Governmental Industrial Hygienists
ACS	American Community Survey
AGC	annual guideline concentration
alms	above mean sea level
APC	air pollution control
Applicant	Astoria Gas Turbine Power LLC
AQCR	Air Quality Control Region
AQRV	Air Quality Related Value
ATSDR	Agency for Toxic Substances and Disease Registry
BACT	Best Available Control Technology
BESS	battery energy storage system
BFE	base flood elevation
BOEM	Bureau of Ocean Energy Management
BPIP-PRIME	USEPA's Building Profile Input Program
C&D	construction and demolition
CAA	Clean Air Act
CAF	Consistency Assessment Form
CAISO	California Independent System Operator
CCCT	combined cycle combustion turbine
CDC	U.S. Centers for Disease Control and Prevention
CECONY	Consolidated Edison Company of New York, Inc.
CEMS	continuous emissions monitoring system
CEQR	New York City Environmental Quality Review
CFR	Code of Federal Regulations
CH_4	methane
CI	confidence interval
CLCPA	Climate Leadership and Community Protection Act
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
COVID-19	SARS-CoV2
CT	combustion turbine
CTG	combustion turbine generator
CPCN	Certificate of Public Convenience and Necessity
CP-29	NYSDEC Commissioner Policy 29 - Environmental Justice and Permitting
CRIS	NYS Cultural Resources Information System
CRRA	Community Risk and Resiliency Act
CSAPR	Cross-State Air Pollution Rule
dBA	A-weighted decibels

DC	direct current
DEIS	draft environmental impact statement
DSNY	New York City Department of Sanitation
DSEIS	draft supplemental environmental impact statement
DLN	Dry Low NOx
E3	Energy and Environmental Economics, Inc.
EAF	Environmental Assessment Form
ECL	Environmental Conservation Law
eGRID	Emissions & Generation Resource Database
ENB	Environmental Notice Bulletin
EJ	environmental justice
EO-52	Executive Order 52
EPPP	Enhanced Public Participation Plan
ESSA	Energy Storage Service Agreement
Facility	Astoria Gas Turbine Generating Facility
FAR	floor area ratios
FDNY	New York City Fire Department
FEAF	full environmental assessment form
FEIS	final environmental impact statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Effective Flood Insurance Rate Map
FLAG	Federal Land Managers' Air Quality Related Values Work Group
FLM	Federal Land Managers
FTE	full-time equivalent
FWS	Fish and Wildlife Service
GAQM	Guideline on Air Quality Models
GE	General Electric
GEP	good engineering practice
GHG	greenhouse gas
gpm	gallons per minute
GSU	generator step-up transformer
GWP	global warming potential
H_2SO^4	sulfuric acid
HAP	hazardous air pollutant
HAWT	horizontal axis wind turbines
HOD	Health Outcome Data
ICAP	installed capacity
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
kV	kilovolts

kWe	electrical kilowatts
kWm	mechanical kilowatts
lb/hr	pound per hour
lb/MWh	pound per megawatt-hour
LAER	lowest achievable emission rate
LBW	low birth weight
LCR	Locational Minimum Installed Capacity Requirement
LIPA	Long Island Power Authority
LWRP	local waterfront revitalization program
m/s	meters per second
MECL	minimum emissions compliant load
MMBtu	one million British Thermal Units
MWe	electrical megawatts
MWh	megawatt-hour
NAAQS	National Ambient Air Quality Standards
NED	National Elevation Dataset
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NH_3	ammonia
NO_2	nitrogen dioxide
NOx	nitrogen oxides
NNSR	Nonattainment New Source Review
NRHP	National Register of Historic Places
NSR	New Source Review
NSPS	New Source Performance Standards
NYC	New York City
NYCDHMH	New York City Department of Health and Mental Hygiene
NYC Health	New York City Department of Health
NYCRR	New York Codes, Rules and Regulations
NYNHP	New York Natural Heritage Program
NYMA	New York Metropolitan Area
NYPA	New York Power Authority
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOS	New York State Department of State
NYISO	New York Independent System Operator
NYSDPS	New York State Department of Public Service
NYSERDA	New York State Energy Research and Development Authority
NYSHPO	New York State Historical Preservation Office
NYSRC	New York Stack Reliability Council
O_3	ozone
O&M	operations and maintenance

OC	operating committee
OWS	oil water separator
PAC-1	U.S. Department of Energy's Protective Action Criteria
Part 490	Part 490 of Title 6 of the New York Code of Rules and Regulations
Pb	lead
PEJA	potential environmental justice area
PEP	project emission potential
PFIRM	Preliminary Flood Insurance Rate Map
%	percent
$PM_{2.5}$	particulate matter sized 2.5 microns and smaller
PM_{10}	particulate matter sized 10 microns and smaller
POI	interconnection points
P&W	Pratt & Whitney
ppm	parts per million
ppmvdc	parts per million by dry volume
PSC	New York State Public Service Commission
PSD	Prevention of Significant Deterioration
PSL	Public Service Law
PV	photovoltaic
RCRA	Resource Conservation and Recovery Act
RGGI	Regional Greenhouse Gas Initiative
RO	reverse osmosis
RMP	Risk Management Program
RNG	Renewable Natural Gas
SCCT	simple cycle combustion turbine
SCR	selective catalytic reduction
SEQR	New York State Environmental Quality Review
SEQRA	New York State Environmental Quality Review Act
SEIS	supplemental environmental impact statement
SF_6	sulfur hexafluoride
SGC	short-term guideline concentration
SIL	significant impact level
SIP	State Implementation Plan
SIR	standardized incidence ratio
SO_2	sulfur dioxide
SO_3	sulfur trioxide
SPARCS	Statewide Planning and Research Cooperative System
SPDES	State Pollutant Discharge Elimination System
SPT	significant project thresholds
SRIS	System Reliability Impact Study
STEL	short-term exposure limit

SU/SD	start-up / shutdown
tBtu	one trillion British Thermal Units
TMNSR	Ten Minute Non-Synchronous Reserves
tpy	tons per year
TRI	Toxic Release Inventory
TSD	treatment, storage, and disposal
$\mu g/m^3$	microgram per cubic meter
USFWS	U.S. Fish and Wildlife Service
ULSD	ultra-low sulfur distillate
ULSK	ultra low sulfur kerosene
USEPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey
VOC	volatile organic compounds
WHO	World Health Organization
WRP	waterfront revitalization program

Executive Summary

As lead agency, the New York State Department of Environmental Conservation ("NYSDEC") is conducting a supplemental environmental review of Astoria Gas Turbine Power LLC's (the "Applicant") proposal to modify its Replacement Project, which was approved in 2010. This modified Replacement Project ("Project") would be located at the existing Astoria Gas Turbine Generating Facility ("Facility") which currently consists of 31 combustion turbines installed in 1970 including 24 Pratt & Whitney ("P&W") turbines and seven retired Westinghouse turbines. The existing Facility has a combined nameplate rating of 646 electrical megawatts ("MWe") (502 MWe not including the retired Westinghouse turbines). The modified Project will replace these existing turbines with a new state-of-the-art simple cycle dual fuel peaking combustion turbine generator ("CTG") with a nominal generator output of approximately 437 MWe.

Previous versions of the Project underwent extensive environmental review pursuant to Article 8 of the New York State Environmental Conservation Law, the State Environmental Quality Review Act ("SEQRA"), with NYSDEC serving as Lead Agency. Beginning in 2008, the Applicant began the environmental review and permitting process for a 1,040 MWe combined cycle project, which was a modification of a never completed project in 2001 to install a new 79.9 MW CTG at the Facility. Following numerous public outreach activities and scoping, the Applicant prepared a Draft Environmental Impacts Statement ("DEIS") for the combined cycle project. On April 16, 2010, NYSDEC accepted the DEIS and related Title V air and State Pollution Discharge Elimination System ("SPDES") applications for the Project and made the DEIS and draft permits available for public review and comment.

The DEIS and its appendices, which comprised approximately 880 pages, considered and examined the potential impacts of the Project with regard to a comprehensive list of environmental resources including air, energy use and greenhouse gas emissions, geology and soils, water resources, water supply, wastewater, stormwater, terrestrial and aquatic ecology, fish and wildlife, aesthetic and visual resources, noise, historical and cultural resources, traffic and transportation, socioeconomics, environmental justice areas, land use and zoning. It also examined impacts of various Project alternatives, potential cumulative impacts, growth inducing impacts, and consistency with the State's coastal management policies and local waterfront revitalization plans.

Following public comment on the DEIS and draft permits, which included two public hearings, NYSDEC accepted the Final Environmental Impact Statement ("2010 FEIS") on September 22, 2010 and issued its Findings Statement on October 4, 2010, concluding that the Project was designed, and where necessary revised, to avoid, minimize and mitigate adverse environmental impacts. All NYSDEC permits were subsequently issued. However, the Project was not constructed at that time, and the 24 existing P&W turbines continue to operate in accordance with their original permits.

In July 2017, in response to changes in market conditions, the Applicant sought to move forward with the modified Project and filed a petition with the New York State Board on Electric Generation Siting and the Environment (the "Siting Board") seeking a declaratory ruling that the Project, with certain modifications, is exempt from review under Article 10 of the Public Service Law ("PSL") and instead should continue to be subject to SEQRA ("Petition").

On June 12, 2019, the Siting Board concluded that the Project was an "extension, amendment or continuation of the originally proposed project" and therefore ruled the Project "…*is exempt from review under Article 10 of the Public Service Law and should instead continue to be subject to the State*

Environmental Quality Review Act (SEQR)…" and "need not be treated as an altogether new project" ("Declaratory Ruling").

In accordance with the Siting Board's Declaratory Ruling, Part 1 of the Full Environmental Assessment Form ("EAF") was prepared and submitted to NYSDEC on April 27, 2020 to supplement the prior SEQRA review of the Project. On May 19, 2020, pursuant to SEQRA and its implementing regulations, the NYSDEC issued a Lead Agency coordination letter to other potentially Involved Agencies expressing its intent to continue to serve as SEQRA Lead Agency. Upon receiving no objections from potentially Involved Agencies, the NYSDEC assumed the designation as Lead Agency for the supplemental review of the Project. The NYSDEC subsequently circulated a Draft Scoping Document to the Involved Agencies and Interested Parties and made the document available to the public. Notice of Availability of the Draft Scope was published in the Environmental Notice Bulletin ("ENB") on July 1, 2020. The Final Scoping Document was issued by the NYSDEC on September 18, 2020.

This Draft Supplemental Environmental Impact Statement ("DSEIS") has been prepared in accordance with SEQRA and the implementing regulations incorporated in Part 617 of Title 6 of the New York Code of Rules and Regulations. It presents a focused assessment of potentially significant adverse impacts resulting from Project modifications and changes in circumstances that have occurred since the 2010 FEIS and Findings Statement.

PROJECT PURPOSE

The Facility currently provides three major functions:

i. dual fuel generation in times of high electric demand;

ii. contingency support in case of unexpected transmission and generation outages, or during extreme weather events; and,

iii. system restoration capability in response to a total system outage (i.e., blackout).

The Project's purpose is to modernize the Facility with state-of-the-art technology to alleviate identified reliability shortfalls in New York City; increase generation efficiency; reduce air emissions; facilitate the reliable interconnection of additional renewable resources; help New York State and New York City achieve their climate change limits, targets and goals, including reducing greenhouse gas ("GHG") emissions; contribute to energy storage goals; continue to provide system restoration capability; and provide significant savings to electricity customers in New York City.

PROJECT LOCATION AND SETTING

The Facility is located on a 15-acre site at 31-01 20th Ave., Astoria, Queens County, New York ("Site") and is situated within a large approximately 300-acre complex (referred to as the "Astoria ConEd Complex" or "Complex"). The Astoria ConEd Complex is home to several power generating facilities, as well as barge delivery facilities, a liquefied natural gas plant, a decommissioned wastewater treatment plant, and other miscellaneous energy and utility scale operations. Public access is restricted into the Complex, as well as at the Facility gate. This area has been host to energy and electricity generating, transmission, distribution and associated activities since the 1890s and remains exclusively a major electric generating and utility operations complex.

The Astoria ConEd Complex is situated in the northwestern portion of Astoria on a peninsula bounded by the East River to the west, north and east. The Project Site is relatively flat with very little local relief. The surface elevation is approximately 17 feet above mean sea level ("amsl"). Currently, the

Site is occupied by a fully operational facility that includes power generation equipment, ancillary buildings, parking and circulation, storage tanks and other structures.

PROJECT DESCRIPTION

The Project, as modified, will replace the 50-year-old P&W and Westinghouse turbines at the Facility. The Project will include a new CTG which will be a highly efficient, quick start, fast-ramping, General Electric ("GE") H-Class 7HA.03 unit that has a nominal generator output of approximately 437 MWe. The new CTG will fire natural gas as the primary fuel with limited ultra-low sulfur distillate ("ULSD") liquid fuel for backup. The new CTG will be serviced by a single 250-foot exhaust stack. The Project will also include a ULSD-fired emergency generator to shut the plant down safely in the event of an electric power outage and two ULSD-fired emergency fire system pumps. In addition, the Project will re-utilize the Facility's two existing ultra-low sulfur kerosene ("ULSK") tanks to store ULSD as backup fuel for the new CTG. Each of these existing tanks has a nominal capacity of 2,000,000 gallons for a total of 4,000,000 gallons of ULSD.

Other ancillary project features that will be re-utilized include the existing administration building and warehouse, parking, gated entrance, and existing underground fuel oil, natural gas and raw water pipes. A new 20,000-gallon tank will be installed for storage of aqueous ammonia that will be used to provide additional control of nitrogen oxides ("NOx") emissions from the new CTG. New storage tanks also include a service and fire water tank (raw water) and a demineralized water tank with nominal capacities of 300,000 gallons and 1,000,000 gallons, respectively. Notably, no infrastructure work or improvements are required outside the Complex.

All of the existing units, with the exception of one P&W Twin Pac (consisting of two combustion turbines and a single generator), will be permanently shut down once the Project has completed its shakedown period.[1] The two remaining P&W turbines will remain operational to make the facility black start capable[2] until replaced by a proposed approximately 24 MWe battery energy storage system ("BESS"). The P&W Twin Pac uses natural gas as its primary fuel with ULSK as backup. A new 7,500-gallon ULSK tank will be used to store the backup fuel for the P&W Twin Pac.

POTENTIALLY SIGNIFICANT ADVERSE IMPACTS CONSIDERED

In 2010, NYSDEC found that the project was designed, and where necessary, revised to avoid, minimize and mitigate adverse environmental impacts from the 1,040 MWe combined cycle project. The modified Project has now been reconfigured to be smaller in scale, which means fewer structures and stacks, and will incorporate new state-of-the-art, and more efficient equipment.

Neither modifications to the Project nor any changes in circumstances since 2010 should alter the prior determination that the project was designed, and where necessary, revised to avoid, minimize and mitigate adverse environmental impacts for the following impact categories: water resources; stormwater management; noise; aesthetic and visual resources; traffic and transportation; geology, soils and topographic; biological, terrestrial, and aquatic ecology; historic, cultural and archeological resources; public safety; community facilities and services; communication facilities; land use and zoning; use and conservation of energy resources; socioeconomics, and growth inducing impacts. Therefore, in accordance with the Final Scoping Document, these potential environmental impacts are not considered in this DSEIS.

[1] The existing P&W turbines and the replacement Project cannot operate at the same time since both use the same electrical interconnection.

[2] Black start capability is the ability to restore power to the electric grid following a complete system power outage.

Astoria has also designed the proposed modifications to the Project to reduce the potential for adverse impacts to air quality, climate change, environmental justice and coastal zone consistency. This DSEIS evaluates these potential adverse impacts as well as the various regulatory and other change in circumstances that have occurred since 2010.

Air Quality

The Project includes the following air emission sources:

- One 7HA.03 CTG fired with natural gas as the primary fuel and ULSD as back-up fuel;
- Ancillary combustion equipment, including one ULSD-fired emergency generator (rated at 500 electrical kilowatts ["kWe"]), two ULSD-fired emergency fire system pumps (rated at 117 mechanical kilowatts ("kWm") and 177 kWm, respectively);
- ULSD and ULSK tank vents; and
- Fugitive GHG emissions from onsite electrical circuit breakers and onsite natural gas components (connectors, valves, meters, and regulators).

As discussed above, the Facility will retain two P&W combustion turbines used only to enable black start capability for the site.

Pollutants potentially emitted from these sources include the following:

- Combustion Sources:
  - Criteria Pollutants: NOx, volatile organic compounds ("VOC"), carbon monoxide ("CO"), particulate matter less than 10 µm in diameter ("PM_{10}"), particulate matter less than 2.5 µm in diameter ("$PM_{2.5}$"), sulfur dioxide ("SO_2");
  - Non-Criteria Pollutants: sulfuric acid ("H_2SO_4"), GHGs, ammonia ("NH_3") (CTG only), and air toxic compounds (emitted in very small amounts);
- ULSD and ULSK tank vents: VOC and air toxic compounds (emitted in negligible amounts); and
- Fugitive GHG sources: sulfur hexafluoride ("SF_6") from onsite electrical circuit breakers and methane ("CH_4") from onsite natural gas components.

Because operation of the proposed Project would result in emissions of various compounds into the air, an air quality impact analysis, as documented in the 2020 Air Permit Application, was conducted for criteria pollutants (NOx, CO, PM_{10}, $PM_{2.5}$, SO_2) and air toxic compounds. The Project is subject to Prevention of Significant Deterioration ("PSD") review for PM2.5, PM10, and GHG emissions (as carbon dioxide ("CO_2") equivalents ("CO_2e") and is not subject to nonattainment New Source Review for either NOx or VOC.

A dispersion modeling analysis was conducted in accordance with a NYSDEC-approved modeling protocol to evaluate the air quality impact of Project emissions. Similar to the previously approved configuration of the Project, the modeling analyses for the modified Project demonstrate that air quality impacts are below the U.S. Environmental Protection Agency ("USEPA") significant impact levels ("SILs") for criteria pollutants thus demonstrating compliance with National Ambient Air Quality Standards ("NAAQS") and PSD increments, as well as below all NYSDEC Short-term Guideline Concentrations ("SGCs") and Annual Guideline Concentrations ("AGCs") for air toxic compounds. In addition, a cumulative analysis was conducted which confirmed the maximum modeled concentrations for the Project plus the ambient background concentrations are well below all the NAAQS. This further demonstrates the Project will not result in a significant adverse impact to air quality. Finally, because the Project will displace higher emitting sources, it will cause an overall net reduction in local and regional air emissions which will provide a positive impact on air quality.

Climate Change – GHG Emissions

In 2010, Project-related GHG emissions were evaluated as part of the prior environmental review of the Project as previously configured. At that time, NYSDEC determined the Project as previously configured would reduce GHG emissions by displacing other higher emitting sources. Since that time, several new climate change laws, regulations, and policies have been put into place including: the Climate Leadership and Community Protection Act ("CLCPA"), Part 496, New York City Local Law 97 (as part of the Climate Mobilization Act), OneNYC 2050 and Executive Order 52. In addition, modifications to the Project as previously configured have been proposed that could impact the prior analyses. Therefore, potential impacts to climate change and GHG emissions were re-evaluated as part of this DSEIS.

The CLCPA established Environmental Conservation Law Article 75, which required NYSDEC to promulgate regulations to establish a statewide GHG emissions limit for 2030 that is sixty percent of 1990 GHG emissions, and for 2050 that is fifteen percent of 1990 GHG emissions. NYSDEC recently adopted 6 NYCRR Part 496, which establishes the New York Statewide 1990 baseline CO_2 emissions as 409.78 million metric tons, and Statewide GHG emission limits for 2030 and 2050 as 245.87 million metric tons CO_2e and 61.47 million metric tons CO_2e, respectively. NYSDEC also finalized its *Establishing a Value of Carbon Guidelines for Use by State Agencies* guidance on December 30, 2020, which is for use by State agencies to monetize benefits/costs of actions that impact GHG emissions based on societal impacts incurred as a result of climate change. The CLCPA also amended the Public Service Law to require the Public Service Commission to establish a program to meet a target of seventy percent of statewide electrical generation from renewable sources by 2030, and a target of zero GHG emissions for statewide electrical demand by 2040. Section 7(2) of the CLCPA requires all state agencies to consider whether its decision to issue permit(s) is inconsistent with or will interfere with the attainment of the GHG emission limits established in ECL Article 75. Similar to the CLCPA requirements, Local Law 97 requires a minimum forty percent reduction in New York Citywide GHG emissions by 2030 and an eighty percent reduction by 2050; and, OneNYC 2050's goals include reduction of GHG emissions and achievement of 100 percent of New York City's electricity from clean sources by 2040 and sector-wide carbon neutrality by 2050.

While construction and operation of the Project will create GHG emissions, due to its efficiency and use of low carbon fuels, the Project will displace higher emitting sources and result in an overall net reduction in direct, upstream, and indirect GHG emissions from the electric grid. Based on forecasted operation of the Project, it will reduce direct GHG emissions from the electric system by 421,000 tons over the 2023-2035 timeframe. Due to the high efficiency of the Project, over the 2023-2035 timeframe, it will also cause a 186,000 ton reduction in upstream GHG emissions associated with the production and transportation of fuels to New York to produce electricity by displacing electric generating units that use more fuel to produce the same amount of electricity.

In addition, the Project will cause an indirect reduction in GHG emissions by providing economic capacity and flexible operating capabilities to the electric system allowing for reduced costs to ratepayers and acceleration of the procurement of downstate renewable energy projects. This leads to large indirect GHG reductions, particularly during the 2030-2040 time period when the electrical system is rapidly transitioning to meet CLCPA targets. The indirect GHG emissions reductions from the Project during the 2030-2035 timeframe are estimated to be between 476,000-990,000 tons per year. The Project is forecasted to cause a total reduction of over 5,000,000 tons of GHG emissions by 2035 through direct, upstream, and indirect GHG emission reductions. The value of the Project's GHG emission reduction benefits, based on the NYSDEC Value of Carbon guidance, is at least $3.3 billion and could even be as high as $21.4 billion.

Because the Project will cause an overall decrease in GHG emissions, it will not result in a significant adverse impact on GHG emissions or climate change and is fully consistent with new regulations, laws and policies.

Notwithstanding, assuming that the Project is deemed to be inconsistent with or that it will interfere with the attainment of the statewide GHG limits, the Project is justified given that it (1) addresses reliability shortfalls in New York City, (2) reduces costs for electricity customers in New York City by providing economic capacity (without a ratepayer guaranteed support contract); (3) displaces higher emitting sources such that it will result in an overall net reduction in air emissions in the New York City area, including a reduction in statewide GHG emissions; (4) facilitates the integration of renewable energy resources by providing long-term, long duration backup power and; (5) preserves the Site's black start capability to facilitate electrical system restoration in New York City following major power outages. Further, if deemed necessary, potential mitigation options include a declining carbon emissions cap, carbon offsets, upgrades to the starting system for the two P&W combustion turbines being retained for black start service, future replacement of the two P&W combustion turbines with energy storage at the Site, or, the use of hydrogen or renewable natural gas once commercially available.

Climate Change – Future Climate Risk

Due to the impacts of climate change, future physical risks include sea-level rise, storm surge and flooding. The future climate risk associated with the Project was previously evaluated as part of the 2010 EIS. Based on that analysis, NYSDEC determined that an increase in sea-level rise associated with climate change would not have an impact on the Site because of the Project's grade elevation of approximately 17 feet amsl.

Since that time, several new future physical climate risk laws, regulations, and policies have been put into place, including: the CLCPA; the Community Risk and Resiliency Act ("CRRA"); Part 490 of Title 6 of the New York Code of Rules and Regulations ("Part 490"); and, the 2018 Draft New York State Flood Risk Management Guidance for the Implementation of the Community Risk and Resiliency Act ("2018 Guidance"). The future physical climate risk of the Project, as modified, therefore was reevaluated as part of this DSEIS.

Part 490 and the 2018 Guidance were used to determine the suitable elevation for construction of the Project, taking into account future physical climate risks associated with sea-level rise, storm surge and flooding. In doing so, the Project was designed to be consistent with the high sea-level rise projection in the 2018 Guidance and the Project elevation was increased to 18.5 feet amsl. Consequently, the Project will be protected from future physical climate risk.

Environmental Justice

NYSDEC's CP-29, Environmental Justice and Permitting, requires permit applications for major projects or major modifications to conduct an environmental justice ("EJ") analysis if the proposed action is in or near a potential environmental justice area ("PEJA"). In accordance with NYSDEC Policy CP-29, a comprehensive EJ analysis was previously conducted for the Project as previously configured and was documented in the 2010 FEIS. As part of that analysis, the Applicant collected and evaluated existing health related events data for the project Study Area (the host community) and compared that information in a qualitative and quantitative manner to data for the same health related events in similarly configured communities apart from the Project Study Area (referred to as the Health Outcome Data ("HOD") analysis). The Applicant also previously prepared and implemented an Enhanced Public Participation Plan ("EPPP") to inform the public and other interested stakeholders with regard to the previous version of the Project.

Based on this analysis and the Applicant's implementation of its EPPP, NYSDEC concluded that (1) the Project as previously configured would not contribute any additional environmental burden on the nearby PEJA; and (2) "the Astoria community does not demonstrate health outcome statistics that are atypical of the larger metropolitan area, and that the proposed Repowering Project will have no net effect with respect to increasing the number or size of environmental facilities located within the study area." It also determined that the Applicant's public outreach was consistent with CP-29.

Since that time, the New York State Department of Health ("NYSDOH") issued its Updated Guidance for Health Outcome Data Review and Analysis Relating to NYSDEC Environmental Justice Requirements for CP-29 and 6 NYCRR Part 487 (updated October 2014, revised January 2015, links updated June 2017, referred to as the updated HOD Guidance). In addition, in 2017, New York City passed Local Law 60 & 64 to codify environmental justice into City decision-making. Further, SARS-CoV-2, a novel coronavirus, was declared a pandemic on March 11, 2020.

Given these changes in circumstances and the passage of time, as well as project modifications, a new environmental justice analysis for the Project has been completed as part of this DSEIS. The updated analysis shows that implementation of the Project as currently configured will not cause adverse or disproportionate impacts in the PEJA. Because the Project replaces the existing turbines at the Astoria Gas Turbine Power facility with a smaller, more efficient CTG equipped with state-of-the-art emission controls, there is no additional burden on the community. Moreover, the Project as designed will provide substantial environmental benefits to the community in the form of a net reduction in GHG and $PM_{2.5}$ emissions, as well as significant economic benefits during construction and operation. Accordingly, additional mitigation measures above those already included in the Project design are not required.

The Applicant also updated and supplemented the 2010 EPPP for the Project and submitted a draft Supplemental EPPP to the NYSDEC on April 27, 2020. Subsequently, the Applicant has implemented the Supplemental EPPP, by among other things, holding two virtual public participation meetings to provide the public an opportunity to ask questions and learn about the modified Project and its environmental review process, establishing on-line www.cleanerpowerforastoria.com and physical repositories, and meeting regularly with local community groups and elected officials with regard to the Facility and the Project.

Finally, given recent events, the Applicant assessed the Project's potential impact on public health considering the current COVID-19 pandemic. Based on this assessment, it was determined that there is no expectation that construction or operation of the Project will affect COVID-19 susceptibility or severity for nearby communities. A review of the current data from the New York City Department of Health ("NYC Health") on COVID-19 cases in the Study Area and the comparison areas (NYC Health, 2020 220-8938) showed the rate of COVID-19 in the Study Area is less than the rates of COVID-19 for the comparison areas.

Although some press accounts of research-in-progress have suggested that ambient air pollution generally, and $PM_{2.5}$ specifically, may be a risk factor for COVID-19 severity, including higher risk of mortality, they are based on incomplete data. Moreover, even if scientists conclude in the future that there is evidence of a causal connection between ambient $PM_{2.5}$ and either increased COVID-19 susceptibility or severity, the direct reduction of net $PM_{2.5}$ emissions as a result of the Project's operation will actually benefit the community through its contribution to improving local and regional $PM_{2.5}$ air quality.

Disadvantaged Communities

The CLCPA also seeks to ensure that disadvantaged communities are not disproportionately burdened. One of the components of the CLCPA, therefore, is the identification of disadvantaged communities.

Section 75-0101 defines disadvantaged communities as "communities that bear burdens of negative public health effects, environmental pollution, impacts of climate change, and possess certain socioeconomic criteria, or comprise high-concentrations of low- and moderate- income households, as identified pursuant to section 75-0111 of this article." Although this identification process is ongoing, using New York's interim criteria for disadvantaged communities, a comparison was made between CLCPA interim disadvantaged communities and the updated PEJA. Given the general agreement in the areas covered by each program, the EJ analysis fulfills the disadvantaged communities' component of the CLCPA and establishes that the Project will not disproportionately burden disadvantaged communities.

Coastal Zone Consistency

The Project previously was evaluated to determine if it was consistent with the WRP. This evaluation considered the City's original Waterfront Revitalization Program (circa 1982). As part of the 2010 EIS, NYSDEC found that the Project was "consistent with the policies of the LWRP in that it maximizes the benefits derived from economic development and environmental management." NYSDEC, therefore, concluded that the Project "complies with all state and local coastal zone requirements."

A new coastal consistency review was completed for this supplemental SEQR assessment because in October 2013 the City Council approved a revised version of the New York City Waterfront Revitalization Program ("WRP"). The intent of these revisions was to update the policies based on new information and to reflect the City's objectives for waterfront revitalization, as embodied in Vision 2020, the NYC Comprehensive Waterfront Plan, released in 2011. One of the most significant revisions to the policies was to incorporate the consideration of climate change projections for coastal flooding and sea level rise into the design and review of projects. This policy requires all projects, except for maintenance and in-kind replacement of existing facilities, to identify potential vulnerabilities to and consequences of sea level rise and coastal flooding over their lifespan and to identify and incorporate design techniques to address these risks. New York City's revised WRP was approved by the New York State Department of State on February 3, 2016.

Based on the Coastal Assessment Form prepared for the Project, the following policies in the WRP are further assessed in this DSEIS: 1.1, 1.3, 1.5 and 6.1, 6.2, 7.1, 7.2, and 7.3. This assessment confirmed that the modified Project continues to be consistent with the updated WRP.

CUMULATIVE IMPACTS

SEQRA and its implementing regulations require the consideration of potential cumulative impacts when actions are proposed, or can be foreseen as likely, to take place simultaneously or sequentially in a way that the combined impacts may be significant. Cumulative impacts occur when multiple actions affect the same resource(s). These impacts can occur when the incremental or increased impacts of an action, or actions, are added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from a single action or from two or more individually minor but collectively significant actions taking place over time.

To identify potential cumulative impacts, information on projects, developments, or activities that might overlap temporally or geographically with the Project were collected from various city and state agency web sites such as NYC Department of City Planning, NYC Department of Environmental Protection, New York City Department of Sanitation ("DSNY"), New York City Department of Parks and Recreation, New York City Department of Correction, Port Authority of New York and New Jersey, New York State Public Service Commission ("PSC"), NYSDEC, borough planners, and other local publications. Four projects were ultimately identified for inclusion in the cumulative impact analysis with the Project; namely, the NRG Astoria Storage LLC Battery Energy Storage System

project, the DSNY Queens District 1 Garage & Salt Shed project, East River ESS Battery Storage System project, and the LaGuardia Airport Central Terminal Building Redevelopment Program.

The proposed Project, taken in concert with these other reasonably foreseeable future actions would not result in significant adverse cumulative impacts.

UNAVOIDABLE ENVIRONMENTAL IMPACTS

As part of the 2010 EIS, unavoidable adverse impacts were evaluated. In particular, the 2010 EIS determined that "the most significant impact identified is air quality." It then, compared the Project with the available alternatives (no-action and a Phase 1 only alternative which would have only replaced the Westinghouse units at the Site) and found that the Project, as configured at that time, provided "dramatic benefits … in significant impact categories, air quality and energy." Based on this analysis, NYSDEC concluded in its Findings Statement that "[c]onsistent with social, economic and other essential considerations from among the reasonable alternatives available, the action is the one that avoids or minimizes adverse environmental impacts to the maximum extent practicable, and that adverse impacts will be avoided or minimized to the maximum extent practicable by incorporating as conditions to the decision those mitigative measures that were identified as practicable."

The Project has been modified from its previously permitted configuration such that it would be smaller in scale, which means fewer structures and stacks, and will incorporate a new state-of-the-art and more efficient CTG. Due to these modifications, the Project as considered in this DSEIS further reduces the potential for adverse impacts. Most of the potential significant adverse impacts of the Project will be avoided or mitigated through Project design and implementation of mitigation measures. However, in a few instances, no practicable mitigation was identified to fully mitigate adverse impacts and there are no reasonable alternatives to the Project that would meet its purpose and need, eliminate its impacts, and not cause other or similar significant adverse impacts.

With respect to air quality, the current Project's design includes modern air pollution control systems that minimize air emissions to the maximum extent practicable during operation. The air quality impact analyses that have been conducted demonstrate that operation of the Project as modified would result in ambient concentrations of criteria and non-criteria compounds well below health and welfare-based ambient air quality standards and guidelines. In addition, the Project will displace emissions from less-efficient, higher emitting fossil-fueled electric generating units. This will result in a significant net air quality benefit. Further, there are no reasonable alternatives to the Project that would meet its purpose and need, eliminate its impacts, and not cause other or similar significant adverse impacts. Thus, as in 2010, the Project would not result in any unavoidable unmitigated adverse air quality impacts.

Regarding climate change and greenhouse gas emissions, an analysis of the GHG emissions anticipated from operation of the Project and upstream GHG emissions demonstrate that the Project is (1) consistent with the CLCPA's and local New York City limits, targets and goals; (2) will not interfere with the attainment of the ECL Article 75 GHG reduction standards established by the CLCPA; and (3) will assist in the attainment of the CLCPA renewable resource targets and GHG emission reductions, as well as New York City's climate-related Executive Orders, local laws and policies. The Project will avoid and minimize GHG emissions by implementing the Best Available Control Technology ("BACT") for GHGs. GHG emissions will be mitigated though the use of: (1) high-efficiency generating technology and (2) low-carbon fuels. The Project will also reduce GHG emissions from the electric system by displacing other less efficient electric generating units that have higher GHG emissions. The Project will also reduce the amount of natural gas and liquid fuel used by the electric system by replacing and/or displacing less efficient generation units. It will, therefore, reduce upstream GHG emissions associated with the production and transportation of these fuels to

New York, which further decreases GHGs from the electric system, and increases the GHG benefit of the Project.

Nevertheless, as mitigation for direct GHG emissions at the Project location, Astoria will upgrade the starting system for the two P&W combustion turbines being retained for black start service. This will result in an additional total GHG emissions savings of 1,077 tons of CO_2e per year. Further, the Project's future physical climate risk was minimized as it has been designed to be consistent with NYSDEC guidance for minimizing risks associated with sea-level rise, storm surge and flooding. The Project has further mitigated this risk by establishing a Project site elevation of 18.5 feet.

As there are no reasonable alternatives to the Project that would meet its purpose and need, eliminate its impacts, and not cause other or similar significant adverse impacts, as in 2010, the Project would not result in any unavoidable, unmitigated adverse impacts due to GHG emissions or future physical climate risk.

REASONABLE AND FEASIBLE ALTERNATIVES

SEQRA and its implementing regulations require the consideration of alternatives to the Proposed Project. Part 617.9(5)(v) of the SEQRA regulations requires that a DEIS describe and evaluate "the range of reasonable alternatives to the action that are feasible, considering the objectives and capabilities of the project sponsor." SEQRA also requires analysis of a "No Action" alternative, under which the proposed Project would not be constructed.

Taking into account alternatives that are within the Applicant's control, eight alternatives, including one with multiple options, were considered including:

1. The "No-Action" Alternative, including options to cease operation of the existing P&W units at the Facility, install controls on the existing P&W units to meet the Peaker Rule NOx Emission Limits under Part 227-3.4, or prohibit operation of the P&W units during the ozone season;

2. The 2010 Project Configuration;

3. The Project as defined by the Siting Board's 2019 Declaratory Ruling;

4. Stand Alone Battery Energy Storage;

5. A Photovoltaic Solar Energy System;

6. A Wind Energy Conversion System;

7. The Project's Immediate Use of Hydrogen/Renewable Natural Gas; and

8. The Electric Interconnection of Offshore Wind and/or Enhancing New York Port Infrastructure.

The Wind Energy Conversion, the Project's Immediate Use of Hydrogen/Renewable Natural Gas and Electric Interconnection of Offshore Wind and/or Enhancing New York Port Infrastructure Alternatives were dismissed as technically infeasible while the others were not preferred due to their inability to fully meet the Project's purpose and need. As summarized in Table 4.9-1, the Proposed Action is preferred as it will:

- address known reliability shortfalls in New York City;

- be completed in time to ensure uninterrupted service from the Site; thus, avoiding short-term reliability concerns or the possible need to extend the operation of the existing, less-efficient, P&W units;
- result in significantly less environmental impacts (air quality, water resource, noise, traffic and aesthetic/visual resources) than the Project as previously configured;
- displace higher emitting sources such that it will result in an overall net reduction in air emissions in the New York City area;
- require a shorter construction schedule with attendant benefits as compared to the Project as previously configured;
- facilitate New York State and New York City in achieving their climate limits, targets and goals in that it will:
  - reduce GHG air emissions;
  - facilitate the reliable integration of renewable energy resources as it provides long-term, long duration backup power;
  - result in the addition of proposed battery energy storage;
  - preserve a portion of the Site for future stand-alone battery energy storage installations;
- preserve the Site's black start capability to facilitate electrical system restoration in New York City following major power outages;
- provide positive socioeconomic benefits from construction labor and materials, and from the retention of an operations labor force and secondary support services; and
- provide economic In-City generation significantly reducing capacity prices paid by New York City electricity customers (without a ratepayer guaranteed support contract).

PROJECT BENEFITS

The Project will provide significant environmental and socioeconomic benefits. As in 2010, the Project will reduce onsite air emission rates and minimize impacts to open space, wildlife, wetlands and waterbodies by utilizing an existing, pre-disturbed site located in the Astoria ConEd Complex.

In addition, as compared to the Project as previously configured, the Project will reduce project noise at nearby residential receptors; reduce project size, resulting in less visual and aesthetic impacts; reduce the environmental burden on the nearby PEJAs; reduce water use and wastewater discharge; and reduce potential impacts from construction due to a shorter construction period.

It will also further New York State and New York City's climate limits, targets and goals by, among other things, displacing less efficient generating units resulting in approximately 5.441 million tons of cumulative GHG reductions through 2035, the equivalent of taking approximately 94,000 cars off the road[3] (or approximately 13% of all registered cars in Queens County[4]); lowering region-wide natural gas demand and incorporating energy storage.

With respect to socioeconomics, both during construction and operation, the Project will provide significant benefits in New York State. It will also provide significant ratepayer benefits through energy and capacity cost savings.

[3] USEPA indicates a typical passenger car emits about 4.6 metric tons of CO_2 per year. https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle; 5,441,000 tons GHG /4.6 tpy/ 12.58 years ~ 94,000 cars.

[4] https://dmv.ny.gov/statistic/2018reginforce-web.pdf. 94,000 / 721,426 cars ~ 13%.

Benefits from Construction and O&M Spending

In New York State, over $350 million will be spent locally over the two-year construction period resulting in the creation of over 1,000 job-years and $156 million in total value added during the construction phase. In addition, a significant portion of the Project's CTG will be engineered and manufactured in Schenectady New York. Furthermore, $29 million will be spent locally on an annual basis over the twenty-year operation phase resulting in over 70 full-time equivalent ("FTE") jobs and a total of $170 million value added through 2040.

Ratepayer Benefits

The Project will displace high cost generation and reduce overall system costs in the New York control area. Over the course of 13 years covered in the analysis (2023-35), energy prices in New York Zone J are lower by an annual average of $0.12/MWh (2020$) due to the addition of the Project, resulting in an expected $83.5 million in cost savings for NYC electric customers over the 13-year period. The average reduction in New York Zone J capacity prices during its first five years of operation (Summer 2023 to Winter 2027/28) is approximately $2.67/kW-month (2020$), resulting in an additional estimated $1.55 billion of cost savings for NYC electric customers. Notably, the Project does not require any subsidy from New York ratepayers or taxpayers.

1.0 Introduction and Project Description

This section provides a general description of the proposed Project and the Project site. A characterization of the surrounding area is provided for context. This section also presents a comparison of the Project as proposed today with the Project as it was permitted in 2010. A characterization of the current socio-economic conditions within the surrounding community is provided with a description of the purpose, need and benefits of the Project.

For clarity in this Draft Supplemental Environmental Impact Statement ("DSEIS" or "Draft SEIS"), the entire EIS prepared in 2010, including Draft and Final documents, is referred to as the "2010 EIS". This DSEIS is prepared to address project changes and changes in circumstances since the October 2010 Findings Statement. A complete chronology of previous reviews under the New York State Environmental Quality Review Act ("SEQRA") is provided in Section 2 Permitting and SEQR Process.

1.1 Project Description

Astoria Gas Turbine Power LLC (the "Applicant") is proposing to modify its project, which was approved in 2010, at the Astoria Gas Turbine Generating Facility ("Facility"). As modified, the Project will replace the existing natural gas and liquid fuel fired simple cycle combustion turbines ("SCCTs") with a new state-of-the-art simple cycle dual fuel peaking combustion turbine generator ("CTG") (the "Replacement Project" or "Project").

The Facility currently consists of 31 older, peaking-only gas and oil-fired CTGs including 24 Pratt & Whitney ("P&W") turbines and seven retired Westinghouse turbines, with a combined nameplate rating of 646 electrical megawatts ("MWe") (502 MWe not including the retired Westinghouse turbines). The Project, as modified, will replace the 50-year-old P&W and Westinghouse turbines at the Facility. The Project will include a new CTG which will be a highly efficient, quick start, fast-ramping, General Electric ("GE") H-Class 7HA.03 unit that has a nominal generator output of approximately 437 MWe. The new CTG will fire natural gas as the primary fuel with limited ultra-low sulfur distillate ("ULSD") liquid fuel for backup. The new CTG will be serviced by a single 250-foot exhaust stack. The Project will also include a ULSD-fired emergency generator to shut the plant down safely in the event of an electric power outage and two ULSD-fired emergency fire system pumps. In addition, the Project will re-utilize the Facility's two existing ultra-low sulfur kerosene ("ULSK") tanks to store ULSD as backup fuel for the new CTG. Each of these existing tanks has a nominal capacity of 2,000,000 gallons for a total of 4,000,000 gallons of ULSD.

Other ancillary project features that will be reused for the Project include the existing administration building and warehouse, parking, gated entrance, and existing underground fuel oil, natural gas and water pipes. A new 20,000 gallon tank will be installed for storage of aqueous ammonia that will be used to provide additional control of nitrogen oxides ("NOx") emissions before exhausting through the new CTG stack. New storage tanks also include a service and fire water tank (raw water) and a demineralized water tank with nominal capacities of 300,000 gallons and 1,000,000 gallons, respectively.

All of the existing units, with the exception of one P&W Twin Pac (consisting of two combustion turbines and a single generator), will be permanently shut down once the Project has completed its shakedown period. The two remaining P&W turbines will remain operational to make the Facility black start capable but are proposed to be replaced by an approximately 24 MWe battery energy storage system ("BESS") subject to future approvals. The P&W Twin Pac uses natural gas as its

primary fuel with ULSK as backup. A new 7,500-gallon ULSK tank will be used to store the backup fuel for the P&W Twin Pac.

A general arrangement drawing depicting the layout of existing and proposed equipment, structures, and infrastructure is provided in **Appendix A**.

Upon receipt of required permits and approvals, the Applicant will initiate the construction of the Project targeted for mid-2021. As described in this DSEIS, a critical goal of the Project is to commence operation by May 2023 to ensure continuous service from the Site, addressing known reliability shortfalls and avoiding the possible need to extend the operation of the existing P&W units. A detailed description of the identified permits and approvals are presented in Section 2 - Permitting and SEQR Process.

1.1.1 Project Location and Setting

1.1.1.1 Astoria ConEd Complex

The Facility is located on a 15-acre site at 31-01 20th Ave., Astoria, Queens County, New York ("Site") and is situated within a large approximate 300-acre complex (referred to as the "Astoria ConEd Complex" or "Complex"). **Figure 1.1-1** depicts the Astoria ConEd Complex and Project Site within the surrounding metropolitan area. The Astoria ConEd Complex is home to several power generating facilities, as well as barge delivery facilities, a liquefied natural gas plant, a decommissioned wastewater treatment plant, and other miscellaneous energy and utility scale operations. Public access is restricted into the Complex, as well as at the Facility gate. This area has been host to energy and electricity generating, transmission, distribution and associated activities since the 1890s and remains exclusively a major electric generating and utility operations complex.

The Astoria ConEd Complex is situated in the northwestern portion of Astoria on a peninsula bounded by the East River to the west, north and east. The Project Site is relatively flat with very little local relief. The surface elevation is approximately 17 feet above mean sea level ("amsl").

Changes since 2010 within the Astoria ConEd Complex have been limited to redevelopment and modernization of other generation facilities. This includes the demolition of the New York Power Authority ("NYPA") Charles Poletti Power Plant starting in 2012. In addition, Astoria Energy II, located outside the Astoria ConEd Complex to the southeast on the other side of Luyster Creek, was constructed and subsequently became operational in 2011.

1.1.1.2 Project Site

The Site currently is occupied by a fully operational facility that includes power generation equipment and ancillary buildings, parking and circulation, storage tanks and other structures. The existing generating equipment on Site includes the 31 peaking-only gas and oil-fired turbines (24 P&W and seven retired Westinghouse turbines), with a combined nameplate rating of 646 MWe (502 MWe not including the retired Westinghouse turbines).

As it has been for over a century, the Site is 100 percent ("%") built-out with some boundary landscaping and no natural habitat remaining. There are no significant biological, terrestrial, or aquatic ecological resources on Site.

1.1.1.3 Surrounding Land Use and Zoning

The Site has no direct connection with the local neighborhood as it is surrounded by other industrial and energy facilities, is located in the middle of the Astoria ConEd Complex and is set back several thousand feet from the Astoria ConEd Complex fence line. Luyster Creek bounds the Astoria ConEd

Complex to the east. Beyond Luyster Creek are the Steinway Piano Factory and a substantial development of industrial and warehousing properties.

To the south, 20th Avenue bounds the Astoria ConEd Complex running from northwest to southeast and separates it from commercial and residential areas. The general area south of the Complex is largely low to medium density residential in nature and has been since the 1950s, including multiple low-rise apartment buildings located immediately south of the Astoria ConEd Complex. Other residential uses in the area include low-rise one and two family attached homes. There are two schools in the area south of the Astoria ConEd Complex as well as a park that hugs the east river to the southwest of the Site. A commercial corridor runs north/south along 31st Street, as well as a commercial corridor on Ditmars Blvd, running east to west approximately four thousand feet south of the Site, which is also zoned for commercial uses (via commercial zoning overlays), and is comprised generally of local retail uses.

LaGuardia Airport lies to the southeast of the Complex across Bowery Bay approximately 1.5 miles from the Facility. Directly east of the Astoria ConEd Complex across Rikers Island Channel is Rikers Island, home of the Rikers Island Penitentiary. To the north and west across the Hell Gate Channel of the East River lie Wards and Randall's Islands including Wards Island Wastewater Treatment Plant.

The surrounding land use patterns have not changed significantly since completion of SEQR for the previously approved Project in 2010. All these land uses have been in place for over 20 years. While some newer buildings have replaced older residential buildings and some commercial uses may have changed over the years, the character of the neighborhood has remained consistent. Aerial images from September 2009 and April 2020, **Figure 1.1-2** and **Figure 1.1-3** respectively, demonstrate relatively minor changes in land use or density since the Project was previously permitted in 2010.

The newest large-scale development is the Hallett's Point section of Queens, which resulted from the Astoria Cove Rezoning (ULURP No. C 140322 ZMQ). This is over a mile and a half south of the Project Site. In addition, in 2018 Mount Sinai Health System opened the Queens Pavilion - a 140,000 square foot emergency department and surgical suite facility with expanded outpatient medical, imaging and testing services. This new medical facility is also over one and a half miles from the Site.

Since at least 1961, the entire Astoria Con Ed Complex has been Zoned M3-1, Heavy Manufacturing. Most of the area south of the Astoria ConEd Complex was rezoned under the 2010 Astoria Rezoning (ULURP No C 100199 ZMQ) which was adopted on May 25, 2010. However, this zoning change was largely to protect the existing density within the neighborhood (i.e., a "downzoning"). The residential zoning to the south of the Astoria ConEd Complex allows low and mid density residential and community facility uses. The commercial corridors along 31st Street and Ditmars Boulevard are zoned for commercial uses and are comprised generally of local retail uses.

There are currently no pending zoning map amendments to change any land use or zoning on parcels in this neighborhood. The most recent zoning map amendment within the neighborhood was the "38-01 23rd Avenue Rezoning" (ULURP 180315 ZMQ) which mapped a C2-3 commercial overlay on an existing R5D zoning district. This zoning map amendment did not change any available floor area ratios ("FAR") in the district.

Figure 1.1-1 Facility Location

Figure 1.1-2 2010 Aerial Image of Land Use Surrounding the Facility

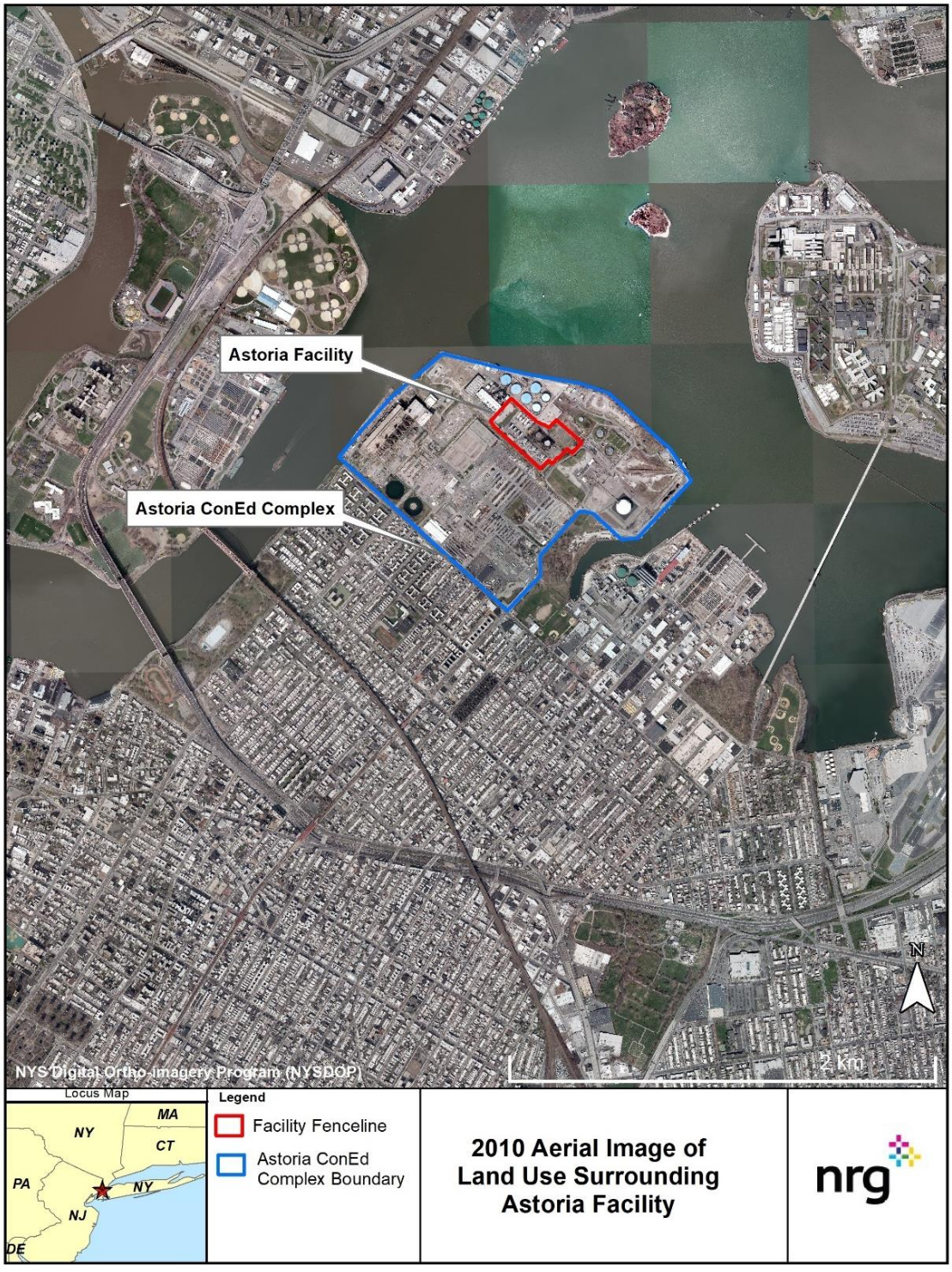
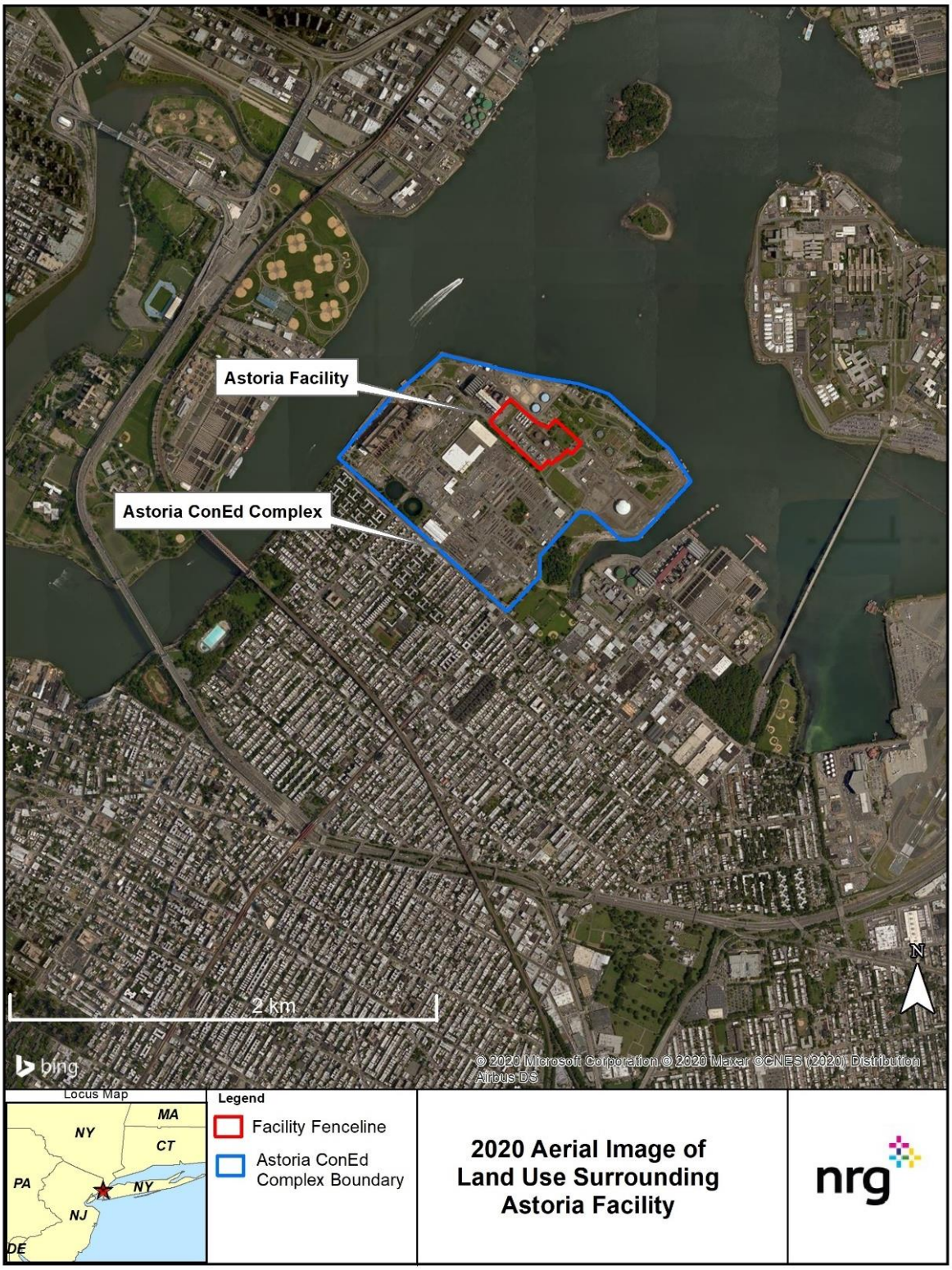


Figure 1.1-3 2020 Aerial Image of Land Use Surrounding the Facility



1.1.1.4 Natural Resources/Protected Species

The New York State Department of Environmental Conservation ("NYSDEC"), as Lead Agency, is required to consult with federal and state agencies to determine whether any federally or state-listed threatened, endangered, candidate, or proposed species under its jurisdiction, or their critical habitats, could be affected. In order to ascertain what may be impacted, both U.S. Fish and Wildlife Service ("USFWS") and New York Natural Heritage Program ("NYNHP") were contacted. Below are results of agency correspondence.

The USFWS was contacted for information regarding rare and endangered species and significant natural communities. According to USFWS's IPaC Trust Resource Report and Official Species List provided by the Long Island Ecological Services Field Office (dated July 21, 2020), four threatened or endangered species have been known to occur within the vicinity of the Site. Those species and their designations are identified in **Table 1.1-1** below. Details on each species can be found in **Appendix B**.

Table 1.1-1 USFWS Listed Species

Common Name	Scientific Name	Status
Piping plover	*Charadrius melodus*	FT, SE
Red knot	*Calidris canutus rufa*	FT, ST
Rosette tern	*Sterna dougallii*	FE, SE
Seabeach amaranth	*Amaranthus pumilus*	FT, ST
Notes: FE – Federally Endangered FT – Federally Threatened SE – State Endangered ST – State Threatened		

The Site is located in a heavily urbanized, major metropolitan area and is dominated by industrial infrastructure and facilities. The identified species are shorebirds and a plant that occurs on barrier island beaches. The Site and immediately adjacent areas do not contain suitable shoreline habitat for piping plover, roseate tern, red knot, or seabeach amaranth.

Correspondence with the USFWS and NYNHP indicated that no critical habitat occurs within the Project area (see **Appendix B**). A request was also submitted to the NYNHP regarding the presence of protected species within the project area. The NYNHP responded in a letter dated August 25, 2020 indicating that no records of rare or state-listed animals or plants, or significant natural communities occur at the Site or in its immediate vicinity.

1.1.1.5 Historic, Cultural and Archeological Resources

Although the Site is located within an area designated by NYS Office of Parks, Recreation and Historic Preservation ("NYSHPO") as having potential sensitivity for archaeological resources, in 2010, as part of the SEQRA process, clearance was obtained from the NYSHPO confirming the Project would not result in any adverse impacts upon cultural resources. Project activities will still occur within the same existing previously disturbed property.

According to the NYSDEC Environmental Assessment Form ("EAF") Mapper, there have been no significant changes or new National Register of Historic Places ("NRHP") listed historic resources identified at the site or in the area immediately surrounding the Site since the NYSDEC as Lead Agency issued the 2010 FEIS.

On June 25, 2020 the Applicant consulted with the NYSHPO to reaffirm their previous determinations (consultation number 20PR03797). The NYS Cultural Resources Information System ("CRIS") was utilized to seek comment for the purpose of complying with SEQR guidance. While a formal notification has not been received during as of the preparation of this Draft SEIS, the CRIS website indicates the following NYSPHO comment: "*Previously reviewed and approved as 08PR01279*" (https://cris.parks.ny.gov/Default.aspx, last accessed October 20, 2020.

1.1.1.6 Demographics and Socio-Economic Conditions

In the subsequent 10 years since the SEQR and permitting was completed for the Project in 2010, there have been minimal changes in the character of the surrounding community and its demographic profile. A characterization of the community south of 20th Avenue is provided for context. An updated environmental justice analysis is provided in Section 3.3.

The general area commencing approximately two thousand feet south of the Project Site (at the property line of the Astoria ConEd Complex) is largely low to mid density residential in nature and has been since the 1950s. The zoning districts to the south of the Astoria ConEd Complex are residentially zoned allowing low and mid density residential and community facility uses. Population density in Astoria has decreased 3.4% from 2010 to 2018. During this time, the neighborhood has slightly shifted from families to more young professionals. Households with children under 18 dropped from about 24% in 2010 to 19% in 2018, and single-person households increased from about 33% to 36%. The neighborhood's immigrant population has been reduced and replaced by out-of-state transplants rather than New Yorkers, with a reduction of foreign-born population from about 45% to 39%, but only an increase of about 2% of New York State born population.

Zip Code 11105 (comprising most of the area referred to as Astoria) has a lower fraction of its population 25 years and older with a part or full college education than in Queens County as a whole. Of the population 25 years and over, the total percentage of those reporting some college education was about 50% in 2018 compared to 48% in 2000.

Owner-occupied housing represents about 32% and rental housing represents about 68% of the available housing units in Zip Code 11105. Median residential housing values increased from $661,000 (2007-2011 average) to $807,000 (2014-2018 average). Vacant housing units (2014-2018) averaged about 12% annually, an increase of about 6% from the 2007-2011 average. Rental housing vacancies also increased, although at a lower rate (from 2.2% to 3.2%).

1.1.2 Project Background and History

In 2009, the Applicant proposed to replace the existing SCCTs at the Site with a combined cycle combustion turbine ("CCCT") project with a total generating capacity of 1,040 MWe. At that time, a Draft Environmental Impact Statement ("2010 EIS"), Clean Air Act Title IV and Title V air permit applications, and a State Pollutant Discharge Elimination System ("SPDES") application were submitted to the NYSDEC. The NYSDEC issued the SPDES and air permits, accepted the Final Environmental Impact Statement ("2010 EIS") and issued a findings statement in the Fall of 2010. In addition, the New York State Public Service Commission ("PSC") issued a Certificate of Public Convenience and Necessity ("CPCN") and a SEQR Findings Statement in Spring 2011. However, due to prevailing market conditions, the Project was not constructed at that time.

In response to a subsequent change in market conditions, in July 2017, the Applicant filed a petition with the New York State Board on Electric Generation Siting and the Environment (the "Siting Board") seeking a declaratory ruling that the Project is exempt from review under Article 10 of the Public Service Law ("PSL") and instead should continue to be subject to SEQRA ("Petition") (Siting Board, 2019).

According to Section 162(4)(d) of the PSL, Article 10 does not apply "[t]o a major electric generating facility if, on or before the effective date of the rules and regulations promulgated pursuant to this article and section 19-0312 of the environmental conservation law, an application has been made for a license, permit, certificate, consent or approval from any federal, state or local commission, agency, board or regulatory body, in which application the location of the major electric generating facility has been designated by the applicant; or if the facility is under construction at such time." As such, Article 10 does not apply to projects which (1) filed an application for a permit or other approval before August 1, 2012, and (2) designated the location of the generation facility in such application.[5]

On June 12, 2019, the Siting Board determined approval under Article 10 of the PSL is not required for the construction and operation of the Project and granted the Applicant's request for an exemption under PSL §162(4)(d). In doing so, the Siting Board determined that:

> The Proposed Replacement Project is an extension, amendment or continuation of the originally proposed project. The Proposed Replacement Project, therefore, need not be treated as an altogether new project initiated after the enactment of PSL Article 10. DEC, as lead agency, may determine to continue its review under SEQRA for the proposed Replacement Project. Finally, the SEQRA exemption does not preclude projects that have been subject to reasonable updating or revisions.[6]

1.1.3 Project Modifications Since 2010

The scope and size of the Project has been reduced since it was previously permitted in 2010. The number of CTG units has decreased from four to one, as has the total output from 1,040 MWe to 437 MWe, a 58% reduction. The number of exhaust stacks has also been reduced from four to one. The Project now includes black start capability enabling the Facility to provide electricity into the grid in event of a total power outage in New York City, where the Project as permitted in 2010 did not.

Table 1.1-2 provides a comparison of the key Project features and components.

[5] Siting Board, 2019, p. 10.

[6] Siting Board, 2019, p. 12.

Table 1.1-2 Comparison of Current Project Configuration to the Previously Approved Project Configuration and 2017 Declaratory Ruling Project Configuration

	2010 Permitted Project Configuration	2017 Declaratory Ruling Project Configuration	Current Project Configuration
Location	Astoria ConEd Complex	Astoria ConEd Complex	Astoria ConEd Complex
Technology	Combined Cycle (Intermediate Duty)	Simple Cycle (Peaking Duty)	Simple Cycle (Peaking Duty)
Number / type of CTGs	4 / CCCT (GE 7FA CC-Fast)	3 / SCCT (GE 7FA.04)	1 / SCCT (GE 7HA.03)
CTG fuels (primary / backup)	Natural Gas / ULSD	Natural Gas / ULSD	Natural Gas / ULSD
Electrical output (MWe) (a 58% reduction)	1,040	579	437
Steam condensing system	Indirect Dry Cooling	None	None
Number / height (feet) of stacks	4 / 250	3 / 250	1 / 250
Battery Energy Storage capacity (MWe)	None	None	24
Ancillary Equipment:			
Emergency generator	None	1 / (1500 kWe)	1 / (500 kWe) (1)
Fire system pumps	None	None	2 / (117 & 177 kWm) (2)
New ULSK storage tank	None	None	One 7,500 gallon
Bulk Fuel Storage Tanks (gallons)(3)	2 / 2,000,000 - ULSD	2 / 2,000,000 - ULSD	2 / 2,000,000 - ULSD
Aqueous ammonia storage tank	One 10,000-gallon	One 20,000 gallon	One 20,000 gallon
Black start capability	No	Yes	Yes

(1) 500 electrical kilowatts ("kWe") ULSD-fired engine; limited to 500 hours/year maximum.
(2) 117 mechanical kilowatts ("kWm") and 177 kWm ULSD-fired engines; each limited to 500 hours/year maximum.
(3) Existing ULSK tanks will be utilized to store ULSD.

1.2 Regulatory Changes in Circumstances

Additional environmental assessment is warranted in a Supplemental EIS when potentially significant adverse environmental impacts due to changes in circumstances have been identified that were not adequately considered in a previously completed EIS. For the Project, the following regulatory changes have been implemented since the 2010 EIS and now require further assessment.

1.2.1 Coastal Consistency Review and NYC Local Waterfront Revitalization Program ("WRP")

As part of the 2010 EIS and Findings, the NYSDEC determined that the Project was consistent with the policies of the New York City Local Waterfront Revitalization Program ("WRP"), which was developed in 1999 and approved by the NYS Department of State ("NYSDOS") in 2002.

Since the completion of SEQR in 2010, the City Council approved a revised version of the WRP in October 2013. The intent of these revisions was to update the policies based on new information and to reflect the City's objectives for waterfront revitalization, as embodied in Vision 2020, the NYC Comprehensive Waterfront Plan, released in 2011. One of the most significant revisions to the policies was to incorporate the consideration of climate change projections for coastal flooding and sea level rise into the design and review of projects. This policy requires all projects, except for maintenance and in-kind replacement of existing facilities, to identify potential vulnerabilities to and consequences of sea level rise and coastal flooding over their lifespan and to identify and incorporate design techniques to address these risks. New York City's revised WRP was approved by the New York State Department of State on February 3, 2016.

The updated coastal consistency review and evaluation of the WRP policies is presented in Section 3.4.

1.2.2 Climate Leadership and Community Protection Act ("CLCPA")

Since the completion of SEQR and permitting in 2010, the CLCPA was passed and signed into law in 2019 (Chapter 106 of the Laws of 2019). The CLCPA and Environmental Conservation Law ("ECL") Article 75 require NYSDEC to promulgate regulations to establish a statewide greenhouse gas ("GHG") emissions limit for 2030 that is sixty percent of 1990 GHG emissions, and for 2050 that is fifteen percent of 1990 GHG emissions. The CLCPA also requires the Public Service Commission ("PSC") to establish a program to meet a target of seventy percent of statewide electrical generation from renewable sources by 2030, and a target of zero GHG emissions for statewide electrical demand by 2040. NYSDEC adopted 6 NYCRR Part 496 on December 30, 2020, which established the statewide GHG emission limits for 2030 and 2050 consistent with ECL Article 75 and the CLCPA. On October 15, 2020, the PSC issued an Order expanding the Clean Energy Standard to increase renewable energy in the state to 70% by 2030. In addition to the regulations, Section 7(2) of the CLCPA requires all state agencies to consider whether the decision to issue permit(s) is inconsistent with or will interfere with the attainment of the ECL Article 75 GHG emission limits. If there is an inconsistency, the state agency must provide "a detailed statement of justification as to why such limits/criteria may not be met and identify alternatives or greenhouse gas mitigation measures to be required where such project is located."

The assessment of the Project's consistency with the CLCPA is presented in Section 3.2.

1.2.3 6 NYCRR Part 496 "Statewide Greenhouse Gas Emission Limits."

Part 496 was adopted by NYSDEC on December 30, 2020 and establishes Statewide limits on GHG emissions for the years 2030 and 2050 as a percentage of 1990 emission levels of 60% and 15% as required by the CLCPA. The 1990 Statewide GHG baseline established by Part 496 is 409.78 million metric tons. The Statewide GHG emission limits for 2030 and 2050, are 245.87 and 61.47, respectively. Part 496 also establishes the 20-year global warming potential factors to be used for purposes of the CLCPA. The rule applies to all emission sources in New York State, but the rule does not itself impose compliance obligations. The Part 496 limits will form the baseline for the promulgation of future CLCPA regulations by NYSDEC that will assist the State in meeting the CLCPA limits.

1.2.4 Establishing a Value of Carbon: Guidelines for Use by State Agencies

The Establishing a Value of Carbon Guidelines for Use by State Agencies ("Value of Carbon Guidance") was finalized by NYSDEC on December 30, 2020, as required by the CLCPA and ECL Article 75. A value of carbon is a monetary representation of the impact of a change in GHG emissions resulting from an action, and the associated social cost/benefit. The Value of Carbon Guidance provides a recommended procedure for using a damages-based value of carbon to be

used by State agencies in considering GHG emissions and climate change in their decision-making. The Value of Carbon Guidance does not establish a requirement on any public or private entity.

1.2.5 Community Risk and Resiliency Act

Since the completion of SEQR and permitting in 2010, the Community Risk and Resiliency Act was signed into law in 2014. The Community Risk and Resiliency Act requires applicants to consider impacts of extreme weather including storm surge, sea level rise and flooding. NYSDEC promulgated Part 490 of Title 6 of the New York Code, Rules and Regulations ("NYCRR"), which includes sea level rise predictions for use in consideration of the impacts. The 2018 Draft New York State Flood Risk Management Guidance for the Implementation of the Community Risk and Resiliency Act ("2018 Guidance") has been put into effect.

The potential effects from sea level rise are included in Sections 3.2 and 3.4, where impacts related to Climate Change are evaluated.

1.2.6 FEMA Flood Mapping

The Project is located in an area covered by the FEMA-mapped flood hazard areas. Since the completion of the SEQR and permitting in 2010, preliminary floodplain mapping was issued in 2013 by the Federal Emergency Management Agency ("FEMA") and reissued in 2015. Although the 2015 mapping is available and utilized by New York City, the new maps have not yet been put into effect by FEMA and the Effective Flood Maps remain from 2007. Both flood maps (attached to the FEAF Part 1 indicate that portions of the Project Site lie in an area having a 1% chance of annual flood hazard (100-year floodplain).

The assessment of the effects from flooding on the Project are presented in Sections 3.2 and 3.4.

1.2.7 NYC Climate Change Executive Orders, Local Laws and Policies

1.2.7.1 Executive Order 52 ("EO-52") – Statement of Administration Against Addition of Infrastructure that Expands the Supply of Fossil Fuels in New York City

On February 6, 2020, Mayor Bill DeBlasio issued EO-52. EO-52 sets forth New York City's opposition to the development of infrastructure that expands the supply of fossil fuels via pipelines, and new fossil-fuel based electric generation capacity. It includes four key components:

1. Commitment to ending the expansion of fossil-fuel related infrastructure that "expands the supply of fossil fuels via pipelines or terminals for the transfer of fossil fuels or via the construction of new fossil-fuel based electric generation capacity."
2. Comprehensive review of processes for approving or allowing infrastructure that expands the supply of or extends reliance on fossil fuels.
3. Regulatory interventions to articulate the City's opposition to infrastructure that expands the supply of fossil fuels.
4. Agency cooperation to ensure that potential economic impacts and the potential disruption of existing fossil fuel supply is taken into account to assess potential conflicts with contract requirements.

1.2.7.2 Local Law 97, 2019

On April 18, 2019, the New York City Council passed the Climate Mobilization Act. Included in the Climate Mobilization Act is Local Law 97, which mandates reductions in citywide greenhouse gas emissions. Codified in Section 24-803(a)(1) of the NYC Administrative Code, Local Law 97 requires that:

> There shall be, at minimum, a 40 percent reduction in citywide emissions by calendar year 2030, and an 80 percent reduction in citywide emissions by calendar year 2050, relative to such emissions for the base year for citywide emissions.

These reduction goals enacted by Local Law 97 are to be "achieved through the applicable policies, programs and actions included in PlaNYC, the long-term sustainability plan developed and updated pursuant to section twenty of the New York city charter, and any additional policies, programs and actions to reduce greenhouse gas emissions that contribute to global warming." (NYC Code, Section 24-803(a)(2)).

Local Law 97 also requires substantial reductions in greenhouse gas emissions from City government operation and contains building emissions and energy conservation requirements.

1.2.7.3 OneNYC 2050

Following a nearly year-long effort to explore and evaluate the most important local and global challenges facing New York City, to craft a strategic plan to address those challenges, and to offer a vision for New York City in the 21st century, New York City released its OneNYC 2050 in April 2015. Created under the requirements of Local Law 84 of 2013, OneNYC 2050 is New York City's long-term strategic plan. The relevant goals of the OneNYC Plan, as the successor document to PlaNYC and updated in April 2019, include the City's New Green Deal policies including the reduction of $PM_{2.5}$ emissions, GHGs and the achievement of carbon neutrality by 2050.

NYC Climate Change Executive Orders, Local Laws and Policies are assessed in Section 3.2.

1.3 Other Changes in Circumstances

1.3.1 Energy and Environmental Economics, Inc. ("E3") Report "The Potential for Energy Storage to Repower or Replace Peaking Units in New York State"

The New York State Public Service Commission's energy storage deployment order from late 2018 (New York State Department of Public Service ("NYSDPS"), 2018) included a requirement for Department of Public Service staff to analyze the operational and emissions data of conventional peaking units, defined as fossil-fuel generators with low utilization that typically operate during periods of high demand, to identify potential candidates for repowering or replacement with energy storage and/or clean resources. In consultation with the New York Independent System Operator ("NYISO"), New York State Energy Research and Development Authority ("NYSERDA"), NYSDEC, the Long Island Power Authority ("LIPA"), and Consolidated Edison Company of New York, Inc. ("CECONY or Con Edison"), E3 conducted this analysis and issued its report in July 2019.

An evaluation of the findings in E3's report is included in Section 4.5.3.

1.3.2 COVID-19

According to the New York State Department of Health:

> SARS-CoV-2, a novel coronavirus, was first identified as the cause of an outbreak of respiratory illness in Wuhan, Hubei Province, China in 2019. There are many coronaviruses, all of which typically cause respiratory disease in humans. The World Health Organization (WHO) named the disease caused by SARS-CoV2 "COVID-19."

COVID-19 was declared a pandemic on March 11, 2020 due to the number of countries affected by its rapid spread. An assessment of Project impacts on COVID-19 is included in Section 3.3.10.

1.3.3 Demand Management and Energy Efficiency

In response to increasing energy costs and efforts to reduce greenhouse gas emissions, the State and New York City have employed a number of different measures to manage and reduce energy use, including demand management and energy efficiency. Demand management is the modification of consumer demand for energy through various methods, the goal of which is to encourage the consumer to use less energy during peak hours, or to move the time of energy use to off-peak times such as nighttime and weekends. Peak demand management does not necessarily decrease total energy consumption, but could be expected to reduce the need for investments in networks and/or power plants for meeting peak demands. Energy efficiency seeks to reduce energy consumption by using less energy to attain the same amount of useful output.

Demand Management and Energy Efficiency are further discussed in Section 4.10.

1.4 Purpose, Public Need and Benefits, Socioeconomic Considerations

1.4.1 Project Purpose and Need

The existing Facility currently provides three major functions:

i. dual fuel generation in times of high electric demand;

ii. contingency support in case of unexpected transmission and generation outages, or during extreme weather events; and

iii. system restoration capability in response to a total system outage (i.e., blackout).

During times of crisis and exceptional need, the Facility has been indispensable in keeping the power on in New York City. While the need for reliable local power can arise at any time, significant examples of the Facility's important functions include:

- COVID-19 Pandemic (March-April 2020): Deemed critical infrastructure by the NYISO, the Applicant established health and safety protocols for the Facility's dedicated staff, who have maintained 24/7 plant availability, ensuring reliable service for New York City during the pandemic.
- Con Edison Transformer Explosion (December 27-28, 2018): The Facility's units were dispatched for 23 consecutive hours following Con Edison's nearby substation incident, which resulted in a loss of power at LaGuardia airport for almost an hour.
- Polar Vortex (January 2-29, 2014): Facility units were dispatched for 291 hours to support local power needs. Dual fuel capability of the units was critical in keeping power flowing during an unprecedented cold snap in the northeast leading to extended curtailments of natural gas fuel.
- Superstorm Sandy (October 29 – November 4, 2012): Facility units were dispatched for 580 hours to support local power needs. On October 31 alone, ten Astoria units were dispatched continuously between 15-21 hours each.
- 2003 Northeast Blackout (August 14-16, 2003): Facility units were dispatched for 353 hours to provide critical system restoration service immediately following the blackout. Fifteen units were also dispatched at various times over a three-day period to support local power needs.
- Hurricane Irene (August 26-29, 2001): Facility units were dispatched for 22 hours over four days to support local power needs.
- 9/11 (September 11-12, 2001): Facility units were dispatched for 31 hours to support local power needs.

The Project's purpose is to modernize the Facility with state-of-the-art technology to alleviate identified reliability shortfalls in NYC; increase generation efficiency; reduce air emissions; facilitate the reliable interconnection of additional renewable resources; help New York State and New York City achieve their climate change limits, targets and goals, including reducing GHG emissions; contribute to energy storage goals; continue to provide system restoration capability; and provide significant savings to electricity customers in New York City.

Addresses Reliability Shortfalls in New York City

In December 2019, NYSDEC adopted 6 NYCRR Subpart 227-3, "Ozone Season Oxides of Nitrogen (NOx) Emission Limits for Simple Cycle and Regenerative Combustion Turbines" (the "NOx Peaker Rule") that lowers the allowable NOx emissions from simple cycle and regenerative combustion turbines during the ozone season. The NOx Peaker Rule helps address Clean Air Act requirements and ozone nonattainment.[7] The NOx Peaker Rule phases in control requirements from 2023 to 2025.[8] It is anticipated that these regulations will result in the near-term retirement of 1,510 MW of capacity in New York City that is currently comprised of existing, aging combustion turbine peaking units, some of which will need to be replaced to maintain system reliability.[9]

Following the adoption of the NOx Peaker Rule, the New York Independent System Operator ("NYISO") with assistance from Con Edison completed a Short Term Assessment of Reliability: 2020 Q3 ("STAR Report")[10] and Reliability Needs Assessment ("RNA")[11] to determine potential impacts from the new regulations. The STAR Report addresses issues between 2021 and 2025, while the RNA looks ahead from 2024 to 2030.

The STAR Report "identifies short-term needs starting in 2023 and increasing in scope and scale through 2025. The issues identified are primarily driven by a combination of forecasted peak demand and the assumed unavailability of certain generation in New York City affected by the [NOx Peaker Rule]. The short-term needs include both thermal overloads on the bulk system as well as dynamic instability. … The needs observed in years 2024 and 2025 are identical to those identified in the RNA, and therefore will be addressed in the long-term Reliability Planning Process."[12] Similar to the STAR Report, the RNA "identified violations or potential violations of reliability criteria … in the base case throughout the entire study period (2024-2030) due to dynamic instability, transmission overloads, and resource deficiencies."[13]

Collectively, the STAR Report and RNA detail the following deficiencies[14]:

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7 *See* **Appendix E** (Navigant/Guidehouse GHG Study) at 5-6 (2020). The Title V Air Permit Major Modification Application publicly available at: www.cleanerpowerforastoria.com/.

8 *Id.*

9 *Id*. at 5-6; 9.

10 https://www.nyiso.com/documents/20142/16004172/2020-Q3-STAR-Report-vFinal.pdf/f836a71a-8fb7-dd24-2b6a-bfd0e739e2ec

11 https://www.nyiso.com/documents/20142/2248793/2020-RNAReport-Nov2020.pdf/64053a7b-194e-17b0-20fb-f2489dec330d

12 STAR Report at pg 3

13 RNA, p 1.

14 Deficiencies in the STAR Report and RNA are represented in terms of generic compensatory resources, in megawatts (MW) or megavolt-amperes (MVA). Compensatory MW and MVA amounts are determined by adding generic "perfect capacity" resources to effectively satisfy the needs. "Perfect capacity" is a term used to describe resources that are always able to produce energy on demand, without any limitations due to factors such as equipment failures or lack of fuel, without energy duration limitations, and without consideration of transmission security or interface impacts. Actual resources would need to be larger in order to achieve the same impact as perfect-capacity resources. RNA, p. 2.

- On Con Edison jurisdictional facilities ("non-BPTF") in the Astoria East/Corona 138kV Transmission Load Area ("TLA"), thermal overloads of 110 MW starting in 2023 growing to 180 MW by 2030; the duration of the deficiency ranges from 10 hours in 2023 to 13 hours in 2030.

- On NYISO jurisdictional Bulk Power Transmission Facilities ("BPTF") in the New York City 345kV TLA, a 340 MVA dynamic instability issue starting in 2023 and growing from 1,020 MVA in 2025 to 1,390 MVA in 2030; the duration of the deficiency ranges from 9 hours in 2023 to 12 hours in 2030.

- Transmission loading issues in the New York City 345kV TLA starting at 700 MW in 2025 growing to 1,075 MW with the same duration as above.

To address the non-BPTF local transmission security violations in the Astoria East 138kV load pocket, Con Edison has proposed the installation of a "6-mile-long, 345/138kV Phase Angle Regulator (PAR) controlled feeder" from the 345kV Rainey substation to the 138kV Corona substation.[15] As described in a December 30, 2020 petition to the PSC, Con Ed further describes the new PAR controlled feeder ("TRACE Project") and sought an order authorizing ratepayer cost recovery for its design, engineering, permitting and construction which was granted on April 15, 2021.[16] As part of this petition, Con Ed confirms a fully operational, 437 MWe Astoria Replacement Project would also resolve the local reliability issues in the Astoria East load pocket.[17] The Con Ed TRACE Project is further discussed in Appendix M.[18]

To address the near term BPTF issues, the NYISO selected an alternative Con Edison operating procedure for summer 2023. This operating procedure changes the status of seven series reactors on Con Edison's 345kV transmission system.[19] The report does not address BPTF reliability deficiencies for the years 2024 and 2025 stating they will be addressed in the long-term Reliability Planning Process.

In a report dated February 23, 2021, the NYISO confirmed the Con Edison TRACE Project and alternative operating procedure "have reduced, but not eliminated, the dynamic instability issues. Transient voltage response violations are still observed on Con Edison's non-BPTF system from 2025 through 2030."[20] In a subsequent report dated March 26, 2021, the NYISO stated the remaining non-BPTF dynamic instability issues will be addressed by a future Con Edison Corrective Action Plan.[21]

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[15] Utility Report Case 20-E-0197 Utility Transmission & Distribution Investment Working Group Report at pg 109.

[16] December 30, 2020 filing in 19-E-0065 http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={0CC2E0C7-6EC5-40B0-8DE7-19B237C85ACE} While Con Ed has proposed a total of three Transmission Reliability and Clean Energy Projects, in this DSEIS "TRACE Project" refers only to the Rainey to Corona project.

[17] *Ibid* at pg 27.

[18] In contrast, the Project would obviate the need for the TRACE Project and provide greater GHG emission reductions as well as significantly greater reductions in New York Zone J capacity prices.

[19] Short-Term Reliability Process Report: 2023 Near-Term Reliability Need – Solution Selection February 22, 2021 at pg 7 https://www.nyiso.com/documents/20142/15930753/2020-Quarter-3%20Short-Term-Reliability-Process-Report-vFinal3.pdf/df5f4ead-0bea-3b31-710b-5fdbe4649a57

[20] 2020-2021 Reliability Planning Process: Post RNA Base Case Updates, February 23, 2021 Slide 19; https://www.nyiso.com/documents/20142/19415353/07%202020-2021RPP_PostRNABaseCaseUpdates.pdf/b81547bc-0411-7958-de0c-7b74244904a5

[21] 2020-2021 Reliabilty Planning Process: Post-RNA Base Case Updates – Dynamics March 26, 2021 at pg 7.
https://www.nyiso.com/documents/20142/20255668/03%202020-2021RPP_PostRNABaseCaseUpdates_Dynamics.pdf/60e9535a-a5c2-2b43-7d24-97046c54575e

As the NYISO received only two proposed solutions to the Near-Term Reliability Needs,[22] if the Project or TRACE Project are not completed in time, then it is likely the operation of the existing P&W units will need to be extended beyond May 1, 2023 to address the local reliability deficiency as provided for in the NOx Peaker Rule. Accordingly, given the critical nature of reliable electric supply to New York City, it is prudent to implement a portfolio of reliability solutions. In the words of Rich Dewey (CEO of the NYISO), hitting the 2030 and 2040 [CLCPA] targets, from a reliability standpoint, will require "every tool in the toolkit."[23] Otherwise, New York City could experience reliability issues similar to those faced by Texas in Winter 2021 or California in Summer 2020.[24] As reported by the NYISO, "The conditions we saw in California and Texas serve as a reminder of the importance of resource adequacy and dispatchability."[25] New York can avoid a similar situation by ensuring ample reliable backup/standby units are available to the system operator at all times.

The reliability need for long-term, long duration backup/standby units, like the Project, to support the addition of large amounts of intermittent renewable resources in the future has been well documented by numerous third party consultants and is further discussed below in this section, as well as in Section 3.2.1.2.C.

The Project has been specifically designed to allow continuous service from the site and, to the extent the ConEd solutions are not completed on time, avoid the possible need to extend the operation of the existing P&W units.[26] As such, either by itself or as part of a portfolio approach with the TRACE Project, the Project is expected to fully address the identified local reliability shortfalls in the Astoria East 138kV load pocket and the Near-Term dynamic instability issues in the New York City 345kV TLA as soon as it achieves commercial operation. In addition, the Project will contribute more than 500 MVA to alleviating longer term New York City dynamic instability and transmission security violations. Since the duration of the identified deficiencies last up to 13 hours, current energy storage technologies alone cannot resolve the issues.

Given the design of the new unit and its ability to start up and reach full load within 10 minutes, the Project will be able to quickly respond to the loss of intermittent renewable energy and meet peak demands in New York City. Its dual-fuel capability also allows for flexibility to address fuel price volatility and circumstances when natural gas may not be available (a situation seen during the recent Texas cold snap when major natural gas supplies were disrupted). As reported, one of the reasons New York would likely avoid the kind of statewide power outages recently seen in Texas is the state's dual-fuel mandate. According to Rich Dewey, "We've got the capability to run oil as a backstop".[27] This benefit is also supported by the findings in the Analysis Group's November 2019 Final Report for the NYISO on Fuel and Energy Security in New York State, which includes the following observations: "Dual fuel

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[22] Short-Term Reliability Process Report: 2023 Near-Term Reliability Need February 22, 2021 pg 5 "In response to the solution solicitation to address the 340 MVA need in 2023, the NYISO received a regulated transmission solution from Con Edison, the Regulated Transmission Owner, and a proposed market-based generator solution from NRG [the Project]."

[23] Backup Fuel Provides Reliability to the Power Grid by Rick Karlin *Times Union* February 25, 2021 https://www.timesunion.com/business/article/Backup-fuel-oil-provides-reliability-to-power-grid-15979270.php

[24] Between February 14 and February 19, 2021, the Electric Reliability Council of Texas (ERCOT) had to institute rolling black outs during a life threatening cold snap due to insufficient electric generation being available on the system. Similarly, on August 14 and August 15, 2020, the California Independent System Operator ("CAISO") implemented involuntary rotating outages as a result of the rapid retirement of dispatchable generation outpacing replacement capacity needed for system reliability (see *The intersection of Decarbonization Policy Goals and Resource Adequacy Needs: A California Case Study* prepared for NARUC dated March 2021. https://pubs.naruc.org/pub/55D05995-155D-0A36-315C-A161357DA070

[25] State of the Grid 2021 Presentation Talking Point February 25, 2021 https://www.nyiso.com/documents/20142/15736687/State-of-the-Grid-Dewey-Presentation-Talking-Points.pdf/560be98f-1ae9-0e10-ccef-cfcea25fff84

[26] A short outage will be required to transfer the electrical interconnections to the new unit immediately prior to hot commissioning.

[27] Backup Fuel Provides Reliability to the Power Grid by Rick Karlin *Times Union* February 25, 2021 https://www.timesunion.com/business/article/Backup-fuel-oil-provides-reliability-to-power-grid-15979270.php

capability – with oil as a backup fuel to natural gas – is vital for maintaining reliability. Maintaining adequate dual fuel … operating capability is critical to reliable operations during adverse winter conditions, especially in the downstate region." (Analysis Group, 2019) [28].

Significantly Reduces Air Emission Rates including Greenhouse Gases ("GHG")

The existing P&W and Westinghouse units were designed in 1970 to operate on natural gas and kerosene fuel without modern air pollution control equipment. Currently, these units operate with an efficiency of approximately 25.7%. Replacing the 50-year-old operating P&W CTGs with a new, more efficient, simple cycle dual-fuel CTG will result in direct annual reductions in air emissions, including reductions in GHG emissions in furtherance of the State and City's climate limits, targets and goals.

The Project's new combustion turbine generator offers the highest efficiency in its class at approximately 37%. This represents an increase in efficiency of approximately 30%, which translates directly into reduced GHG emission rates. In addition, the Project will incorporate state-of-the-art air pollution control technologies including GE's latest Dry Low NOx combustion system (DLN 2.6e), a water/liquid fuel emulsification system and post combustion oxidation catalysts and selective catalytic reduction ("SCR"). The increase in efficiency and modern pollution controls results in up to 99% reductions from existing onsite air emission rates (see **Figure 3.1-1**).

Furthermore, because the NYISO dispatches the bulk power system based on the next lowest cost resource, the Project will displace other older, less efficient generation in New York City, resulting in a net reduction in GHG emissions.[29] Based on modeling of future market conditions, which assumes the retirement of the existing units as a baseline, the Project's operation is forecasted to result in a direct reduction of approximately 72,000 tons and 88,000 tons of GHG annually in 2023 and 2024, respectively, and with cumulative direct GHG emission reductions of over 421,000 tons by 2035.[30] The Project's increased efficiency and displacement of other less efficient electric generating units also results in a reduction in upstream GHG emissions. Moreover, by providing required quick start and fast ramping capability to maintain reliability in New York City, large amounts of capacity from energy storage can be avoided. This cost savings can be translated into accelerated procurement of additional renewable resources including significant amounts of offshore wind resulting in additional indirect GHG reductions.[31] In total, the Project is expected to reduce cumulative GHG emissions by over 5 million tons through 2035, which is the equivalent of taking 94,000 cars off the road (or 13% of all cars currently registered in Queens County)[32].

Facilitates the Reliable Integration of Renewable Energy Resources by Providing Long-Term, Long Duration Backup Power Supply

The need for quick start, fast ramping dispatchable resources in New York's future electric grid has been well documented. In Power Trends 2019, the NYISO reported "[t]he addition of renewable resources … will create a more dynamic grid, where supply is heavily influenced by weather conditions. This necessitates … adding flexible resources to balance intermittent renewables. These

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[28] https://www.nyiso.com/documents/20142/9312827/Analysis%20Group%20Fuel%20Security%20Final%20Report%20201911111%20Text.pdf/cbecabaf-806b-d554-ad32-12cfd5a86d9e

[29] *Id*. at 5-6; *see also* **Appendix E** (Navigant/Guidehouse GHG Study) at 1, 16-17.

[30] See **Table 3.2-1** of this DSEIS.

[31] **Appendix E** of this DSEIS.

[32] https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle. https://dmv.ny.gov/statistic/2018reginforce-web.pdf

flexible attributes include … fast response rates and the ability to startup and shutdown quickly and frequently." (NYISO, 2019)[33]. Similarly, Power Trends 2020 elaborates "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." (NYISO, 2020b)[34].

The Project has been specifically designed with these attributes in mind. As primarily a backup/standby resource, the Project most often expects to supply Ten Minute Non-Synchronous Reserves[35] ("TMNSR") to the wholesale energy market. This service requires a resource to be able to startup and reach full load within 10 minutes. The resource must then be able to shut down and restore its 10-minute start capability within one hour. This operating profile allows the Project to provide critical long-duration contingency support for New York City's electric supply including for intermittent renewable energy, unexpected generator/transmission line outages and extreme multi-day weather events.

While energy storage is expected to play a significant role in the integration of future renewable resources, flexible dispatchable resources will still be needed to provide long-duration seasonal scale backup service (a.k.a. firm capacity).[36] Currently these services are required following an extreme weather event (e.g., hurricane, polar vortex or ice storm). However, in the future long-duration backup supplies will also be required during heat waves, cold snaps including ice storms, multi-day wind lulls and drought events which occur on a regular basis (Analysis Group, 2020)[37]. These needs have been well documented in recent third-party analyses completed for NYSERDA and the NYISO. For instance, in a recent assessment of climate change impacts on power system reliability in New York State, the Analysis Group makes the following two major observations (Analysis Group, 2020):

1. "Battery storage resources help to fill in voids created by reduced output from renewable resources, but periods of reduced renewable generation rapidly deplete battery storage resource capabilities";

2. "The [dispatchable/zero emission] DE Resource needed to balance the system in many months must be significant in capacity, be able to come on-line quickly and be flexible enough to meet rapid, steep ramping needs."

Similarly, in *Pathways to Deep Decarbonization in New York State*, E3 observed the "need for firm resources would be most pronounced during winter periods of high demand for electrified heating and transportation and lower wind and solar output" over multi-day periods (E3, 2020) [38]. This need can be seen graphically in **Figure 1.4-1** (Figure 20 from the E3 report).

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[33] https://www.nyiso.com/documents/20142/6386402/Por-Trends-2019-Media-Briefing-FINAL.pdf/bc903ee2-d571-190e-e2d0-831a16b425a5?t=1556738785048

[34] https://www.nyiso.com/documents/20142/6386402/Power-Trends-2020-Media-PPT.pdf/6c8770c9-7a6f-44fd-1db9-6626ab768e0c?t=1591734914513

[35] Ten Minute Non Synchronous Reserves is a wholesale market product procured by the NYISO in accordance with NYISO Market Administration and Control Area Services Tariff Sec 15.4.1.2.2 10-Minute Non-Synchronized Reserve.

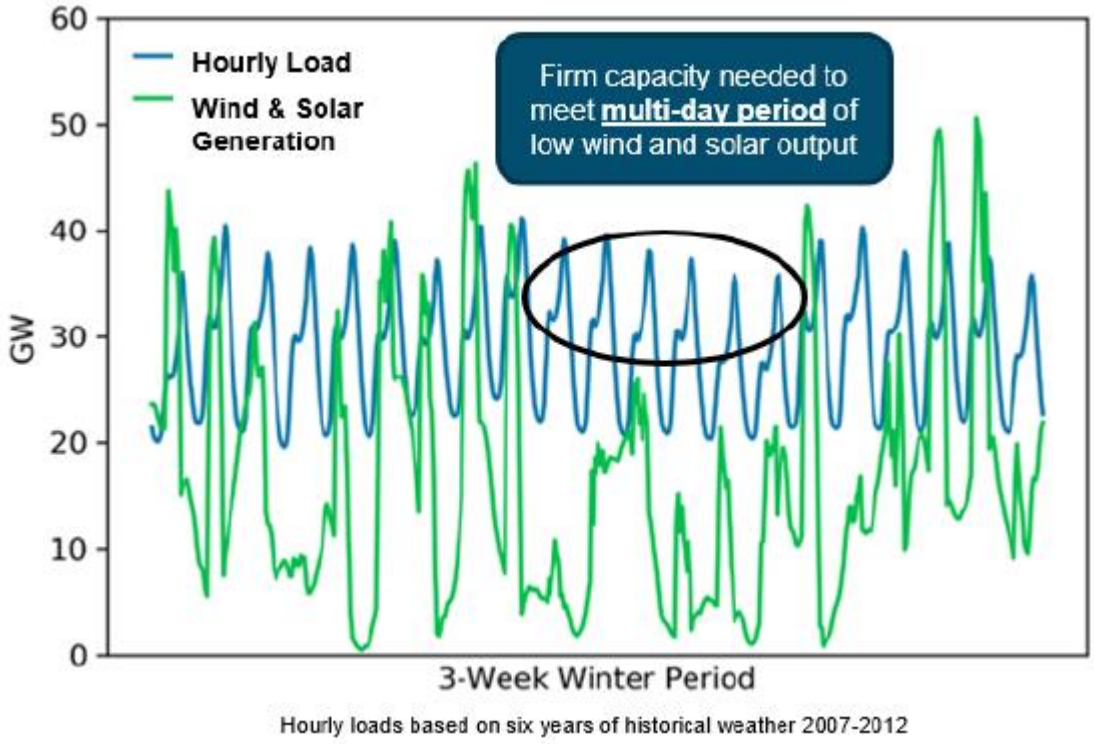
[36] Firm Capacity is defined by E3 in Pathways to Deep Decarbonization in New York State as "the amount of energy available for power production which can be guaranteed to be available at a given time".

[37] https://www.nyiso.com/documents/20142/15125528/02%20Climate%20Change%20Impact%20and%20Resilience%20Study%20Phase%202.pdf/89647ae3-6005-70f5-03c0-d4ed33623ce4

[38] https://climate.ny.gov/Climate-Resources

The Project's quick start/fast ramping long-duration capability allows it to provide this needed backup balancing service for intermittent renewables. See Section 3.2.1.2 C for further discussion on how the Project facilitates New York's transition to a reliable zero-carbon grid.

Figure 1.4-1 Electricity Demand and Wind + Solar Generation



Contributes to New York's Energy Storage Goals

The Project helps New York State and New York City achieve their climate change goals by contributing to the CLCPA's energy storage goal of 3,000 MW by 2030. It does so by both incorporating a proposed 24 MWe battery energy storage system to enable black start capability, as well as preserving portions of the Site and its valuable electrical interconnections for additional stand-alone energy storage applications in the future.[39]

Capable of Qualifying for Con Edison's System Restoration Plan

The Project has been designed to start up and operate without any external power source ("black start capability") a critical requirement of the New York State Reliability Council ("NYSRC").[40] This capability allows the Project to qualify for system restoration service – the ability to restore electric service to New York City following a total system outage. Black start service is necessary to facilitate

[39] NRG has already initiated early development efforts for an onsite 79.9 MW stand alone battery storage system (Q830 in NYISO's electric interconnection queue). In addition, the Applicant notes it has sponsored a 1.5 MW mobile battery storage demonstration project in partnership with Con Edison on the Site as part of New York's Reforming the Energy Vision ("REV") initiative. The project, known as Storage on Demand, is currently under construction and expected to be operational by summer 2021.

[40] NYSRC 2018, Rule F.

a stable and orderly restoration of the power system in the event of a partial or complete shutdown of the system. One notable example at the Facility is the 2003 Northeast Blackout (August 14-16, 2003) when the existing Facility units were dispatched for 353 hours in support of system restoration efforts immediately following the blackout.

Provides Significant Savings to Electricity Customers in New York City by Supplying Economic Capacity (without a ratepayer guaranteed support contract)

Recent forecasts of future electric load have dramatically increased as a result of the CLCPA and Local Law 97. Peak load in New York City is now forecast to gradually rise from 11.9 GW in 2020 to 14.6 GW in 2040 (E3, 2020). Electrification of building heat and the City transportation sector are responsible for a significant portion of this increase. The NYISO administers an Installed Capacity Market (ICAP) to procure the resources necessary to meet peak load. The ICAP market uses a demand curve approach whereby the greater the quantity of resources supplying capacity in a particular zone, the lower the price in that zone. However, based on recent FERC precedent, resources with state sponsored contracts are mitigated or assigned a floor price in the market which limits their ability to provide economic capacity. The Project has no support contracts and based on its cost structure, it has already been deemed economic capacity by the NYISO[41] and will contribute to lowering capacity prices for New York City electricity customers through its participation in the ICAP market. As further described in Section 1.4.2.2 below and as calculated in Figure 11 of the January 2021 Navigant/Guidehouse *Supplement to Economic Development Benefits of the Proposed Astoria Replacement Project* (**Appendix C**), the average reduction in New York Zone J capacity prices from the Project from Summer 2023 to Winter 2027/28 is approximately $2.67/kW-month (in 2020$), resulting in a total cost savings to New York City electricity customers of over $1.5 billion in just its first five years of operation.

In conclusion, a diversified portfolio approach, which includes the Replacement Project, will be necessary to fully address the identified reliability issues in New York City, maximize the reduction of both direct and indirect GHG emissions, help New York achieve its climate limits, targets and goals, facilitate a stable and orderly restoration of the power system in the event of a partial or complete shutdown of the system and reduce costs for New York City electricity customers.

1.4.2 Project Benefits

1.4.2.1 Environmental Benefits

The proposed modification of the Project will provide significant environmental benefits including:

- Reducing onsite air emission rates by up to 99% (see **Figure 3.1-1**);
- Furthering New York State and New York City's climate limits, targets and goals (refer to Section 3.2) by, among other things,
  - Causing over 5 million tons of cumulative GHG reductions through 2035 (Navigant/Guidehouse, 2020a supplemented 2021; provided in **Appendix E** and **Table 3.2-1**), the equivalent of taking 94,000 cars off the road (or 13% of all registered cars in Queens County),
  - Displacing less efficient generating units, lowering region-wide natural gas demand;
- Incorporating energy storage;

[41] As part of the 2017 Class Year process, the NYISO determined the Project will be exempt from an Offer Price Floor in the ICAP market pursuant to Section 23.4.5.7.2(b) of its Open Access Transmission Tariff.

- Minimizing impacts to open space, wildlife, wetlands and waterbodies by utilizing an existing, pre-disturbed site located in the Astoria ConEd Complex. (refer to Section 1.1);
- Reducing project noise at nearby residential receptors. (refer to **Table 3.3-4**);
- Reducing project size, resulting in less visual and aesthetic impacts. (refer to **Figure 3.3-7** and **Figure 3.3-8** for a comparison of the Project renderings);
- Reducing the environmental burden on the nearby potential environmental justice areas ("PEJA"). (refer to Section 3.3);
- Reducing water use and wastewater discharge from the Project as previously approved (refer to Section 3.3.7.2); and
- Reducing potential impacts from construction due to a shorter construction period - 25 months (20 of which involve construction activities) as compared to the previously approved two-phase construction period totaling 60 months (refer to Section 3.3.7.15).

1.4.2.2 Economic Benefits

The Project will provide significant economic benefits in New York State (Navigant, 2020b supplemented 2021; provided in **Appendix C**). These benefits occur during construction and operation, including private capital investment and local jobs. It will also provide significant ratepayer benefits through energy and capacity cost savings.

Benefits from Construction and O&M Spending

In New York State, over $350 million will be spent locally over the two-year construction period resulting in the creation of over 1,000 job-years and $156 million in total value added during the construction phase. In addition, $10.6 million will be spent locally on an annual basis over the operation phase resulting in over 70 full-time equivalent (FTE) jobs and a total of $170 million value added during the operation phase through 2040. **See Table 1.4-1** (see **Appendix C**, Table 5-1 of the Navigant/Guidehouse Socioeconomic Report).

Table 1.4-1 Summary of Jobs and Investment Impacts in New York State

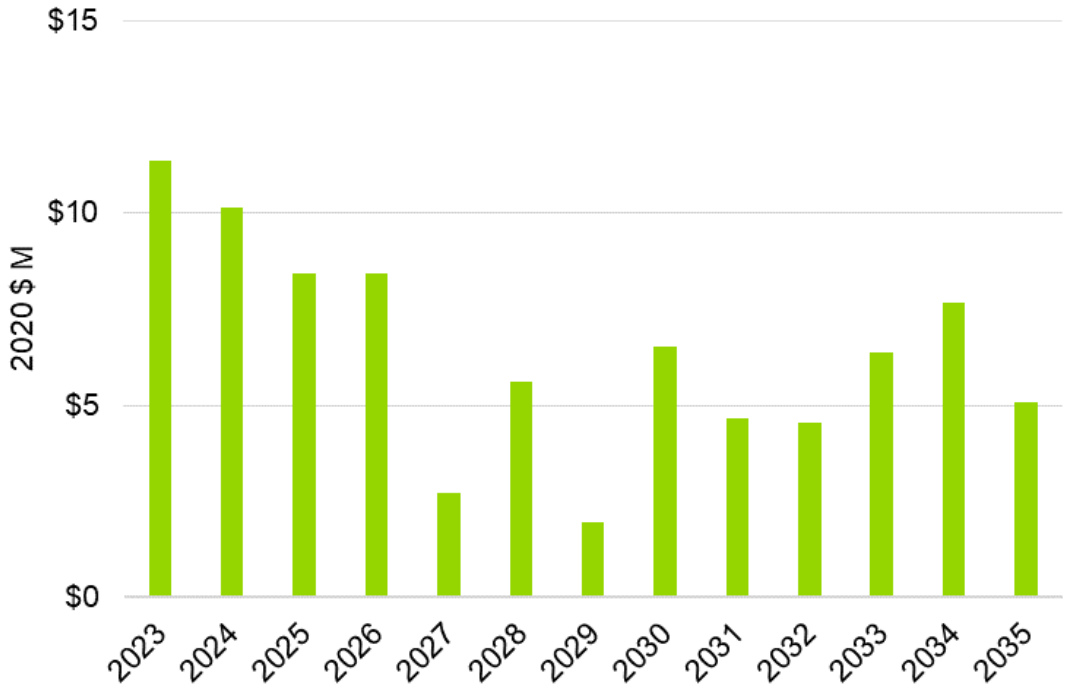
Benefit Categories	Impact Categories	Jobs	Value Added (2020 USD Millions)
Construction Phase (Total)	Direct	538	$96.4
	Indirect	261	$31.8
	Induced	223	$27.4
	Total	**1,022**	**$155.6**
Operational Phase (Annual)	Direct	13	$2.3
	Indirect	43	$6.1
	Induced	17	$2.2
	Total	73	**$10.6**
Source: Navigant/Guidehouse Socioeconomic Report in **Appendix C**.			

Ratepayer Benefits

The Astoria Replacement Project will displace high cost generation and reduce overall system costs in the New York control area. Over the course of 13 years covered in the analysis (2023-35), power

prices in New York Zone J are lower by an annual average of $0.12/MWh in 2020$ due to the addition of the project, resulting in an expected $83.5 million total energy cost savings over the 13-year period (see **Figure 1.4-2**). The average reduction in New York Zone J capacity prices from Summer 2023 to Winter 2027/28 is approximately $2.67/kW-month (in 2020$), resulting in an estimated $1.55 billion of total capacity cost savings (in 2020$) over the first five years of operation (see **Figure 1.4-3**). Notably, the Project does not require any subsidy from NY ratepayers or taxpayers.

Figure 1.4-2 Energy Cost Reduction Value due to Astoria Replacement Project, 2023-2035 (Real 2020 $M)



Source: Navigant/Guidehouse Analysis

Figure 1.4-3 Capacity Cost Reduction due to Astoria Replacement Project (Real 2020 $M)

Source: Navigant/Guidehouse Analysis

2.0 Permitting and SEQR Process

This section presents the environmental assessment process being undertaken by the NYSDEC as the SEQR Lead Agency for the Project. The Project has submitted a number of applications for permit modifications for approval by the NYSDEC. They include:

- Article 17 State Pollutant Discharge Elimination System ("SPDES") Permit Modification;
- Article 19 Air Title IV and Title V Facility Permit Modification;
- SPDES Permit for construction-related groundwater dewatering (temporary); and,
- Water Withdrawal Permit for construction-related groundwater dewatering (temporary).

NYSDEC's issuance of these permit modifications are subject to review under SEQRA and prompted the preparation of this DSEIS.

2.1 State Environmental Quality Review Act

Pursuant to regulations promulgated under SEQRA, all state, regional, and local government agencies are to consider potential environmental impacts equally with social and economic factors during preliminary stages of proposed development actions. The Lead Agency[42] and other Involved Agencies[43] must assess the environmental significance of all actions they have discretion to approve, fund, or directly undertake. The intent of SEQRA is not that environmental factors be the sole consideration in the decision-making process. SEQRA requires Involved Agencies to balance the environmental impacts with social, economic, and other essential considerations when deciding to approve or undertake an action.

2.2 Chronology of Previous Environmental Reviews and Permitting

The Project previously underwent extensive environmental review under SEQRA, with NYSDEC serving as Lead Agency.

In 2001, Berrians 1 Gas Turbine Power, LLC began the environmental assessment and permitting process to install a new 79.9 MW CTG *"…to help meet the peak power demands within New York City*" (Berrians, 2002). The modifications at the existing facility were also intended to replace lost generating capacity due to the destruction of Unit 9 by fire (the "2001 Berrians Project"). The final "Environmental Assessment Statement" was prepared for the 2001 Berrians Project and revised in August 2002. However, the new CTG was not constructed.

In 2008, the Applicant began the environmental review and permitting process for this Project, which was a modification of the 2001 Berrians Project. In October 2008, the Applicant engaged in numerous

[42] 6 NYCRR 617.2. Lead agency 617.2(v) "*Lead agency* means an involved agency principally responsible for undertaking, funding or approving an action, and therefore responsible for determining whether an environmental impact statement is required in connection with the action, and for the preparation and filing of the statement if one is required."

[43] 6 NYCRR 617.2. Involved agency 617.2(t) "*Involved agency* means an agency that has jurisdiction by law to fund, approve or directly undertake an action. If an agency will ultimately make a discretionary decision to fund, approve or undertake an action, then it is an "involved agency" notwithstanding that it has not received an application for funding or approval at the time the SEQR process is commenced. The lead agency is also an "involved agency"."

public outreach activities, including meetings with local government representatives and civic organizations, to discuss the Project and its potential impacts on the community.

Although the Project as proposed in 2008 would have significantly decreased emission rates from the existing facility, it was determined that a DEIS should be prepared to study the environmental impacts of the Project. As part of this process, a Draft Scoping Document was prepared in accordance with SEQR Part 617.8 - Scoping. The NYSDEC conducted two public informational sessions on the Draft Scope on November 12, 2008. Public comments on the Draft Scope were accepted through November 26, 2008. NYSDEC issued the Final Scope on December 24, 2008.

Thereafter, an initial DEIS along with draft permit applications to modify the Title V air permit and the SPDES permit were submitted to NYSDEC in February 2009. The DEIS and its appendices, which comprised approximately 880 pages, considered and examined the potential impacts of the Project with regard to a comprehensive list of environmental resources: air, energy use and greenhouse gas emissions, geology and soils, water resources, water supply, wastewater, stormwater, terrestrial and aquatic ecology, fish and wildlife, aesthetic and visual resources, noise, historical and cultural resources, traffic and transportation, socioeconomics, environmental justice areas, land use and zoning. It also examined impacts of various Project alternatives, potential cumulative impacts, growth inducing impacts, and consistency with the state's coastal management policies and local waterfront revitalization plans.

A revised DEIS and updated Title V air permit application were submitted to NYSDEC in February 2010. NYSDEC accepted the DEIS, Title V air permit application and SPDES permit application as complete on April 16, 2010 and made the DEIS and draft permits available for public review and comment. NYSDEC issued a Notice of Complete Application and Legislative Hearing, which was published in the Environmental Notice Bulletin on April 21, 2010. The DEIS and supporting project materials, including the 2001 Berrians Project's "Environmental Assessment Statement," were available at public repositories and on the Project website. Two public hearings were held on May 20, 2010 to receive public comments on the DEIS and draft permits.

The 2010 FEIS, including responses to comments, was accepted by NYSDEC on September 22, 2010. NYSDEC issued its Findings Statement on October 4, 2010, concluding that the Project was designed, and where necessary revised, to avoid, minimize and mitigate adverse environmental impacts. NYSDEC's Findings Statement evaluated each of the potential impacts addressed in the DEIS and detailed its conclusion as to why the Project would not result in any adverse environmental impact because all potential environmental impacts had had been minimized or mitigated to the maximum extent practicable. All modified NYSDEC permits were subsequently issued. However, the Project was not constructed at that time, and the Facility continues to operate in accordance with its existing permits.

2.3 Chronology of Current SEQR Process

This DSEIS is prepared to address project changes and changes in circumstances since the October 2010 Findings Statement. The April 2010 DEIS and September 2010 FEIS are included in this SEIS by reference only.

Prior to preparing the DSEIS for the Project, the Applicant and Lead Agency completed a series of procedural steps in accordance with SEQRA and its implementing regulations (6 NYCRR Part 617).

2.3.1 Full Environmental Assessment Form – SEQR Classification

On April 27, 2020, the Applicant submitted to the NYSDEC Division of Environmental Permits applications for modification of the Facility's existing Title V and Title IV air permits, and SPDES

permit. The Applicant also submitted Part 1 of the Full Environmental Assessment Form ("EAF") to supplement the prior SEQRA review of the Project.

The Full EAF provided a description of the Project, identified agencies that have permitting and approval jurisdiction over the Project, and identified potential environmental impacts. The Project (or Proposed Action) remains classified as a Type 1 Action for the purposes of environmental review because the Project includes a structure exceeding 100 feet above ground (Part 617.4.(b)(7)).

2.3.2 Coordinated Review and Involved Agencies

In the SEQRA process, there are two types of agencies: Involved Agencies (including the Lead Agency) and Interested Agencies. Involved Agencies have jurisdiction to fund, approve, or directly undertake an action. Interested Agencies are agencies that do not have (at the time of the environmental review) permitting, funding, or approval jurisdiction directly related to the Proposed Action, but may desire to participate in the review process because of their expertise or concern regarding the action.

The Lead Agency is the one agency among all of the potential Involved Agencies that has the responsibility under SEQRA to coordinate the environmental review process for the proposed Action and is required by SEQRA for Type 1 actions. The NYSDEC remains the Lead Agency as this is a supplement, or continuation of the 2010 SEQR process, and because the NYSDEC has the primary permitting jurisdiction (Air and SPDES permits).

On May 19, 2020, pursuant to SEQRA and its implementing regulations, the NYSDEC issued a Lead Agency coordination letter to other potentially Involved Agencies expressing its intent to continue to serve as SEQRA Lead Agency.[44] As listed in the Lead Agency coordination letter, other potentially Involved and Interested Agencies that may have a permit, review, approval and/or funding role, or other interest in the implementation of the Project include:

- New York State Department of Public Service
- New York State Department of State
- New York State Office of Parks, Recreation and Historic Preservation
- NYC Department of Environmental Protection
- Mayor's Office of Environmental Coordination
- NYC Department of City Planning
- Queens Community Board 1

Although not all are discretionary (and subject to SEQRA), the following potential regulatory permits and approvals have been identified for the Project:

- NYSDEC: Title IV Air Permit Modification
- NYSDEC: Title V Air Permit Modification
- NYSDEC: Industrial SPDES Permit Modification
- NYSDEC: SPDES Permit for construction-related groundwater dewatering (temporary)
- NYSDEC: Water Withdrawal Permit for construction-related groundwater dewatering (temporary)

[44] New Yok State Department of Environmental Conservation, correspondence dated May 19, 2020.

- NYSDEC: Chemical Bulk Storage Registration
- NYS PSC: Certificate of Public Convenience and Necessity Amendment
- NYC DEP: Certificate of Operation for Fuel-Burning Equipment
- NYC DOB: Building Permit, and Floodplain Development Permit
- FDNY: Storage permit for aqueous ammonia and bulk oil storage, fire protection system permit, and Battery Energy Storage System Letter of No Objection
- FAA: Notice of Proposed Construction for new stack

Upon receiving no objections from potentially Involved Agencies, the NYSDEC assumed the designation as Lead Agency for the supplemental review of the Project. Pursuant to the requirements of SEQRA, this DSEIS for the Proposed Action will be subject to review and comment by the aforementioned Involved Agencies, Interested Agencies, and the public.

2.3.3 Scoping

Scoping for this DSEIS identified the potentially significant adverse environmental impacts that may result from project modifications and/or changes in circumstances that were not adequately considered in the 2010 EIS and therefore needed to be supplemented by further SEQR assessment.

A Draft Scoping Document was prepared by the Applicant and submitted to the NYSDEC, as Lead Agency, on June 12, 2020. The Draft Scoping Document defined the analyses necessary for the current Project configuration, their methodology and the general format of this DSEIS. The NYSDEC subsequently circulated the Draft Scoping Document to the Involved Agencies and Interested Parties and made the document available to the public. Notice of Availability of the Draft Scope was published in the Environmental Notice Bulletin ("ENB") on July 1, 2020, a copy of which the Applicant mailed to all stakeholders identified as part of its Supplemental Enhanced Public Participation Plan. The Draft Scope was also made available on the Project website. Public and agency comments were accepted through September 4, 2020.

The Final Scoping Document was issued by the NYSDEC on September 18, 2020 (see **Appendix D**).

2.4 Preparation of the Draft Supplemental Environmental Impact Statement

This DSEIS has been prepared in accordance with 6 NYCRR 617.9, as applicable to a supplemental assessment. As such, it presents a focused assessment of potentially significant adverse impacts resulting from Project modifications and changes in circumstances that have occurred since the 2010 FEIS and Findings Statement. This DSEIS presents a stand-alone document providing a more general characterization of the existing conditions and inventory of existing resources than the original EIS. The 2010 FEIS will be appended by reference.

The following steps present the anticipated sequence of remaining SEQR procedural actions that will complete this supplemental assessment of the Project.

- NYSDEC reviews and accepts DSEIS as complete and ready for public and agency review.
- Notice of Completion of DSEIS and intent to hold public hearing is published in the ENB and distributed to interested stakeholders.
- DSEIS is released for public review on the Project's website and available repositories and the public is provided the opportunity to submit written comment.
- Public comment period is closed.

- Preparation of Final Supplemental Environmental Impact Statement ("FSEIS"), which responds to and addresses substantive public and agency comments and presents any significant revisions to the DSEIS.
- Notice of Completion of FSEIS is published in the ENB.
- Preparation of the Findings Statement.

3.0 Existing Conditions, Potential Impacts and Mitigation Measures

The following subsections provide the assessments conducted for the various environmental resource categories addressed in this supplement as defined by the September 18, 2020 Final Scoping Document.

3.1 Air Quality

3.1.1 Introduction

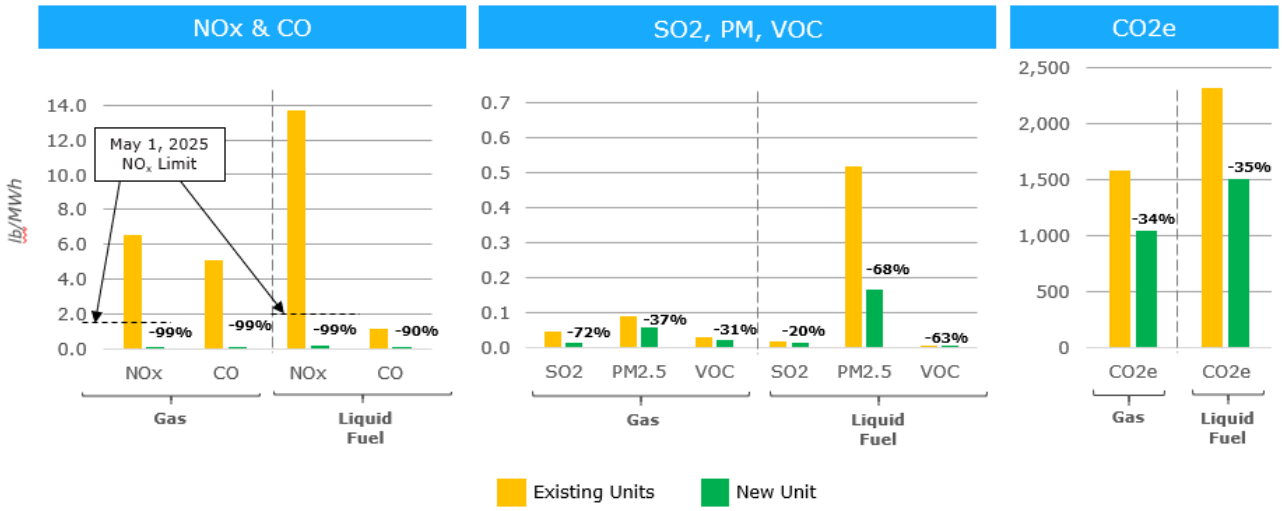
This section describes the existing air quality for the Site and the potential impacts to air quality due to the Project as modified. This section also discusses how the Project will be permitted consistent with state and federal regulations.

A comprehensive air quality analysis was conducted for the Project as previously approved which is documented in the 2010 Air Permit Application and evaluated in the 2010 EIS. Based on this analysis, NYSDEC determined in its 2010 Findings Statement that the Project would not have a significant adverse air quality impact.

The air quality analysis has been updated for the proposed Project as modified. This section presents updated information and analysis regarding the Project's potential impact on air quality based on Project modifications since 2010. Air quality impacts for the Project as modified were evaluated through air quality dispersion modeling conducted in accordance NYSDEC and USEPA modeling guidelines. The applicant submitted an air quality modeling protocol to NYSDEC on February 12, 2020 (AECOM, 2020) which was approved by NYSDEC March 10, 2020. This approved modeling protocol served as the basis for conducting the modeling and assessing air impacts. Further information on the air quality modeling, applicable Federal and New York State regulatory requirements and compliance with the regulatory requirements can be found in the Title V Air Permit Modification Application ("Air Permit Application") submitted to the NYSDEC.

As is discussed in the subsections below, the air emissions associated with the Proposed Project will comply with all applicable state and federal regulatory requirements and will include design measures and air pollution controls to limit emissions. Air emission rates for the Project CTG will be up to 99% lower than the existing P&W units (see **Figure 3.1-1**). As a result, the air quality analyses presented below demonstrate that the Project will have an insignificant impact on air quality and will comply with all air quality standards for all criteria pollutants and air toxic compounds.

Figure 3.1-1 Combustion Turbine Emission Factors - Comparison of Existing Facility to Proposed Project



3.1.2 Existing Conditions

3.1.2.1 Climate

The climate of the region and Project site are described below. The site-specific climate data provided is based on local meteorological data collected at the National Weather Service located at LaGuardia Airport which is approximately 1.5 miles to the southeast of the Site.

The classification for the regional climate is “modified continental”, as the climate of the region is primarily continental in character but is also modified by the proximity to the Atlantic Ocean. The mid-latitude location of the Project and proximity to the Atlantic Ocean subjects the region to a variety of meteorological conditions and events depending on the season including blizzards, hurricanes, tropical storms, thunderstorms, and periods of drought. The mid-latitude location subjects the area to large annual ranges in temperatures with cold weather originating from the north and heat and humidity that often originates from the Gulf of Mexico.

The nearest National Weather Service (NWS) meteorological monitoring station is LaGuardia Airport located approximately 1.5 miles east of the Project site. Given its close proximity, this station provided a good source of representative data for the Project both in 2010 and as part of the current Air Permit Application.

Of the various meteorological parameters collected by the NWS, several are important in assessing Project impacts. Specifically, wind speed, wind direction and temperature are primary data used in air quality dispersion modeling for the prediction of the location and magnitude of Project air emission impacts. Since combustion turbine performance is affected by inlet air temperature, average, maximum and minimum ambient temperature values are also important for determining air pollutant emission rates.

Climate data presented in the 2010 DSEIS compared to the most recent climatological data set available for LaGuardia Airport as shown in **Table 3.1-1**.

Table 3.1-1 Comparison of Climatological Data for LaGuardia Airport

Meteorological Parameter	2010 DSEIS[1]	Current [2]
Wind Speed (mph)	12.4	11.3
Wind Direction	(3)	(3)
Ambient Temperature (°F)	54.6	55.4
Annual Precipitation (inches)	44.4	44.7

(1) Source is U.S. Department of Commerce (USDOC) 2003.
(2) Source is USDOC 2020; data from 1981-2010.
(3) See text for discussion of wind direction and comparison of wind roses.

General wind direction is seasonal and related to large-scale circulation patterns. During warm months, the prevailing winds are generally southerly turning northwesterly during the winter months. During the seasonal transition months of May and September, winds are often from the northeast. Average wind speed is generally strongest in the winter months.

The 2010 DEIS presented a five-year wind rose (i.e., graphical representation of wind speed and direction data), 2000-2004, for the period of LaGuardia Airport meteorological data used in the air quality modeling analysis as shown in **Figure 3.1-2**. A wind rose depicts the frequencies and intensities of wind direction and speed. A wind rose has also been generated for more recent LaGuardia meteorological data that were used for the modified Project air quality modeling, 2014-2018; see **Figure 3.1-3**. Comparison of both wind roses shows the same general pattern of predominating winds from the northwest, northeast and southerly directions. This distribution is consistent with the variety of weather the Project site is exposed to. Specifically, cold winds from the northwest in the winter, northeast winds during the transitional months and from sea breezes and coastal storms, and warm/hot summertime winds from the south. Given the relative lack of terrain features surrounding the Project site, topography has little effect on wind direction of the Site unlike a mountainous area where terrain features can steer the winds or can be channeled in valleys.

Figure 3.1-2 2000-2004 LaGuardia Airport Wind Rose

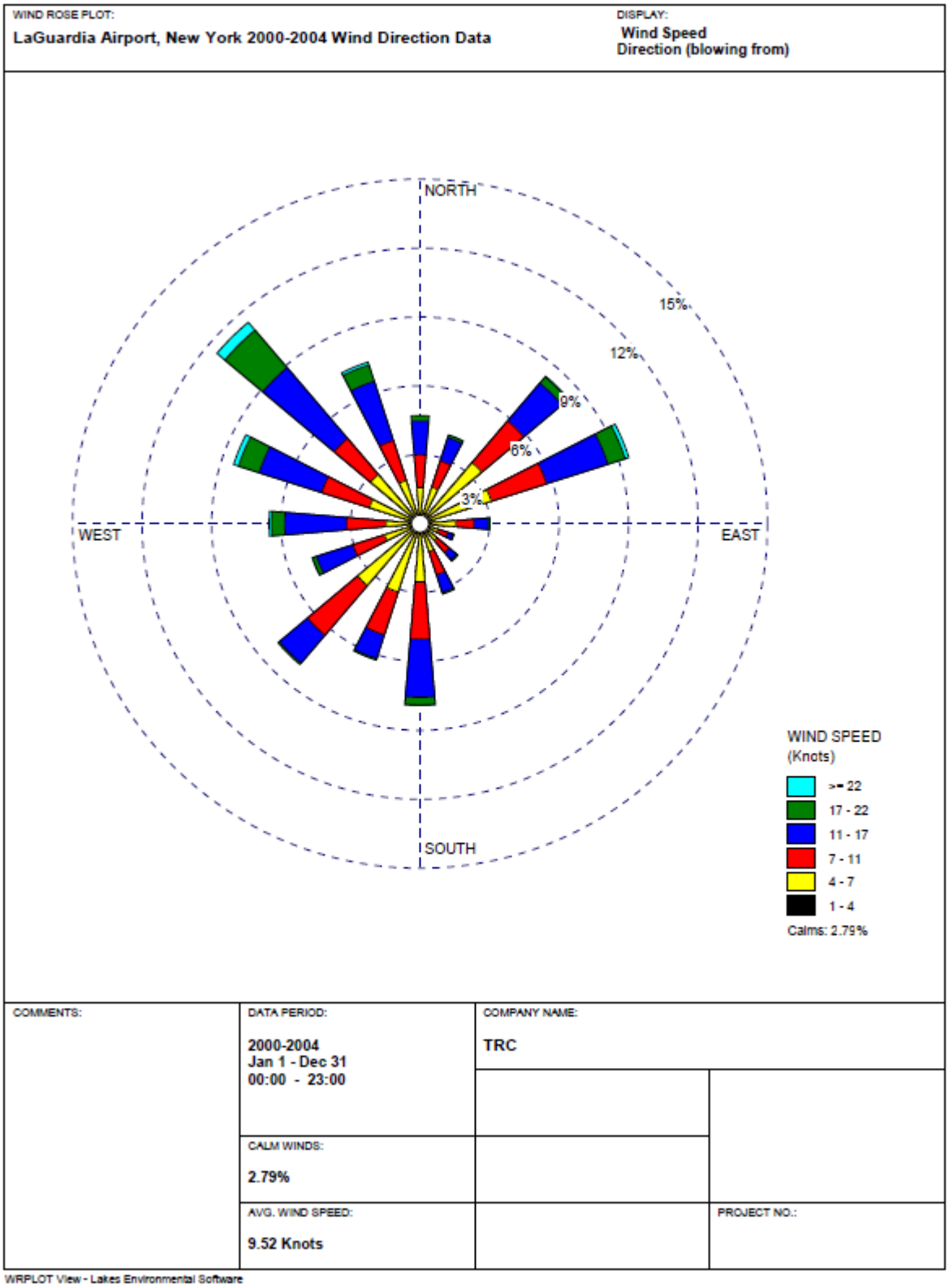
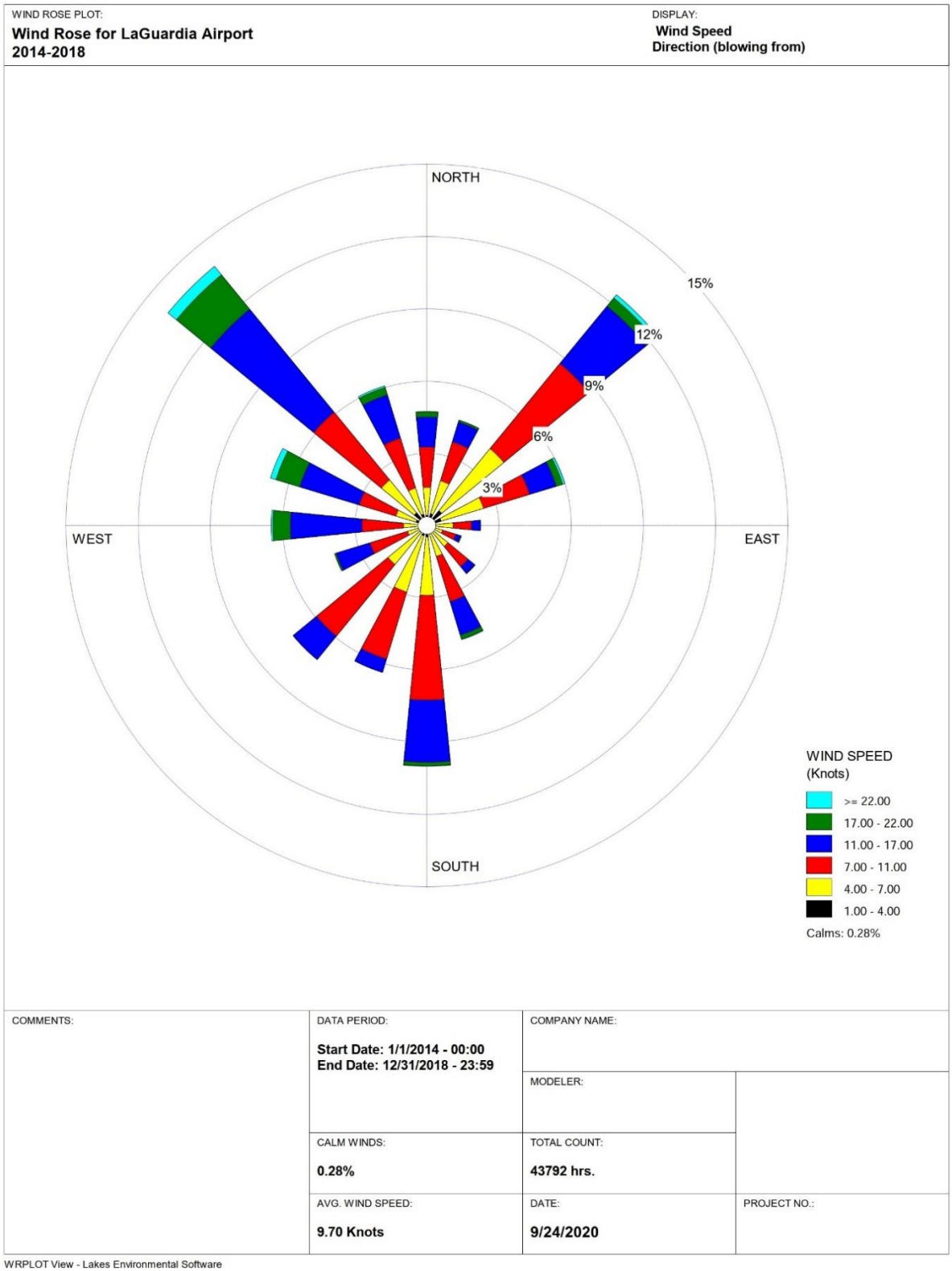


Figure 3.1-3 2014-2018 LaGuardia Airport Wind Rose



As mentioned above, combustion turbine performance is affected by ambient temperature. As a result, establishing representative ambient temperature extremes are important in assessing resultant impacts. Consistent with the prior analysis conducted in 2010 and NYSDEC policy, turbine performance data were developed based on a range of ambient temperature data:

- Minimum Temperature = minus (–) 5 degrees Fahrenheit (°F);
- Maximum Temperature = 100 °F; and,
- Average Temperature = 54.6 °F (although there was a slight difference in the annual average temperature for more recent climate data, 55.4 °F, for purposes of the modeling, the difference is negligible and 54.6 °F was used to be consistent with the prior study and is slightly conservative as turbine emissions increase with cooler temperatures).

3.1.2.2 Existing Air Quality

A detailed review of the background ambient air quality in the area surrounding the Site was documented in the 2010 DEIS using ambient air quality data available from the NYSDEC and USEPA. An updated review of representative air quality data in the Project area has been conducted including a comparison to the data presented in the 2010 DEIS.

National Ambient Air Quality Standards ("NAAQS")

The USEPA has promulgated National Ambient Air Quality Standards ("NAAQS") that have been adopted by NYSDEC. The NAAQS are levels of pollutants in the ambient air that have been determined to be protective of human health, including the health of sensitive subpopulations such as children, the elderly, and those with chronic respiratory problems; in addition, they are developed to protect public welfare, including damage to property and structures, visibility, vegetation, animal species, and other concerns.

The NAAQS have been established for the following pollutants that will be emitted by the Project, which are known as "criteria pollutants": particulate matter sized 10-microns and smaller ("PM_{10}"), particulate matter sized 2.5 microns and smaller ("$PM_{2.5}$"), nitrogen dioxide ("NO_2"), sulfur dioxide ("SO_2"), carbon monoxide ("CO"), ozone ("O_3"), and lead ("Pb"). Following is a brief discussion of each of the criteria pollutants that will be emitted by the Project.

Sulfur Dioxide (SO_2)

Sulfur is naturally found in fuels and is released as SO_2 when the fuels are combusted. Natural gas has only trace quantities of sulfur, resulting in very low SO_2 emissions. SO_2 emissions are also minimal when firing 0.0015% sulfur by weight Ultra Low Sulfur Distillate fuel. At sufficiently high concentrations, SO_2 can irritate the lungs and make breathing difficult, particularly among people with asthma. Adverse health effects from SO_2 are generally short-lived.

Particulate Matter (PM, PM_{10} and $PM_{2.5}$)

PM is a broad classification of airborne material that consists of either solid particles or fine liquid droplets. PM originates from many sources including combustion (coal fly ash, wood smoke), motor vehicle exhaust (especially diesel-engine exhaust), windblown dust (fugitive dust) from roadways, tilled fields, construction sites, soil erosion, and ocean spray. Particulate matter with a diameter less than 10 micrometers in diameter is defined as PM_{10} and particles smaller than 2.5 micrometers is called $PM_{2.5}$ or fine particulate matter.

PM results from trace quantities of non-combustible matter in the fuel. The generation of PM is also associated with the formation of ammonium salts resulting from the reaction of residual ammonia

used in emissions control systems. PM emissions are minimal when burning natural gas and very low when firing ULSD. PM (particularly $PM_{2.5}$) can also result from chemical reactions of gases (such as SO_2 and NO_2) released into the atmosphere, which over time become fine-particulate sulfates and nitrates.

Given that it can be inhaled deep into the lungs, $PM_{2.5}$ is considered to be the PM fraction of greatest potential health risk. Scientific studies have linked sufficiently elevated exposures to constituents of ambient $PM_{2.5}$ with health problems, including respiratory symptoms (*e.g.*, asthma exacerbation, coughing, difficulty breathing), heart attacks and cardiovascular disease, and premature mortality. The health effects evidence linking ambient $PM_{2.5}$ with human health risks is strongest for ambient $PM_{2.5}$ levels above the NAAQS.

Nitrogen Oxides (NO_x)

NO_x is formed from atmospheric nitrogen gas during high temperature combustion processes such as the burning of fuel (natural gas, oil, and coal) and internal combustion (motor vehicles). The amount of NOx emitted from combustion is significantly reduced by the use of NOx emission controls, such as the low NOx burners and selective catalytic reduction ("SCR") that will be utilized by the Project. NOx is a precursor in ozone (smog) formation and can be oxidized to a greater extent to form nitric acid, one of the compounds found in acid rain. At sufficiently high concentrations, NO_x is a respiratory irritant, and short-term exposures have been linked with aggravated asthma, respiratory symptoms, and respiratory hospital admissions and emergency room visits.

Carbon Monoxide (CO)

CO emissions are formed due to incomplete combustion of carbon-based fuels, typically resulting from insufficient residence time in the combustion system. CO emissions are generally higher during transient and low load operating conditions. Control technologies used to minimize CO emissions include the use of clean burning fuels and state-of-the-art combustion technology like what will be utilized by the Project. For exposure to excessive levels of CO, which generally only occur in indoor or other enclosed environments, CO poisoning can result in dizziness, confusion, unconsciousness, and death. At lower CO concentrations that still exceed the NAAQS, there is some evidence for cardiovascular health risks among individuals with pre-existing cardiovascular disease.

Ozone (O_3)

Ozone is formed as the result of both electrical discharges (*e.g.*, lightning) and a series of chemical reactions involving sunlight, warm ambient temperatures, and precursor compounds. The precursor compounds to O_3 formation include NO_x and volatile organic compounds ("VOCs") such as hydrocarbons from motor vehicle exhaust, gasoline storage and transfer, solvents, degreasing agents, and fuel combustion. At sufficiently high concentrations, O_3 is a respiratory irritant, and short-term O_3 exposures have been linked with aggravated asthma, respiratory symptoms, and respiratory hospital admissions and emergency room visits.

Lead (Pb)

Pb is naturally found in fuels and is released when fuels are combusted. Natural gas and refined liquid fuels such as ULSD and ULSK have only trace quantities of Pb, resulting in negligible air emissions. At sufficiently high concentrations, Pb can cause organ and nervous system damage in humans.

The following changes to the NAAQS have occurred since the 2010 evaluation of the Project:

- 1-hour SO_2 NAAQS was promulgated by USEPA in June 2010.
- 24-hour and annual SO_2 NAAQS were revoked by USEPA in August 2010.
- 8-hour O_3 NAAQS reduced from 0.075 parts per million ("ppm") to 0.070 ppm in October 2015.
- Annual average $PM_{2.5}$ NAAQS reduced from 15.0 micrograms per cubic meter ($\mu g/m^3$) to 12.0 $\mu g/m^3$ in January 2012.

Ambient Air Quality

The NYSDEC operates various air quality monitors for criteria pollutants. As documented in the 2010 DEIS, monitoring stations were reviewed and sites were selected based on their proximity and representativeness. In the 2010 EIS, the averaging periods for the pollutants were based on the NAAQS that were in place at that time. The air quality data review has been updated to reflect the current NAAQS**. Table 3.1-2** provides a summary and comparison of the current monitored ambient concentration levels with the data available from the 2010 study including reference to the NAAQS. As shown in **Table 3.1-2**, all pollutant concentrations have reduced over time as the air quality in the Project area has improved.

Table 3.1-2 Ambient Background Concentrations ($\mu g/m^3$)

Pollutant	Averaging Period	2010 DEIS 2005-2007(1)	Current Analysis 2016-2018(2)	NAAQS	Monitor Location (3)
CO	1-hour	2645	1970	40,000	PS59 in 2010; monitoring discontinued at PS59; current values from Queens College
	8-hour	1955	1603	10,000	
SO_2	1-hour	ND	16	196	IS52
	3-hour	183	NA	1,300	
	Annual	29	2	NA	
PM_{10}	24-hour	60	32	150	PS59 in 2010; current values from IS52
$PM_{2.5}$	24-hour	35.8	18	35	IS52
	Annual	13.7	8	12	
NO_2	1-hour	132(6)	109	188	IS52
	Annual	39	34	100	
O_3	8-hour	147	137	140	IS52
Pb	3-month	0.02	0.0047	0.15	JHS126 in 2010; current values from IS52

(1) Data from 2005-2007; source is 2010 DEIS/ New York State Air Quality Monitoring Reports 2005, 2006 and 2007. ND = no data; the 1-hour SO_2 NAAQS was promulgated in June 2010 following submission of the 2010 DEIS.
(2) Data from 2016-2018; source is New York State Air Quality Monitoring Report 2019 (https://www.dec.ny.gov/chemical/8536.html)
(3) PS59 – located at 288 E. 57th St. (6 km southwest of the Project site).
(4) IS52 – located at E. 156th St. Between Dawson & Kelly (3 km north of the Project site).
(5) JHS126 – located at 424 Leonard St. (8.5 km south-southwest of the Project site).
(6) Based on data from 2006-2008.

One of the basic goals of federal and state air pollution regulations is to ensure that ambient air quality, including consideration of existing background levels and contributions from existing and new sources, is in compliance with the NAAQS. For each criteria pollutant, every area of the United States has been designated as one of the following categories: attainment; unclassifiable; or nonattainment. In areas designated as attainment, the air quality with respect to the pollutant is equal to or better than the NAAQS. These areas are under a mandate to maintain, i.e., prevent significant deterioration of, the air quality. In areas designated as unclassifiable, there are limited air quality data, and those areas are treated as attainment areas for regulatory purposes. In areas designated as nonattainment based on exceedances of the NAAQS for one or more criteria pollutants, the air quality in the area is considered to be worse than the NAAQS. These areas must take actions to improve air quality and achieve attainment with the NAAQS within a certain period of time.

The current attainment designations for New York are found in 40 CFR 81.333. The Project is located in Queens County, NYSDEC Region 2, and is within the New York-New Jersey-Connecticut Air Quality Control Region ("AQCR"). Queens County is currently designated as attainment/unclassified for all criteria pollutants with the exception of O_3. The area is a serious O_3 nonattainment area based on the 2008 1-hour O_3 standard, and this designation is unchanged from when the 2010 DEIS was accepted by NYSDEC. In comparison, at the time of the 2010 DEIS, Queens County was also a $PM_{2.5}$ nonattainment area. Given the improvement of air quality over time, Queens County has been re-designated as an attainment area for $PM_{2.5}$.

3.1.3 Project Emission Sources and Pollutants Emitted

A detailed description of the Project as currently configured, and a comparison to the previously approved 2010 configuration, is provided in Section 1.1 of this SDEIS. Additional detail can be found in Section 2 of the Air Permit Application. The Project includes the following air emission sources:

- One 7HA.03 CTG fired with natural gas and ULSD;
- Ancillary combustion equipment, including one ULSD-fired emergency generator (rated at 500 electrical kilowatts ["kWe"]), two ULSD-fired emergency fire system pumps (rated at 117 mechanical kilowatts ("kWm") and 177 kWm, respectively);
- ULSD and ULSK tank vents; and
- Fugitive GHG emissions from onsite electrical circuit breakers and natural gas components (connectors, valves, meters, and regulators).

The Project will also re-utilize the Facility's two existing ULSK tanks to store ULSD as backup fuel for the new CTG. Each of these existing tanks has a nominal capacity of 2,000,000 gallons for a total of 4,000,000 gallons of ULSD. As noted, the Facility will retain two of the existing P&W combustion turbines solely to provide black start capability to site.

Pollutants emitted from the Project sources include the following:

- Combustion Sources:
  - Criteria Pollutants: NOx, VOC, CO, PM_{10}/$PM_{2.5}$, SO_2
  - Non-Criteria Pollutants: H_2SO_4, GHGs, NH_3 (CTG only), and air toxic compounds (emitted in very small amounts);
- ULSD and ULSK tank vents: VOC and air toxic compounds (emitted in negligible amounts);
- Fugitive GHG sources: sulfur hexafluoride ("SF_6") from onsite electrical circuit breakers and methane ("CH_4") from onsite natural gas components.

Criteria pollutants are discussed above in Section 3.1.2. With respect to non-criteria pollutants, sulfuric acid ("H_2SO_4") is generally formed by the oxidation of SO_2 and the reaction of the resulting sulfur trioxide ("SO_3") with water. Exposure to H_2SO_4 emissions at certain concentrations, well above those resulting from Project operation, can irritate the nose and throat and cause difficulties breathing.

Ammonia ("NH_3") is a naturally occurring gas and may also be produced as unreacted NH_3 when it is released or "slips" from the NOx SCR emissions control system. Inhalation exposure to ammonia at high ambient concentrations (well above the levels resulting from Project operation) can cause irritation of the nose and throat and respiratory effects.

Air toxic compounds are emitted by Project sources in very small amounts as a result of the presence of these compounds in the fuel in trace amounts or as products of incomplete combustion. The NYSDEC has developed short-term and annual guideline concentrations ("SGCs" and "AGCs") for evaluating health effects of emissions of these compounds (see Section 3.1.7.4). As shown in Section 3.1.7.4, Project emissions of air toxic compounds are well below the SGCs and AGCs.

3.1.4 Applicable Regulatory Requirements

Section 3 of the Air Permit Application provides a detailed discussion of the federal and New York State air regulatory requirements that are applicable to the Project. Provided below is a brief summary of the applicable requirements and how the Project will comply with each of them.

3.1.4.1 Federal

New Source Review

If construction of a new major stationary source or a major modification of an existing major stationary source of air pollution is proposed, it must undergo New Source Review ("NSR"). There are two NSR programs, one for sources being built in areas designated as in attainment or unclassifiable with respect to the NAAQS (i.e., existing air quality is below the NAAQS) and one for sources in nonattainment areas (i.e., where current air quality does not meet the NAAQS). The NSR program for sources in attainment/unclassifiable areas is known as the Prevention of Significant Deterioration ("PSD") Program. The NSR program for sources being built in nonattainment areas is known as the Nonattainment New Source Review ("NNSR") Program. NYSDEC has adopted their own NSR rules (at 6 NYCRR Part 231) that have been approved by the USEPA.

The Project will be a modification of the existing Facility which is classified as a major source. Based upon the Project maximum potential emission estimates detailed in the air permit application (refer to Section 3.1.6 below and Sections 2 and 3 of the Air Permit Application), the Project as modified is subject to PSD review for emissions of PM, PM_{10}, $PM_{2.5}$ and GHGs (expressed as carbon dioxide equivalents ["CO_2e"]). In comparison, the 2010 Project did not trigger PSD review for PM, PM_{10}, $PM_{2.5}$; and greenhouse gases were not a PSD regulated pollutant at the time of the 2010 Project. Similar to the 2010 configuration of the Project, the current Project configuration also does not trigger NNSR for either NO_X or VOC emissions with respect to O_3 nonattainment.

In accord with PSD requirements, a Best Available Control Technology ("BACT") emission control review was conducted for the pollutants subject to PSD review, and BACT emission controls for PM/PM_{10}/$PM_{2.5}$ and GHG were determined.

Additional discussion of the air pollution control system, including the BACT analysis, is provided in Section 3.1.5 and further detailed in Section 4 of the Air Permit Application.

An air quality dispersion modeling analysis was conducted for the Project, which used the Modeling Protocol approved by NYSDEC and an USEPA-approved dispersion model that simulates atmospheric dispersion to predict the maximum ambient concentrations of pollutants that will be emitted by the Project. Based on the modeling analysis, which is discussed further in Section 3.1.7, the Project will satisfy all PSD air quality analysis requirements.

The Project will also comply with all applicable New Source Performance Standards ("NSPS") and National Emission Standards for Hazardous Air Pollutants ("NESHAP"s). NSPS are technology-based standards applicable to new and modified stationary sources. NSPS have been established for approximately 70 source categories. Based upon a review of these standards, several subparts are applicable to the Project as modified. USEPA has also promulgated NESHAPs to control hazardous air pollutant ("HAP") emissions (also referred to as air toxic compounds) from certain source types. The Project's compliance with each of the applicable NSPS and NESHAPs is discussed in detail in Section 3 of the Air Permit Application.

GHG emissions are also assessed more fully in Section 3.2, Climate Change and Greenhouse Gas Emissions.

3.1.4.2 State

All potential state air regulations that the Project as modified may be subject to that are codified Title 6 of the New York Codes, Rules and Regulations ("NYCRR") are detailed in Section 3.2 of the Air Permit Application. A summary of the requirements applicable to the Project are summarized below.

6 NYCRR 201 – Permits and Registrations

The Facility's existing Title V Air Permit will be modified to include the currently configured Project sources. The Project will be a significant modification to this permit. The NYSDEC Title V permit application forms and attachments are located in Appendix A of the Air Permit Application.

6 NYCRR 211 – General Prohibitions

This regulation contains generally applicable requirements to not cause or allow air contaminants which cause a nuisance and limit opacity to 20% with an allowance up to 57%. The Project will comply with this requirement through the use of low particulate-emitting fuels (natural gas and ULSD) and maintaining good combustion management.

6 NYCRR 225 – Fuel Composition and Use

This regulation limits the sulfur content of distillate oils (including kerosene) to 0.0015% sulfur by weight (15 ppmw). The Project fuels (natural gas and ULSD) will meet this requirement and compliance will be demonstrated by conducting fuel analyses for each oil delivery to the Facility which may also include supplier certifications of ULSD and ULSK sulfur content.

6 NYCRR 227 – Stationary Combustion Installations

This regulation has three subparts which cover particulate matter and opacity limitations, and NO_X emission limitations specific to simple cycle combustion turbines.

3.1.4.3 6 NYCRR 227-1 – Stationary Combustion Installations

Particulate matter from the new CTG is limited to 0.1 lb/MMBtu; this limit does not apply to other, smaller Project combustion sources. Compliance will be based on periodic emissions testing.

Opacity from stationary combustion sources is limited to 20% as a six-minute average, with one period per hour not to exceed 27%. Compliance will be based on periodic visual inspection (combustion turbines are not required to operate continuous opacity monitoring systems).

3.1.4.4 6 NYCRR 227-2 – RACT for Major Facilities of Oxides of Nitrogen

The existing Facility is a major source of NO_X emissions with a potential to emit greater than 25 tpy. The existing P&W simple cycle combustion turbines are limited to a presumptive emission limit of 100 parts per million by dry volume, corrected to 15% oxygen ("ppmvdc"). The one remaining P&W Twin Pac, which will be used solely for black start capability, will comply with this regulation by using a system averaging plan.

The new CTG will comply with the presumptive NO_X emission limit using SCR and water-ULSD emulsion injection controls and compliance will be based on the use of a continuous emissions monitoring system ("CEMS").

The emergency generator and two fire system pumps are emergency power generating stationary combustion engines [as defined in 200.6(cq)], and therefore are exempt from the regulation per 227-2(f)(6).

3.1.4.5 6 NYCRR 227-3 – Ozone Season NO_X Emission Limits for Simple Cycle and Regenerative Combustion Turbines

A newly promulgated regulation applies to simple cycle combustion turbines that have electric generating nameplate capacities of 15 MWe or greater and that operate during the ozone season. There are two phases of NO_X emission limits required by the regulation. The first phase is effective May 1, 2023 and limits ozone season NO_X emissions to 100 ppmvdc. The second phase begins on May 1, 2025 and limits ozone season NO_X emission based on the fuel fired: 25 ppmvdc when burning natural gas and 42 ppmvdc when firing liquid fuel. The new CTG will comply with both phases of emission limit using SCR and water-ULSD emulsion injection controls and CEMS monitoring.

The regulation specifically exempts turbines which are limited to black start use (with allowance for testing and maintenance). The two P&W turbines to remain will be designated as black start resources as defined in 227-3.2(1) and will not be subject to the ozone season NO_X emission limits in 227-3. As noted, the two P&W Twin Pac turbines will remain operational solely to make the site black start capable, but are proposed to be replaced by an approximately 24 MWe BESS.[45].

6 NYCRR 231 New Source Review for New and Modified Facilities

Part 231 encompasses NYSDEC's NNSR and PSD permitting regulations addressed herein and in the Air Permit Application. As noted, the Project as modified is not be subject to NNSR but is subject to PSD for PM, PM_{10}, $PM_{2.5}$ and GHGs.

3.1.4.6 6 NYCRR 231-8 – Modifications to Existing Major Facilities in Attainment Areas (Prevention of Significant Deterioration)

As discussed in Section 3.1.4.1, the Project as modified must undergo PSD review for PM, PM_{10}, $PM_{2.5}$, and GHG. The maximum potential emissions for CO, SO_2, H_2SO_4, and lead are each below the respective significant project thresholds. As such, BACT analyses are required for PM, PM_{10},

[45] Conversion to the black start battery energy storage system may require prior approval from Con Edison, NYISO and the Federal Energy Regulatory Commission ("FERC").

$PM_{2.5}$, and GHG as discussed in Section 3.1.5. The PSD required air quality analyses are discussed in Section 3.1.7.

3.1.4.7 6 NYCRR 242 – CO_2 Budget Trading Program

This regulation incorporates the Regional Greenhouse Gas Initiative ("RGGI") into the NYSDEC regulations. This program establishes state-wide CO_2 allowances within the participating states, where applicable sources must obtain CO_2 allowances through auctions or from third parties to match CO_2 emissions from fossil-fuel combustion. The program runs on three-year cycles where compliance entities must obtain half of their required allowances in each of the first two years, then be in full compliance at the end of the third year. The existing Facility is subject to this regulation and the proposed CTG will also be subject. Allowances for the Project will be obtained in an amount necessary to comply with this rule.

3.1.4.8 6 NYCRR 243/244/245 – Cross-State Air Pollution Rule ("CSAPR") NOX Ozone Season Group 2, NOX Annual, and SO2 Group 1 Trading Programs

These three regulations collectively comprise the CSAPR regulations, as discussed in Section 3.11 of the air permit application. All three CSAPR emissions trading programs are applicable to the current Facility and will also be applicable to the proposed CTG turbine. As a new unit in the CSAPR programs, the Project will request new unit set-aside allocations for the CTG in accordance with the provisions in 6 NYCRR 243.5; 244.5, and 245.5.

On October 15, 2020 USEPA proposed a revision of the current federal CSAPR regulation for ozone season NO_X to create CSAPR NOx Ozone Season Group 3, which includes the state of New York. The revision would affect the Project when it becomes operational in 2023 and thereafter. It is anticipated that NYSDEC will incorporate the federal regulation into 6 NYCRR 243 after its promulgation.

3.1.4.9 6 NYCRR 251 – CO_2 Performance Standards for Major Electric Generating Facilities

This regulation applies to major electric generating facilities, which are defined in the regulation as having "*an electric generation capacity of at least 25 MW*". The rule limits CO_2 emissions from applicable sources to either a heat input-based limit or an output-based limit using gross electrical output.

The regulation has an effective date for existing sources of December 31, 2020. The existing P&W Twin Pac turbines at the Facility will be retained for black start capability until such time as they are replaced by the proposed BESS. This regulation is not applicable to units used exclusively for black start operation, and therefore this regulation will not apply to the P&W units because these turbines will not provide electric power to the grid.

The CTG will be subject to the regulation as a new simple cycle combustion turbine source, subject to a heat input-based CO_2 emission limit of 160 lb CO_2/MMBtu. Emissions from the CTG will be well below 160 lb CO_2/MMBtu.

3.1.5 Air Emissions Reduction Strategy

The air emission reduction strategy for the Project is the installation of a new, highly efficient GE 7HA.03 CTG with state-of-the-art emission controls. The existing generating units[46] will be retired upon

[46] With the exception of two P&W combustion turbines that will be retained to provide black start capability until replaced by the proposed 24 MWe battery energy storage system.

commercial operation of the CTG, and emission reduction credits will be used to offset emissions from the new CTG. Therefore, the Project will not trigger nonattainment NSR for NOx or VOCs.

The operation of the CTG will be limited by the Title V permit to an equivalent capacity factor of approximately 30%. The primary fuel that will be utilized by the CTG is natural gas, with limited firing of ULSD as a back-up fuel (equivalent to approximately 720 hours/yr). The use of natural gas as the primary fuel and limited use of ULSD will minimize sulfate, fine particulate, and H_2SO_4 formation. The CTG is designed to further limit emissions through a variety of technologies and controls, which include:

- Dry Low NOx ("DLN") combustion technology will provide a 25 parts per million by volume, dry basis, corrected to 15 percent oxygen ("ppmvdc") NOx CTG emission rate at the turbine exhaust flange during post start-up, natural gas steady-state operating levels.
- Water-ULSD emulsion injection providing a 42 ppmvdc NOx CTG emission rate at the turbine exhaust flange during post-start up, ULSD steady-state operating levels.
- Tempering air combined with a conventional catalytic reduction ("SCR") system with aqueous NH_3 injection will be used to control NOx, providing 2.5 ppmvdc (natural gas) / 5 ppmvdc (ULSD) discharge rates for NOx emissions to the atmosphere (top of stack); unreacted NH_3 emissions (referred to as NH_3 slip) will be limited to 5 ppmvdc for both natural gas and ULSD.
- Good combustion management systems will provide initial control of CO, VOCs and hazardous air pollutant ("HAP") emissions exiting the CTG.
- Catalytic oxidation will provide additional control of CO, VOC, and organic HAP (air toxic compound) emissions.
- Use of prompt start and fast ramp procedures minimizing the SU/SD emissions. (The CTG unit will be able to achieve compliance with steady-state emission limits within a maximum of 30 minutes [10 minutes is typical] of initiating fuel combustion in the CTG.)
- Control system will be designed to achieve stack emissions compliant operation at any load between minimum emissions compliant load ("MECL") and base load across the prescribed ambient temperature range.
- The use of natural gas as the primary fuel and limited use of ULSD minimizing sulfate, fine particulate, and H_2SO_4 formation.
- Use of natural gas as the primary fuel and a high efficiency CTG to minimize GHG emissions.

The NOx stack concentration limits are equivalent to the lowest achievable emission rate ("LAER") (even though the Project is not subject to NNSR). As detailed in the Air Permit Application, BACT for PM/PM_{10}/$PM_{2.5}$ was determined to be the use of good combustion controls and low sulfur fuels which minimize particulate emissions.

3.1.6 Project Emissions and NSR Applicability

3.1.6.1 Project Emissions

Table 3.1-3 presents a summary of the estimated maximum hourly emissions in pounds per hour ("lb/hr") for PSD-regulated pollutants emitted from the CTG at steady-state operation. Emission rates for air toxic compounds are provided in Appendix C of the Air Permit Application as are the calculations for emission rates for all steady-state operating conditions and ambient temperatures.

Table 3.1-3 Summary of Estimated Maximum Hourly Emissions (lb/hr) for the CTG During Steady-State Operation

Pollutant[1]	Natural Gas Firing[2, 3]	ULSD Firing[2, 3]
NO_X	36.48	77.61
VOC	10.15	10.80
CO	31.08	47.23
PM	25.30	71.10
PM_{10}	25.30	71.10
$PM_{2.5}$	25.30	71.10
SO_2	5.56	6.13
H_2SO_4	3.66	4.04
Pb	N/A[4]	0.056
GHG as CO_2e	232.55 (tons/hr)	326.18 (tons/hr)

(1) Emission rates for other PSD-regulated pollutants [fluorides, total reduced sulfur, reduced sulfur compounds, and hydrogen sulfide] are negligible (<0.001 lb/hr).

(2) Project may exceed these emission rates during defined periods of start-up, shutdown, fuel switching and malfunction.

(3) Maximum mass emission rate across all steady-state loads and ambient temperatures.

(4) There are no established emission factors for lead from natural gas-fired combustion turbines. Use of USEPA AP-42 emission factor for natural gas-fired boilers results in a maximum emission rate of <0.002 lb/hr.

Emissions during start-up and shutdown ("SU/SD") and fuel switching may, for some pollutants, result in an increase in short-term (lb/hr) emission rates due to the lower combustion and exhaust gas temperatures during these periods. Estimated emission rates provided by the CTG manufacturer (General Electric), which are typically very conservative, for these non-steady-state operating conditions are included in Appendix C of the Air Permit Application. The emissions estimates for the CTG during SU/SD conditions are summarized in **Table 3.1-4**.

Table 3.1-4 Summary of Estimated Maximum Hourly Emissions (lb/hr) for the CTG During Start-up and Shutdown

Operating Case	Fuel	Hourly Emissions (lb/hr)[1]			
		NO_X	$PM_{10}/PM_{2.5}$	CO	SO_2
Start-up	Natural Gas	195.0	9.4	140.0	2.3
Shut-down	Natural Gas	57.5	6.3	100.0	0.9
Start-up	ULSD	230.0	25.0	430.0	2.6
Shut-down	ULSD	117.0	19.0	221.0	1.0

(1) Based on estimated lb/event SU/SD emissions in Appendix C of the Air Permit Application.

Hourly air emissions from ancillary equipment have been estimated based upon manufacturer's information, USEPA emission factors, mass balance calculations, and engineering estimates and are summarized in **Table 3.1-5**. Details on the calculations are provided in Appendix C of the Air Permit Application.

Table 3.1-5 Summary of Estimated Maximum Hourly Emissions (lb/hr) for the Facility's Ancillary Equipment

Pollutant[(1)]	Emergency Generator Engine	Fire Pump Engine #1	Fire Pump Engine #2	Existing P&W Black Start Twin Pac[(3)]
NO_X	0.82	1.03	1.56	249.14
VOC	0.23	0.039	0.047	0.54
CO	4.28	1.29	1.37	98.43
PM	0.04	0.08	0.08	8.93
PM_{10}	0.04	0.08	0.08	8.93
$PM_{2.5}$	0.04	0.08	0.08	8.93
SO_2	0.008	0.002	0.003	0.87
H_2SO_4	0.0012	0.0003	0.0004	n/a
Pb[(2)]	n/a	n/a	n/a	0.0036
GHGs (as CO_{2e})	817	192	292	40,178

(1) Emission rates for other PSD-regulated pollutants (fluorides, total reduced sulfur, reduced sulfur compounds, and hydrogen sulfide) are negligible.

(2) There are no established lead or H_2SO_4 emission factors for ULSD firing in diesel industrial engines or H_2SO_4 emissions from ULSD or natural gas firing in stationary internal combustion sources.

(3) The existing P&W units are not part of the Project as they are existing sources that will be retained solely to provide black start capability for the Facility. Emission rates indicated are the higher of natural gas or ULSK firing; values provided are per turbine.

Potential annual emissions from the proposed Project were conservatively estimated using the following assumptions:

- Operation of the CTG consistent with the annual emission limits requested in the Title V air permit application, which are included in Table 3.1-6 in the "Project Total" column. The annual Project emission limits requested are based on full-load steady-state operation of the CTG on natural gas equivalent to 1,900 hrs/yr[47] at maximum lb/hr emission rates plus an estimated 180 SU/SD cycles and operation of the Project on ULSD approximately equivalent to 720 hrs/year (at maximum load steady-state operation plus an estimated 65 SU/SD cycles);
- Limiting ULSD firing in the CTG under all modes of operation to 21.954 million gallons per year ("gal/yr") (equivalent to approximately 720 hrs/yr at maximum load steady-state operation plus SU/SD); and

[47] This is the maximum natural gas operating time remaining at steady-state conditions that results in Project net VOC emissions being maintained below the NNSR triggering threshold after accounting for emissions from the other listed operational assumptions. Refer to Section 3.1.6.2 for details.

- Operation of the emergency generator and fire pump engines for 500 hrs/yr.

The existing P&W Twin Pac (consisting of two combustion turbines and a single generator) will be retained solely for black start capability, with its operations limited to 12 hrs/yr.

As discussed further in the air permit application, all of these operating assumptions/restrictions are additive (i.e., would all be permitted to occur simultaneously on an annual basis).

Note that natural gas can be fired for more than 1,900 hrs/yr provided that ULSD firing is less than the proposed limit of 21.954 million gal/yr, as long as the Project's total VOC and NO_X annual emissions are below the proposed annual limits. Potential annual emissions for the proposed Project, and total Facility emissions following construction of the Project, are summarized in **Table 3.1-6**. Refer to Appendix C of the Air Permit Application for backup calculations.

Table 3.1-6 Project and Facility Potential Annual Emissions (tpy)

Pollutant[1]	CTG	Emergency Generator Engine	Fire Pump Engine #1	Fire Pump Engine #2	ULSK Tank	ULSD Tanks	Fugitives [2]	Project Total	Existing P&W Black Start Twin Pac[3]	Facility Total[4]
NO_X	96.60	0.20	0.26	0.39				**97.45**	2.99	**100.44**
VOC	24.82	0.06	0.01	0.01	0.002	0.50		**25.40**	0.006	**25.41**
CO	89.29	1.07	0.32	0.34				**91.02**	1.18	**92.20**
PM	52.47	0.009	0.019	0.02				**52.52**	0.11	**52.63**
PM_{10}	52.47	0.009	0.019	0.02				**52.52**	0.11	**52.63**
$PM_{2.5}$	52.47	0.009	0.019	0.020				**52.52**	0.11	**52.63**
SO_2	7.90	0.002	0.0005	0.0007				**7.90**	0.01	**7.91**
H_2SO_4	5.20	0.0003	0.0001	0.0001				**5.20**	n/a	**5.20**
Pb	0.02							**0.02**	0.00004	**0.02**
GHGs (as CO_{2e})[5]	713,487	204	48	73			2,708	**716,520**	482	**717,002**
Total HAPs	4.52	0.002	0.0011	0.0017	0.0003	0.044		**4.56**	0.006	**4.57**
Formaldehyde (max HAP)	1.99	0.0001	0.0003	0.0005				**1.99**	0.002	**2.00**

(1) Emission rates for other PSD regulated pollutants (fluorides, total reduced sulfur, reduced sulfur compounds, and hydrogen sulfide) are negligible.

(2) Includes SF_6 from onsite electrical circuit breakers and CH_4 from onsite natural gas components (connectors, valves, meters, and regulators)

(3) The emissions listed for the P&W black start Twin Pac are the total values for both turbines operating for 12 hrs/yr each.

(4) Following construction of the Project.

(5) Based on GWPs consistent with proposed revision to NYCRR 231-13.9, Table 9.

It should be noted that the Project emissions do not include existing sources that are not being modified, specifically the existing P&W Twin Pac that will remain to provide black start capability, and the existing ULSK tanks that will be used to store ULSD as back-up fuel for the new CTG. Total Facility emissions following construction of the Project are included in the table above for informational purposes only.

The previously approved Project's configuration included four combined cycle generating units intended to be used for intermediate duty with a permitted annual capacity factor in excess of 85%; ULSD firing in all four units was limited to a total of 400 hours/year. The Project, as modified, consists of one simple cycle unit and is designed to operate as a peaking facility with annual emission caps equivalent to a capacity factor of approximately 30%[48]; with operation on ULSD limited to 21.954 million gal/yr (the ULSD-gallon equivalent of approximately 720 hours/year at full load). Based on a dispatch analysis conducted by Navigant/Guidehouse (Navigant/Guidehouse GHG Report and Supplement; provided in **Appendix E**), the Project's annual capacity factor is expected to average

[48] As described in the Project's Title V Air Permit Major Modification Application, operations will be limited by fuel use and annual emission caps.

4.4% over the 2023-2035 time period. **Table 1.1-2** provides a comparison of the 2010 Project design parameters and the proposed Project as modified.

Table 3.1-7 provides a summary comparison of the maximum potential short-term and annual combustion turbine emissions for the previously approved Project and the currently proposed Project. As shown in **Table 3.1-7,** the proposed Project's short-term air emissions are lower than those for the previously approved Project for all pollutants with the exception of VOC and CO. As noted in note 3 of **Table 3.1-7**, the projected emissions for VOC and CO associated with the previously approved configuration of the Project were based on USEPA provided emission factors and actual stack test data available for similar units, rather than based on emission rates guaranteed by the turbine manufacturer. For the current Project configuration, guaranteed emission rates provided by the manufacturer were used to calculate CO and VOC emissions. Note that the guaranteed emission rates provided by the manufacturer are typically very conservative in comparison and therefore use of guaranteed emissions provided by the manufacturer would have resulted in considerably higher short-term VOC and CO emissions rates for the previously approved configuration of the Project compared to the Project as modified. Maximum potential annual combustion turbine emissions for the Project as modified are lower than those for the Project as previously configured for all pollutants.

Table 3.1-7 Maximum Potential Combustion Turbine Air Emissions - Comparison of Current Configuration of the Project to Previously Approved Configuration of the Project

Pollutant	Previously Approved Project Configuration		Current Project Configuration	
	lb/hr[(1)]	tpy[(1)]	lb/hr[(2)]	tpy[(2)]
NOx	226.7	404.6	77.6	96.6
VOC	7.1[(3)]	25.2[(3)]	10.8	24.8
$PM/PM_{2.5}/PM_{10}$	86.4	160.7	71.1	52.5
SO_2	10.9	21.9	6.1	7.9
CO	41.6[(3)]	194.4[(3)]	47.2	89.3
GHGs (asCO_{2e})	1,175,760	3,865,000	652,360	713,487

(1) Maximum short-term and annual emissions as submitted to NYSDEC on February 5, 2010. There are no short-term mass emission limits in the Title V permit for the previously approved configuration. Note that annual emissions include start-up/shutdown ("SU/SD") events only for NOx and VOC. Annual emissions were based on a maximum annual capacity factor of approximately 98%.

(2) Maximum short-term and annual emissions as reported in Tables 2-1 and 2-3, respectively, of the Astoria Replacement Project Title V Air Permit Modification Application, submitted to NYSDEC. Listed short-term values are the proposed permit emission limits. Emissions for estimated SU/SD events were included for all pollutants. Annual emissions will be capped based on an estimated annual capacity factor of approximately 30%.

(3) The Title V permit for the previously approved configuration did not contain emission limits for VOC or CO, and the projected emissions of VOC and CO were based on AP-42 emission factors and stack test data, not on vendor guarantee. The emission rates as listed in the Astoria Replacement Project Title V Air Permit Modification Application, submitted to NYSDEC are proposed permit limits and based on the vendor guarantees which are more conservative.

As discussed in Section 1.1, the Project as currently configured includes ancillary sources of emissions that were not included in the Project as configured in 2010. The Project's maximum potential emissions for all Project sources are summarized in **Table 3.1-8**. For informational purposes only, **Table 3.1-8** also provides a comparison of maximum potential annual Project emissions (from **Table 3.1-6**) with expected annual emissions based on the average capacity factor determined from Navigant/Guidehouse's dispatch analysis. As shown in the table, actual emissions associated with the Project are expected to be much lower than the maximum potential emissions.

Table 3.1-8 Comparison of Maximum Potential and Expected Annual Total Project Emissions (tpy) for the Current Project Configuration

Pollutant	Maximum Potential(1)	Expected based on Navigant/Guidehouse Dispatch Analysis (2023-2035)(2)
NOx	97.45	8.77
VOC	25.40	2.44
$PM/PM_{2.5}/PM_{10}$	52.52	5.57
SO_2	7.90	1.07
CO	91.02	7.75
GHGs (as CO_2e) (3)	716,520	99,815

(1) See Table 2-3 of the Air Permit Application.
(2) Basis for calculations are provided in **Appendix F**.
(3) Maximum potential CO_2e is based on Intergovernmental Panel on Climate Change ("IPCC") AR4 global warming potential ("GWP") in accordance with proposed 6 NYCRR Part 231 revisions. Dispatch Analysis CO_2e is based on Part 496 GWPs.

3.1.6.2 PSD/NNSR Applicability and Emissions Netting

As discussed previously, NSR applies to proposed new major sources of air pollutants and major modifications at existing sources. The NSR program for major sources and modifications includes two distinct permitting programs:

- PSD permitting for projects located in areas designated as unclassified or attainment with the NAAQS; and
- NNSR permitting for projects located in areas designated as nonattainment with the NAAQS.

To comply with the requirements of the Clean Air Act and the major NSR regulations in 40 CFR 51.166 and 40 CFR 51.165, respectively, New York has an USEPA-approved State Implementation Plan ("SIP") in place to implement the PSD and NNSR preconstruction programs. NYSDEC's rules for modifications to existing major sources are in 6 NYCCR Part 231-6 (NNSR) and 6 NYCRR 231-8 (PSD). The existing Facility is a major source with respect to PSD review because the facility's maximum potential emissions for at least one pollutant subject to PSD review exceeds the PSD major source threshold (100 tpy, 100,000 tpy for GHGs). Similarly, the existing Facility is a major source with respect to NNSR because the facility's maximum potential emissions for NO_X exceeds the major source threshold for severe O_3 nonattainment (25 tpy).

A two-step process was followed to determine whether the currently configured Project is subject to PSD review and/or NNSR. The first step compared the Project's maximum annual emissions

(referred to by the NYSDEC as the project emission potential, or "PEP") to the applicable PSD and NNSR significant project thresholds ("SPT"). Those pollutants with PEPs below the SPTs are eliminated from further NSR considerations. For the proposed Project, this applies to CO, SO_2, H_2SO_4, and Pb. For the remaining pollutants, the second step involves a comparison of the net emission increases to the applicable PSD and NNSR triggering thresholds (referred to by NYSDEC as the Significant Net Emission Increase Thresholds ["SNEIT"]). For this project, the net emission increases are the differences between the Project's PEP and baseline emissions from the Facility associated with the future shutdown of the P&W turbines (not including the emissions from the two P&W turbines that will remain as black start units).

A summary of the NNSR and PSD netting analysis is provided in **Table 3.1-9**. Refer to Section 3.1.2 of the Title V air permit application for a detailed discussion of the NSR applicability determination. Backup engineering calculations are provided in Appendix C of the Air Permit Application.

Table 3.1-9 Summary of Nonattainment and PSD Netting Analysis

Compound	Annual Emissions (tpy)						Does NNSR or PSD Review Apply?
	Project Emission Potential[(1)]	Contemporaneous Changes		Net Emissions Increases[(3)]	Significant Net Emission Increase Threshold		
		Increases	Decreases[(2)]		NNSR	PSD	
NO_x	97.45	0	72.55[(4)]	24.90	25	40	No
VOC	25.40	0	0.5[(5)]	24.90	25		No
PM	52.52	0	0.0	52.52		25	Yes, PSD
PM_{10}	52.52	0	0.0	52.52		15	Yes, PSD
$PM_{2.5}$	52.52	0	0.0	52.52		10	Yes, PSD

(1) See Table 3-4 of the air permit application.

(2) Emission Reduction Credits from future shutdown of 22 P&W turbines prior to completion of the Project's shakedown period. See Appendix C of the Air Permit Application for backup calculations.

(3) Project emissions plus contemporaneous increases minus contemporaneous decreases.

(4) The future shutdown of 22 P&W turbines will result in the generation of 116.2 tpy NOx ERCs; however, the Project only needs 72.55 tpy to net out of NNSR. Applicant will place the remaining NOx ERCs (43.62 tpy) in NYSDEC's ERC Registry.

(5) The future shutdown of 22 P&W turbines will result in the generation of 0.65 tpy VOC ERCs; however, the Project only needs 0.50 tpy to net out of NNSR. Applicant will place the remaining VOC ERCs (0.15 tpy) in NYSDEC's ERC Registry.

As shown in **Table 3.1-9**, the Project as currently configured is subject to PSD review for PM, PM_{10}, and $PM_{2.5}$. The Project is also subject to PSD review for GHGs (NYSDEC regulations do not allow emissions netting for GHGs). The Project is not subject to NNSR for either NOx or VOC (i.e., ozone precursors). As was noted in Section 3.1.6.1, the Project will be limited to 21.954 million gal/yr of ULSD firing, and the Project's VOC and NO_X annual emissions will be limited to 25.40 tpy for VOC and 97.45 tpy for NO_X on a 12-month rolling basis.

3.1.7 Air Quality Impact Analysis

3.1.7.1 Air Quality Impact Analysis Methodology

The air quality impact analysis conducted for the Project as modified utilized the same dispersion model and general methodology that was used to assess the air impacts for the Project as permitted in 2010. Dispersion modeling was conducted for the modified Project sources in accordance with NYSDEC's DAR-10 (NYSDEC, 2020a) and the USEPA *Guideline on Air Quality Models* ("GAQM", which is contained in 40 CFR Part 51, Appendix W) (USEPA, 2017) to demonstrate modeled compliance with air quality standards for criteria pollutants (i.e., NAAQS and PSD increments). Modeling of the current version of the Project emissions was also conducted for air toxic compounds in accordance with NYSDEC's DAR-1 (NYSDEC, 2016) for evaluating air toxic compounds relative to the Short-term and Annual Guideline Concentrations ("SGCs" and "AGCs", respectively). The air quality modeling analyses for the Project as modified followed the methodology outlined in the modeling protocol approved by NYSDEC. As shown below in Section 3.1.7.2, similar to the previously approved Project configuration, the modeling analyses for the Project as modified demonstrate that the air quality impacts for criteria pollutants are below the USEPA SILs (i.e., SILs are *de minimis*) thus demonstrating compliance with the NAAQS and PSD increments without requiring further analysis. In addition, the current Project modeled concentrations for air toxic compounds are below all SGCs/AGCs.

The modeling addressed the following combustion sources associated with the currently proposed configuration of the Project:

- One approximately 437 MWe simple cycle CTG with dual-fuel firing capability (natural gas and ULSD);
- One 500 kWe ULSD-fired emergency generator; and
- Two ULSD-fired emergency fire system pumps; 117 and 177 kWm, respectively.

Note that, while not part of the Project, the modeling also conservatively included the existing P&W Twin Pac (consisting of two individual turbines) to be used for black start capability.

Dispersion modeling was initially conducted for the new CTG to determine the maximum impact operating scenario for the CTG over the range of operating loads, ambient temperatures, steady-state operations, and start-up/shut-down operations. Then the worst-case emission scenarios for the CTG were modeled with the ancillary sources to determine if the modeled impacts are above their respective Significant Impact Levels ("SILs") (see **Table 3.1-10**). For Project modeled concentrations less than the SILs, no further modeling is required to demonstrate compliance with the NAAQS and PSD increments. For Project modeled impacts greater than the SILs, a cumulative modeling analysis is required to demonstrate that the Project, existing facility sources, and off-site background sources show compliance with the NAAQS (including ambient background component) and PSD increments, as necessary.

In January 2013, a ruling of the United States Court of Appeals for the District of Columbia Circuit (the Court) held that use of the $PM_{2.5}$ SIL alone cannot be used to demonstrate compliance with NAAQS. The Court decision does not preclude the use of the SILs for $PM_{2.5}$ entirely, but requires that monitoring data be evaluated to ensure that predicted impacts that are less than the SIL do not result in total concentrations (existing ambient plus project-related contributions) that exceed the NAAQS. Therefore, if there is a sufficient margin (greater than the SIL value) between the representative monitored background concentration in the area and the $PM_{2.5}$ NAAQS, then it is sufficient to conclude that a proposed source with an impact less than the SIL value will not cause or contribute to a violation of the NAAQS, so no further analysis is necessary (USEPA, 2014). All pollutants and averaging

periods have a margin between the monitored value and the NAAQS that is greater than the respective SIL; therefore, use of the SILs as *de minimis* levels for all pollutants was used for the Project.

The modeling analysis methodology and results are detailed further in Section 5 of the Air Permit Application.

Model Selection

The suitability of an air quality dispersion model for each regulatory application is dependent upon several factors. The following selection criteria were evaluated:

- stack height relative to nearby structures;
- dispersion environment;
- local terrain; and
- representative meteorological data.

The USEPA's GAQM prescribes a set of approved models for regulatory applications for a wide range of source types and dispersion environments. Based on a review of the factors discussed below, the latest version of the USEPA's AERMOD (Version 19191) dispersion model was used to assess air quality impacts for the Project as modified.

AERMOD was also used to assess the air quality impacts of the configuration of the Project approved in 2010 using the version of the model that was current at the time of the analysis.

Source Exhaust Parameters and Emission Rates

Details on the source parameters and emission rates used in the modeling for the CTG and ancillary sources associated with the Project as modified are provided in Section 5.2 of the Air Permit Application.

Good Engineering Practice Stack Height

USEPA and NYSDEC modeling guidelines require the evaluation of the potential for physical structures to affect the dispersion of emissions from stack emission sources. This analysis accounts for the potential that building and structures in close proximity to stacks may subject the dispersion of the emissions to "aerodynamic building downwash" under certain meteorological conditions. The analysis used to evaluate the potential for building downwash is referred to as a physical good engineering practice ("GEP") stack height analysis. Stacks with heights below physical GEP are considered to be subject to building downwash per the Guideline for Determination of Good Engineering Practice Stack Height (USEPA, 1985).

A GEP stack height analysis was performed for all Project stacks in the modeling using the PRIME version of USEPA's Building Profile Input Program ("BPIP-PRIME") to develop building and structural dimensions for input to the AERMOD dispersion model to simulate building downwash for the sources included in the modeling subject to building downwash.

As with the previously approved configuration of the Project, the current Project CTG will be designed with a 250-foot stack to minimize the potential for building downwash affects. In comparison, the existing P&W units are serviced by short, 38-foot stacks which are subject to greater building downwash affects resulting in poorer dispersion of air emissions.

Dispersion Environment

The application of AERMOD requires characterization of the local (within 3 km) dispersion environment as either urban or rural, based on a USEPA-recommended procedure that characterizes an area by prevalent land use. This land use approach classifies an area according to 12 land use types where areas of industrial, commercial, and compact residential land use are designated urban. According to USEPA modeling guidelines, if more than 50% of an area within a 3-km radius of the project site is classified as rural, then a rural model application is required. Conversely, if more than 50% of the area is urban, an urban dispersion adjustment can be used.

The 3-km area surrounding the facility location area is clearly urban. Therefore, the urban model option in AERMOD was used consistent with the air quality modeling conducted for the previously approved Project.

Meteorological Data

If at least one year of hourly onsite meteorological data is not available, the application of a refined dispersion model such as AERMOD requires five years of hourly meteorological data most representative of the project site. The modeling analysis for the Project configuration utilized five recent years (2014-2018) of concurrent surface meteorological data from LaGuardia Airport coupled with upper air data from Brookhaven, NY. The LaGuardia Airport is approximately one mile to the southeast of the Facility and provides an extremely representative source of meteorological data for this modeling application.

AERMOD-ready meteorological data were provided by NYSDEC for use in this application. NYSDEC prepared the meteorological data using the AERMET program which is part of the USEPA's AERMOD modeling system[49].

The previously approved Project also used five years of meteorological data from LaGuardia Airport coupled with upper air data from Brookhaven, NY that were more current at the time of the modeling; 2000-2004.

Dispersion Model Receptors

Ground-level Receptors

The USEPA GAQM and NYSDEC modeling guidelines require that the differences in elevations between the stack-top and exhaust plume, and the model receptor locations be considered in the modeling analyses. A comprehensive Cartesian receptor grid extending to 20 km was developed for use in AERMOD to assess maximum ground-level pollutant concentrations.

The Cartesian receptor grid was developed following NYSDEC guidelines and consisted of the following receptor spacing:

- 50-meter ("m") increments beyond the fence out to 1 km;
- 100-m increments beyond 1 km out to 2.5 km;
- 250-m increments beyond 2.5 km out to 5 km;
- 500-m increments beyond 5 km out to 10 km; and,

[49] https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod

- 1000-m increments beyond 10 km out to 20 km.

Additional receptors were placed every 25 m along the fenced property boundary of the Facility. This receptor grid was sufficient to resolve all maximum modeled impacts associated with the Project as the maximum concentrations were modeled in areas of 50 m spacing.

Terrain elevations were developed from National Elevation Dataset ("NED") data acquired from United States Geological Survey ("USGS")[50]. Receptors and terrain elevations were processed with USEPA's AERMAP, which is part of the AERMOD modeling system, for use in the modeling. Figures showing the receptor locations are provided in the air permit application show the near-field and far-field receptors, respectively (see Figures 5-4 and Figure 5-5 of the air permit application).

In comparison, the modeling for the previously approved configuration of the Project utilized a polar grid (i.e., coarse grid) supplemented with Cartesian grid receptors (i.e., fine grid) to refine the location of the maximum modeled concentrations. This was a common process to manage the model run-times to the computing power that was available at the time (model run-times are proportional to the number of receptors and sources). Given the improvement of computing power, Cartesian receptor grids with many more receptors can be used at the onset of the modeling to avoid the need for supplemental dispersion model iterations with fine grid receptors to resolve maximum impacts.

Elevated/Flagpole Receptors

In addition to the ground-level receptors, elevated receptors in proximity to the Project were also assessed to evaluate modeling results on rooftops, balconies, and similar areas with public access, but not at open windows or air intakes, in accord with USEPA and NYSDEC policy. The modeling utilized the same flagpole receptors that were used in the previously approved Project supplemented with additional receptors to represent new buildings that have been constructed since 2010. Newly constructed buildings were found by comparing archived Google Earth™ satellite imagery prior to 2010 to the most recent imagery. The search radius included the immediate vicinity of the facility (about 4 km) with a focus on multi-story residential buildings and schools. The search resulted in three newly constructed buildings located to the northeast and west of the facility. While not included in the 2010 receptor set and not newly constructed, three additional residential buildings south of the facility were also selected as flagpole receptors because they are in close proximity (< 1 km) to the facility. The six additional receptors were assigned receptor heights based on the same methodology used in the previous 2010 analysis, which used elevations corresponding to the rooftop as well as half the building height. Figure 5-6 of the air application presents the full set of modeled elevated receptor locations.

Secondary $PM_{2.5}$

As the current proposed Project is subject to PSD for $PM_{2.5}$, secondary $PM_{2.5}$ concentrations associated with Project NO_X and SO_2 precursor emissions was analyzed. The procedure to assess secondary $PM_{2.5}$ concentrations is documented in detail in Section 5.9 of the Air Permit Application.

3.1.7.2 Air Quality Impact Analysis Results

As documented below, similar to the previously approved configuration of the Project, the modeling analyses for the Project as modified demonstrates that the air quality impacts are below the USEPA SILs for criteria pollutants thus demonstrating compliance with the NAAQS and PSD increments, and below all SGCs and AGCs for air toxic compounds. The results of the air quality impact analyses for

[50] https://viewer.nationalmap.gov/basic/

the Project, which was conducted using the inputs and methodologies described in the preceding sections of this DSEIS, are presented below.

Initially, modeling was conducted for the CTG alone to determine the maximum impact steady-state operating scenarios for each pollutant and averaging period based on modeling conducted for each of the 30 operating scenarios presented in Tables 5-1 and 5-2 of the air permit application. The detailed modeling results for this analysis were provided in Appendix E of the Air Permit Application. These results were reviewed to identify the maximum impact case for each pollutant and averaging period for steady-state operations and SU/SD to formulate the composite SIL modeling cases for short-term modeling summarized in Table 5-9 (see Table 5-3 for annual modeling scenarios and source data) of the Air Permit Application.

After determining the worst-case operating scenarios for the CTG, AERMOD was then applied to determine the maximum modeled concentrations for all Project sources (CTG, emergency generator, two fire system pump engines and black start unit). A summary of the overall maximum Project impacts is provided in **Table 3.1-10**. All maximum impacts were modeling in areas where receptor spacing was no greater than 50 meters, and therefore additional modeling to further resolve the modeled concentrations was not required. The modeling results are illustrated as plots of concentration isopleths overlaid on satellite images provided in **Appendix K**.

As shown in **Table 3.1-10**, the maximum modeled impacts for the Project are below all SILs, which demonstrates compliance with the NAAQS and PSD Class II increments. Therefore, no further analysis was necessary.

Table 3.1-10 Project as Modified – SIL Modeling Results

Pollutant	Averaging Period	Maximum Modeled AERMOD Concentrations for Project Sources (µg/m^3)		Significant Impact Level (µg/m^3)
		Ground Receptors	Flagpole Receptors	
NO_2	1-hr	6.48	5.68	7.5
	Annual	0.88	0.05	1
CO	1-hour	833	71	2,000
	8-hour	51	10	500
PM_{10}	24-hour	0.68	0.50	5
	Annual	0.06	0.01	1
$PM_{2.5}$(1)	24-hour	0.45	0.41	1.2
	Annual	0.05	0.01	0.3
SO_2	1-hour	0.13	0.12	7.9
	3-hour	1.84	0.15	25
	24-hour	0.06	0.04	5
	Annual	0.002	0.001	1

(1) Includes only primary $PM_{2.5}$ impact. See Table 5-11 of the air application for calculation of total $PM_{2.5}$ impacts including secondary component. As shown in the air permit application, the secondary $PM_{2.5}$ component is negligible.

The total $PM_{2.5}$ impact for the Project is presented in **Table 3.1-11** as the sum of the direct $PM_{2.5}$ impact (percent) and secondary $PM_{2.5}$ impact (percent), for each of the 24-hour and annual averaging periods. In accordance with the USEPA guidance, since the sum is less than 100 percent, the estimated total $PM_{2.5}$ impact is considered insignificant (less than the SIL) and no additional analysis was required. The results show that the secondary $PM_{2.5}$ component is negligible at approximately 0.46% and 0.14% of the 24-hour and annual $PM_{2.5}$ SILs, respectively.

As with the 2010 Project, the modeling results for the Project as modified show that all modeled concentrations are below all the SILs for all pollutants and averaging periods.

Table 3.1-11 Total $PM_{2.5}$ Impacts – Primary plus Secondary

Averaging Period	Primary $PM_{2.5}$ Impact Calculation			Secondary $PM_{2.5}$ Impact Calculation							Total Primary + Secondary $PM_{2.5}$ Impact (% of SIL)
	Maximum AERMOD Concentration ($\mu g/m^3$)	SIL ($\mu g/m^3$)	Primary Impact (% of SIL)	Project Potential NO_X Emissions (tpy)	NO_X MERPS(1) (tpy)	Impact from NO_X Precursors (% of SIL)	Project Potential SO_2 Emissions (tpy)	SO_2 MERPS(1) (tpy)	Impact from SO_2 Precursors (% of SIL)	Total $PM_{2.5}$ Secondary Impact (% of SIL)	
24-hour	0.45	1.2	37.58%	100.5	30204	0.33%	7.9	6384	0.12%	0.46%	38.04%
Annual	0.05	0.2	26.40%	100.5	128059	0.08%	7.9	12710	0.06%	0.14%	26.54%

(1) Hypothetical source from USEPA database (USEPA, 2019), lowest MERP for Bronx, NY source (90 m stack height).

A comparison of the modeling results for the Project as previously configured and permitted and the Project as modified is provided in **Table 3.1-12.** As the previously approved configuration did not include any emergency ancillary equipment, for informational purposes, **Table 3.1-12** provides a comparison of the modeling results associated with the currently proposed Project's single simple cycle CTG configuration and the previously approved configuration of the Project which included four combined cycle CTGs. As shown in **Table 3.1-12**, all of the current Project modeled concentrations are lower than the 2010 Project configuration concentrations with the exception of the CO results (which are still well below the SILs).

Table 3.1-12 Project Modeling Results Comparison for the Combustion Turbines – 2010 Configuration vs Current Configuration

Pollutant	Averaging Period	Maximum Modeled AERMOD Concentrations for Project CTs (µg/m^3)			
		Ground Receptors		Flagpole Receptors	
		2010 Project CCCTs	2020 Project SSCT	2010 Project CCCTs	2020 Project SSCT
NO_2	1-hr	48.7	6.5	49.9	5.7
	Annual	0.09	0.01	0.1	0.01
CO(1)	1-hour	6.7	18	6.1	12
	8-hour	1.7	11	1.6	8.8
PM_{10}	24-hour	1.1	0.7	1.4	0.5
	Annual	0.005	0.005	0.07	0.006
$PM_{2.5}$	24-hour	1.1	0.4	1.4	0.4
	Annual	0.005	0.005	0.07	0.005
SO_2	1-hour	NA	0.1	NA	0.1
	3-hour	0.6	0.1	0.5	0.1
	24-hour	0.1	0.05	0.2	0.04
	Annual	0.005	0.001	0.007	0.001

(1) As noted in footnote 3 of **Table 3.1-7**, the CO emissions for the 2010 Project were based on AP-42 emission factors and stack test data, not on vendor guarantee whereas the CO emissions for the 2020 Project are based vendor guarantees which are more conservative; therefore resulting in higher modeled concentrations for the 2020 Project.

3.1.7.3 Cumulative Modeling Analysis

As discussed above in Section 3.1.7.2, the modeled concentrations for the currently configured Project are below the SILs for all pollutants and averaging periods and therefore the Project does not have the potential to have a significant impact on ambient air quality. Therefore, the Project as modified complies with the NAAQS and PSD increments without further analysis. A cumulative analysis was however conducted where the maximum Project concentrations have been summed with the representative monitored concentrations described in Section 3.1.2.2 (see **Table 3.1-2**) to provide an estimate of the total air quality impacts including the Project as estimated by the dispersion model.

As shown in **Table 3.1-13**, the maximum modeled concentrations for the Project plus the ambient background concentrations are well below all of the NAAQS further demonstrating that the Project will not result in a significant adverse impact to air quality.

Table 3.1-13 Cumulative NAAQS Analysis

Pollutant	Averaging Period	Concentration (µg/m³)			NAAQS (µg/m³)	Percent of NAAQS
		Modeled Project Sources(1)	Ambient Background(2)	Total		
NO_2	1-hr	6.48	109	115.48	188	61%
	Annual	0.88	34	34.88	100	35%
CO	1-hour	833	1970	2803	40,000	7%
	8-hour	51	1603	1654	10,000	17%
PM_{10}	24-hour	0.68	32	32.68	150	22%
$PM_{2.5}$	24-hour	0.45	18	18.45	35	53%
	Annual	0.05	8	8.05	12	67%
SO_2	1-hour	0.13	16	16.13	196	8%
	3-hour	1.84	16	17.84	1300	1%

(1) See **Table 3.1-10**.

(2) See **Table 3.1-2**. 3-hour average SO_2 not available; 1-hour value used for conservatism.

3.1.7.4 Non-criteria Pollutant Air Quality Impacts

Modeling of the Project emissions was also conducted for air toxic compounds in accordance with NYSDEC's DAR-1 guidance for evaluating air toxic compounds relative to the SGCs and AGCs.

Modeling of air toxic emissions was conducted for emissions from the CTG, emergency generator, two fire-system pump engines and P&W Twin Pac turbines being retained for black start service. The results of the analysis are summarized in **Table 3.1-14** and represent the maximum concentrations across all receptors, both ground level and flagpole.

A screening approach was used where each source was modeled separately with AERMOD and then the highest impacts over the five years of meteorology modeled for each source was summed together to determine the total Project impact for each compound. This is extremely conservative since the highest impacts for each source do not necessarily occur at the same receptor or during same meteorological data time period.

As shown in **Table 3.1-14**, all of the total modeled Project concentrations are well below the SCGs and AGCs where the highest modeled concentrations were for formaldehyde at 8% and 3% of the SGC and AGC, respectively.

These findings for the Project as modified are consistent with the previously approved configuration of the Project where all modeled air toxic compound concentrations were below the SGCs and AGCs.

Table 3.1-14 Air Toxics Modeling Results

HAP	Modeled 1-hour Concentration(1) (µg/m³)	SGC (µg/m³)	% of SGC	Modeled Annual Concentration(1) (µg/m³)	AGC (µg/m³)	% of AGC
1, 3 Butadine	4.98E-02	N/A	-	4.77E-05	3.30E-02	0.1%
Acetaldehyde	3.54E-01	470	<0.1%	8.95E-04	4.50E-01	0.2%
Acrolein	4.82E-02	2.5	2%	1.14E-04	3.50E-01	<0.1%
Arsenic	2.58E-02	N/A	-	4.47E-06	2.30E-04	2%
Benzene	7.35E-01	1300	<0.1%	1.92E-03	1.30E-01	1%
Beryllium	7.26E-04	N/A	-	1.26E-07	4.20E-04	<0.1%
Cadmium	1.08E-02	N/A	-	1.87E-06	2.40E-04	1%
Chromium	2.58E-02	N/A	-	4.47E-06	45	<0.1%
Ethylbenzene	7.39E-02	N/A	-	7.46E-06	1000	<0.1%
Formaldehyde	2.06E+00	30	7%	1.63E-03	6.00E-02	3%
Lead	3.28E-02	N/A	-	5.69E-06	3.80E-02	<0.1%
Manganese	1.85E+00	N/A	-	3.21E-04	5.00E-02	1%
Mercury	2.81E-03	6.00E-01	0.5%	4.88E-07	3.00E-01	<0.1%
Naphthalene(2)	1.59E-01	7900	<0.1%	2.48E-04	3	<0.1%
Nickel	1.08E-02	2.00E-01	5%	1.87E-06	4.20E-03	<0.1%
PAH	2.30E-01	N/A	-	4.34E-04	2.00E-02	2%
Propylene Oxide	6.69E-02	3100	<0.1%	6.76E-06	2.70E-01	<0.1%
Selenium	5.86E-02	N/A	-	1.02E-05	20	<0.1%
Toluene	5.44E-01	37000	<0.1%	7.99E-04	5000	<0.1%
Xylenes	3.16E-01	22000	<0.1%	5.48E-04	100	<0.1%

N/A = Not SGC/AGC listed.

(1) Maximum modeled concentration at either ground-level or flagpole receptors.

(2) NYSDEC DAR-1 (NYSDEC, 2016) indicates that the Naphthalene SGC is based on American Conference of Governmental Industrial Hygienists ("ACGIH") short-term exposure limit ("STEL"), which is an occupational health standard. As a result, the Agency for Toxic Substances and Disease Registry ("ATSDR") and other sources of short-term, health-based comparison values were consulted for a potential alternate threshold to use in the analysis. US Department of Energy's Protective Action Criteria ("PAC-1") provided the same value as the DAR-1 SGC. No other sources, including ATSDR, listed a short-term threshold.

3.1.7.5 Additional Impact Analysis

There are also additional impacts that are required to be addressed for projects subject to PSD review. The various components of the additional impact analyses are summarized below with additional details provided in Section 5.13 of the air permit application.

PSD Class I Area Analyses

PSD Class I Areas are specifically designated pristine locations (e.g., National Parks, Wildlife Refuges, and Wilderness Areas) that are afforded additional protection by the Clean Air Act ("CAA"). The closest Class I area is the Brigantine National Wildlife Refuge approximately 150 km to the south of the Facility in southern New Jersey on the Atlantic Coast. A conservative screening modeling was conducted with AERMOD that demonstrated insignificant impacts relative to the Class I Area SILs. The analysis utilized a ring of receptors (full circle of receptors) at a distance of 50 km from the Facility (i.e., practical limit of AERMOD). **Table 3.1-15** presents modeling results that are all lower than the Class I SILs, demonstrating the Project will have an insignificant impact on the Class I area.

The Federal Land Managers' Air Quality Related Values Work Group ("FLAG") Phase 1 Report guidance document (FLAG, 2010), references a Q/D screening approach that is designed to screen out projects from

the need to conduct an Air Quality Related Values ("AQRV") analysis for Class I areas located more than 50 km away. The Q in the Q/D is the sum of the short-term NO_X, SO_2, $H2SO_4$, and PM emissions expressed in tpy, and D is the distance in km from the project to the Class I area. The FLAG guidance suggests that if the Q/D ratio is less than ten, the FLM may decide that an analysis of AQRVs (including regional haze and acid deposition) is not necessary.

The Project triggers PSD for PM, PM_{10} and $PM_{2.5}$ but results in a net decrease in NO_X emissions, and emission increases of SO_2 and H_2SO_4 are less than PSD emission thresholds given the use of low sulfur fuels (natural gas and ULSD). Therefore, for this Project Q was based on PM_{10}/$PM_{2.5}$ emissions associated with normal CTG operations (worst-case fuel being ULSD). Other Project sources normally operate very intermittently (i.e. less than 500 hours per year) for testing purposes only and were therefore not included in the determination of Q.

Table 3.1-16 provides the inputs to the Q/D analysis which includes a Total Q of 312 tons and the distance from the Project to Brigantine Wildlife Refuge of 150 km. This results in a Q/D of 2.1, which is much less than the FLAG screening threshold of 10. Based on this ratio, the Applicant prepared a Request for Applicability of Class I Area Modeling Analysis which was submitted to the Fish and Wildlife Service ("FWS") to confirm that Class I AQRV modeling will not be required (see Appendix G of the Air Permit Application). The Applicant anticipates approval of its waiver request, and therefore is not planning on assessing AQRVs at Brigantine Wildlife Refuge.

Table 3.1-15 PSD Class I SIL Analysis

Pollutant	Averaging Period	Maximum Modeled AERMOD Concentrations (µg/m^3)	Class I Significant Impact Level (µg/m^3)
PM_{10}	24-hour	0.08	0.3
	Annual	0.001	0.2
$PM_{2.5}$	24-hour	0.06	0.07
	Annual	0.001	0.06

Table 3.1-16 Class I Q/D Analysis

Source	PM_{10} / $PM_{2.5}$ Emissions	
	lb/hr(1)	tpy(2)
CTG	71.1	311.4
Distance to Brigantine Wildlife Refuge (km)	150	
Q/D	**2.1**	

(1) See Table 2-2 of the Air Permit Application.

(2) Equivalent tpy based on the maximum lb/hr emissions.

Growth Analysis

A qualitative assessment was made as to the Project's potential to cause general commercial, residential, industrial or other secondary growth in the area. If substantial growth due to this Project were expected, an assessment of associated air quality impacts would be required. However, the Project is the replacement of existing sources and expected to be operated by employees currently working at the Facility, so additional housing or infrastructure is not necessary to support the Project. Likewise, no secondary industrial growth is anticipated as the necessary support industry is already in place.

Soils and Vegetation Analysis

The screening criteria for evaluating impacts on soils and vegetation are provided in USEPA's *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils and Animals* (USEPA, 1980). Of those criteria, only analysis of PM_{10} is required because no other pollutant listed in USEPA 1980 qualifies for PSD review. As shown in **Table 3.1-17**, the maximum modeled PM_{10} concentrations from the Project are well below the screening criteria. In addition, as shown in **Table 3.1-10**, all modeled pollutant concentrations for the Project are well below the SILs which are more stringent than the screening criteria. Therefore, the Project will not cause an adverse impact to sensitive vegetation, crops, or soil systems.

Table 3.1-17 Soils and Vegetation Analysis

Pollutant	Averaging Period	Maximum Impact of Proposed Project (µg/m^3)	Minimum Impact Level for Effects on Sensitive Plants (µg/m^3) (1)
PM_{10}	24-Hour	0.68	150
(1) USEPA, 1980.			

3.1.7.6 Accidental Ammonia Release

The Project as currently configured includes a new 19% aqueous NH_3 storage tank with a capacity of 20,000 gallons to store NH_3, the reagent for the SCR system that will control NO_x emissions from the proposed CTG. As detailed in Section 3.1.13 of the air permit application, the Project is not subject to the Clean Air Act Risk Management Program ("RMP") because the storage of 19% aqueous NH_3 is exempt from the program. Nevertheless, an analysis was conducted to evaluate the potential off-site impacts associated with the unlikely event of a full failure where the complete contents of the tank empty into a containment area.

The tank will be located within its own concrete containment structure (dike) designed to contain 110% of the volume of the tank. The dike is 60 feet by 12 feet and will be constructed so that the top of the dike wall is 5 feet above grade. In order to minimize the exposed surface area of any aqueous NH_3 that enters the diked area, passive evaporative controls (plastic spheres) are located in the diked area to reduce the surface area by 90%.

The following sections detail an off-site consequence analysis that was completed to ensure that in the unlikely event of a complete failure of the aqueous NH_3 tank, off-site consequences of such a release would be minimized and within safe NH_3 levels.

Aqueous Ammonia Emission Calculation

NH_3 in aqueous solution is volatile, and the accidental release of this material would result in some release of NH_3 to the ambient air. Therefore, emissions for a worst-case accidental release scenario were estimated

in accordance with USEPA's Risk Management Program Guidance for Offsite Consequence Analysis (RMP/OCA) (USEPA, 2009).

The RMP/OCA specifies guidance for calculating the release rate of solutions such as aqueous NH_3. The RMP/OCA specifies that release of the entire contents of the tank should be assumed. Therefore, this analysis assumes that 20,000 gallons of aqueous NH_3 is released into the diked area. In this case, the surface area of the NH_3 release is constrained by the dike, and further limited by the passive evaporative controls (plastic spheres). The exposed aqueous NH_3 surface area (A) is:

A = (60 feet)(12 feet)(90% reduction in surface area for plastic spheres)
A = 72 square feet

RMP/OCA Equation 3-7 is for the calculation for the NH_3 vapor release rate for a diked area smaller than the maximum pool area, as follows:

QR = (1.4)(LFA)(A)

Where: QR = Release rate (pounds per minute)
1.4 = Wind speed factor for 1.5 meters/second (RMP/OCA Guidance value)
LFA = Liquid Factor Ambient (0.015 per RMP/OCA Appendix B, Table B-3)
A = 72 square feet as calculated above

Therefore: QR = (1.4)(0.015)(72) = 1.512 lb/minute

RMP/OCA also specifies that the temperature of the released liquid must be the highest daily maximum temperature occurring in the past three years. Based on the meteorological data collected near the Project site, this highest daily maximum temperature (T) is 100°F (K).

In accordance with RMP/OCA Appendix D, Equation D-5, the temperature correction factor (TCF) is calculated as follows:

TCF = (VPT)(298)/[(VP298)(T)]

Where: TCFT = Temperature Correction Factor at temperature T
VPT = Vapor pressure at temperature T (9.34 psia at 298 K)
VP298 = Vapor pressure at 298 K (5.38 psia at 298 K)
T = Temperature (K) of released substance

Therefore: TCF = (9.34)(298)/[(5.38)(310.9 K)]
TCF = 1.664

Therefore, the release rate calculated for the analysis is:

= (1.512 lb/minute)(1.664)(60 minutes/hr) = 150.96 lb/hr = 19.02 g/sec

Off-site Consequence Analysis

The same AERMOD dispersion model used to predict Project impacts for comparison with the SILs and NAAQS was used for this analysis. Modeling was used to identify the maximum NH_3 concentration using release conditions assuming a full failure of the NH_3 storage tank. The maximum modeled concentration was compared with a health protective threshold.

The aqueous NH_3 storage tank contents will fill into the containment area, and therefore an area source was used to simulate NH_3 emissions that originate from the liquid surface within the dike. As an area

source, the release was assumed to be at ambient temperature and to be released continuously to evaluate the maximum potential concentration across the five years of meteorological data used in the AERMOD model. As described in Section 3.1.7.1, the AERMOD receptor grid includes a dense network of receptors along and adjacent to the fence line.

The concentrations of NH_3 predicted at the fence line and nearby locations were evaluated relative to the American Industrial Hygiene Association (AIHA) Emergency Response Planning Guideline Level ERPG-2, 150 ppm (104,484.7 µg/m^3). The ERPG-2 is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1-hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

The AERMOD modeling assumed the release from the complete failure of the aqueous NH_3 tank and the complete 5-year meteorological data set was used to determine the maximum potential concentration. The overall maximum modeled impact, located at a fence-line receptor, presented in **Table 3.1-18** demonstrates that the maximum predicted NH_3 concentration would be less than the ERPG threshold at all locations at or beyond the facility fence line. The maximum 1-hour concentration is predicted at a facility fence-line receptor within the ConEd complex, and therefore, there are no residences or sensitive receptors that would be subject to NH_3 concentrations approaching the ERPG threshold. **Table 3.1-18** also includes the maximum modeled concentration at a residential receptor (located along 20th Ave) which is well below the ERPG as the modeled concentrations fall off rapidly with distance from the tank. Therefore, the storage plans for aqueous NH_3 adequately minimize the potential impacts at and beyond the fence line of the Facility, even in the unlikely event of the complete failure of the aqueous NH_3 tank.

Table 3.1-18 Accidental Ammonia Release Modeling Results

Pollutant	Receptor Location	Modeled 1-hour Concentration(1) (ppm)	ERPG-2	% of ERPG-2
NH_3	Fence-line(2)	129.7	150	86%
	Residential	2.5	150	1.7%

(1) Highest value modeled over the 5-year modeling period.

(2) Location of the maximum impact over all receptors modeled.

3.1.8 Compliance Demonstration

For air permit limits and enforceable conditions, the Project and the NYSDEC must be able to show continual compliance with each limitation or requirement. The Project will ensure continuous compliance with its air permit limits through a combination of testing, monitoring, and recordkeeping, including:

- Continuous Emissions Monitoring Systems ("CEMS"), which will continuously monitor emissions of NOx, CO and CO_2;
- periodic stack testing;
- continual tracking of operating parameters;
- fuel sampling; and,
- emission factors and manufacturers' certification.

CEMS serve as direct compliance monitors, continuously tracking NOx, CO and CO_2 emissions. The CEMS will be subject to a detailed initial certification process along with daily, quarterly, and annual calibration tests, the results of which will be submitted to NYSDEC quarterly. Any exceedances of permit limits detected by the CEMS will be immediately reported to NYSDEC.

Stack tests will be performed in accordance with a testing protocol following NYSDEC approval. The protocol will describe the test methods, sampling equipment, and sampling procedures, analytical procedures, and the range of operating conditions to be sampled. NYSDEC and/or USEPA typically observe the stack testing. Following the stack test, continual compliance is documented by operating the Project within the range of conditions tested and maintaining the Project in the general condition it was in during the testing.

Project operating parameters, including fuel flow, stack O_2 level, and electrical output will be continuously tracked. These parameters, in conjunction with emission factors, can be used to calculate and continually track emissions. Natural gas will be routinely tested periodically to ensure its sulfur and heat content are consistent with those used in the emissions calculations. Each delivery of ULSD will be similarly tested. The emergency diesel generator and fire pump engines will be certified by the manufacturer to have received USEPA certification to comply with the NSPS limits incorporated in the permit.

3.1.9 Avoidance, Minimization and Mitigation of Potential Impacts

The GE 7HA.03 CTG proposed for the Project is the largest, most efficient, heavy-duty simple-cycle combustion turbine in its class producing more power with lower air emissions. Project air emissions will be further minimized as follows:

- The new CTG will be equipped with dry-low-NO_X ("DLN") burners and SCR to control NO_X emissions. In addition, water will be emulsified with ULSD to control NO_X when firing liquid fuel.
- Emissions of CO and VOC's from the CTG will be controlled with good combustion practices and an oxidation catalyst system.
- Emissions of PM, PM_{10}, and $PM_{2.5}$ will be controlled by the use of low sulfur fuels with natural gas as the primary fuel for the CTG.
- GHG emissions will be minimized by the use of a high efficiency simple cycle CTG fired with natural gas as the primary fuel, with limited firing of ULSD.
- The Project will comply with all applicable New Source Performance Standards ("NSPS") and National Emission Standards for Hazardous Air Pollutants ("NESHAP"s) (Section 3 of the air application).

The Project as modified will include natural gas handling systems and circuit breakers that use SF_6. Fugitive emissions of natural gas and SF_6 from leaks will potentially contribute to GHG emissions from the Project. Estimated Fugitive GHG emissions have conservatively been estimated at 2,708 tpy (see Appendix C of the Air Permit Application). SF_6 circuit breakers are required for high voltage transmission systems. The Project will connect with the Con Ed regional transmission system operating at 138 kilovolts ("kV") and, therefore, will require 138kV circuit breakers. The highest voltage SF_6-free circuit breaker commercially available operates at 72.5kV, well below the voltage requirement for the Project.

The other sources of fugitive emissions from the Project are potential leaks in connections in the natural gas handling system including connectors, flanges, regulators, valves, and meters. The only means of controlling these emissions would be to eliminate component leaks. However, there are no known leak-free connectors, flanges, regulators, valves, or meters commercially available to eliminate these fugitive emissions.

In order to minimize fugitive GHG emissions, the Project will implement the following:

- Implement an auditory/visual/olfactory leak detection program for the natural gas piping components.
- Equip each SF_6 containing circuit breaker with a low-pressure alarm and low pressure lockout. SF_6 emissions from each circuit breaker will be calculated annually (calendar year) in accordance with the

mass balance approach in Equation DD-1 of 40 CFR 98, Subpart DD. The maximum annual leakage rate for SF_6 will not exceed 0.5% of the total SF_6 storage capacity of the plant's circuit breakers.

- Maintain records of all measurements and reports related to the fugitive emission sources, including those related to maintenance and compliance monitoring.

Furthermore, as mitigation for direct GHG emission impacts at the Project location, Astoria will upgrade the starting system for the two P&W combustion turbines being retained for black start service. As described further in Section 3.2.4, substantial GHG emissions savings can be achieved by converting the start system for the black start P&W Twin Pac from natural gas to compressed air. The use of compressed air in the start system avoids exhausting 1.07 tons of methane on each Twin-Pac start up. As the two P&W black start combustion turbines are expected to start up once per month for testing in accordance with Con Edison's system restoration program requirements, the total savings of methane emissions will be 12.83 tons per year, or an annual savings of 1,077 tons of CO_2e.

3.2 Climate Change and Greenhouse Gas Emissions

There is a broad international scientific consensus that human activity-generated GHG emissions are increasing the concentration of GHGs in the atmosphere and leading to global climate change. While the contribution to climate change of a single project is very small, the combined GHG emissions from all human activity contributes to global climate change.

As such, statutes, regulations and policies have been, and continue to be, implemented to address GHG emissions at global, national, regional, state and local levels. Pertinent to the Project, these statutes, policies and regulations include the RGGI; New York State's Climate Leadership and Community Protection Act ("CLCPA"); regulations under the Clean Air Act; and, New York City executive orders, local laws and policies.

Consistent with the Fourth Edition of the SEQR Handbook issued March 2020, the Draft Commissioner's Policy - Assessing Energy Use (NYSDEC, 2020b) and Greenhouse Gas Emissions in Environmental Impact Statements (NYSDEC, 2009) ("GHG SEQRA Policy") and the Final Scope, this DSEIS and the *GHG Impacts of Astoria Replacement Project* analysis prepared by Navigant (A Guidehouse Company) included in **Appendix E**, identify projected GHG emissions associated with the Project; the Project's consistency with climate change laws, regulations and policies; and, practicable means to avoid and minimize GHG emissions from the Project. It also establishes that although the Project will cause GHG emissions, the Project will: (1) directly reduce overall GHG emissions by displacing GHG emissions from less-efficient fossil-fueled electric generating units; (2) facilitate the addition of renewable generation to the electric grid by providing quick start capacity needed to maintain grid reliability, thereby indirectly reducing GHG emissions; and, (3) result in significantly less GHG emissions than the Project as previously approved.

To this end, the Project will utilize an H-class CTG, which is the most efficient technology available for a comparable CTG and results in a much lower GHG emission rate than the existing Facility units and other less efficient electric generating units. While construction and operation of the Project will create GHG emissions, due to its efficiency and use of low carbon fuels, the Project will displace less efficient higher emitting electric generating sources and result in an overall reduction in GHG emissions from the electric grid. By providing quick start capacity needed to maintain grid reliability when a significant amount of intermittent generation is added to the grid, it economically facilitates the addition of large amounts of renewable generation to New York's electrical system. Moreover, since Project modifications will result in a smaller plant size (437 MWe vs 1040 MWe) and convert the Facility from intermediate duty to peaking, projected operations of the Project are considerably less than the previously approved configuration of the Project, resulting in less GHG emissions.

3.2.1 Project Consistency with GHG and Climate Change Statutes, Regulations and Policies

3.2.1.1 Federal Clean Air Act CO_2e Requirements

As discussed further in Section 3.1, the Project will meet all Clean Air Act requirements related to CO_2e. Pursuant to the Clean Air Act and NYSDEC's regulations at 6 NYCRR 231, the Project will utilize BACT for CO_2e. The Project will also be consistent with USEPA's 40 CFR Part 60, Subpart TTTT performance standard that limits CO_2e emissions from new sources.

3.2.1.2 Climate Leadership and Community Protection Act ("CLCPA")

GHG Emission Limits and Targets

The CLCPA (Chapter 106 of the Laws of 2019) and Article 75 of the Environmental Conservation Law ("ECL"), requires NYSDEC to promulgate regulations to establish a statewide GHG emissions limit for 2030 that is sixty percent of 1990 GHG emissions, and for 2050 that is fifteen percent of 1990 GHG emissions. The CLCPA requires that CO_2e emissions be calculated based on a 20-year global warming potential ("GWP") for GHGs that are not CO_2, as opposed to either the 100-year GWP used by the Intergovernmental Panel on Climate Change ("IPCC") or the GWPs required by 6 NYCRR 231-13.9 that are used for permitting . The CLCPA also amended the Public Service Law to require the Public Service Commission ("PSC" or "Commission") to establish a program to meet a target of seventy percent of statewide electrical generation from renewable sources by 2030, and a target of zero GHG emissions for statewide electrical demand by 2040. The regulations and programs to be implemented by NYSDEC and the Commission in accordance with the CLCPA are to be conducted in a manner that minimizes costs and maximizes benefits.

NYSDEC recently adopted 6 NYCRR Part 496, which limits Statewide Greenhouse Gas Emissions in 2030 and 2050 as a percentage of 1990 emissions, per the requirements of the CLCPA. As such, Part 496 limits Statewide Greenhouse Gases in 2030 to 245.87 million metric tons of CO_2e, and 61.47 tons in 2050. Part 496 also includes the 20-year global warming potentials for GHGs that are not CO_2. The rule applies to all emission sources in New York State, but does not itself impose compliance obligations. The final rule was published in the New York State Register on December 30, 2020. The Part 496 statewide emission limits will serve as the baseline for the promulgation of future NYSDEC CLCPA regulations for attainment of the 2030 and 2050 limits. NYSDEC also finalized its *Establishing a Value of Carbon Guidelines for Use by State Agencies* guidance on December 30, 2020, which is for use by State agencies to monetize benefits/costs of actions that impact GHG emissions based on societal impacts incurred as a result of climate change.

Section 7(2) of the CLCPA also requires all state agencies to consider whether its decision to issue permit(s) is inconsistent with or will interfere with the attainment of the statewide GHG emission limits established in ECL Article 75. Where such decisions are deemed to be inconsistent with or will interfere with the attainment of the statewide GHG limits, the agency must provide a detailed statement of justification as to why such limits/criteria may not be met and identify alternatives or GHG mitigation measures to be required where the project is located.

An assessment of the Project's maximum permitted and expected GHG emissions is provided in Section 3.2.2.3 in CO_2e calculated using the 20-year global warming potentials adopted in 6 NYCRR 496.5 ("GWP20").

Based on the CLCPA and Part 496 definitions of "Statewide Greenhouse Gas Emissions," the Section 3.2.2 assessment of the Project's impact on Statewide Greenhouse Gas Emissions includes: direct GHG emissions produced inside of the State; GHG emissions produced outside of the State associated with electricity imported into the State; and, extraction and transmission of fossil fuels imported into the State.

The Project is consistent with the limits, targets and goals of the CLCPA, Article 75 and Part 496 as it:

A. Immediately Results in Direct GHG Emission Reductions Through Increased Turbine Efficiency

The Project is proposing to use an H-class combustion turbine, which is the most efficient combustion turbine in its size range commercially available today. As a result, the Project will generate electricity using less fuel than many existing electric generating units in service today. Since the NYISO dispatches the bulk power system based on the next most efficient resource, the Project will displace older, less efficient generation resulting in a net reduction in direct GHG emissions.

To quantify the Project's reduction of direct GHG emissions, a comprehensive system dispatch model was developed using the new unit's dispatch modeled against expected future market conditions (see Navigant/Guidehouse GHG Report and Supplement in **Appendix E)**. Determining the impact of the Project requires the dispatch model to be run with and without the new unit. In all cases The Navigant/Guidehouse analysis assumes the existing units retire on April 30, 2023. As a result, the dispatch analysis does not include any GHG emission reductions resulting from retirement of the existing units (i.e., the baseline for the analysis does not include the existing units). Similarly, dispatch cases which include the Project assume it begins commercial operations (generating electricity for the grid) in June 2023.

The dispatch analysis forecasts the Project will result in direct CO_2 emission reductions from displacement of other electric generating units of over 72,000 and 88,000 tons annually in 2023 and 2024 when the new unit first comes online. These benefits include the impacts of GHG emissions associated with electricity imported into the State. As the NYISO system integrates a growing amount of renewable resources to achieve the CLCPA's zero-carbon energy system target, the Project's capacity factor declines thereby reducing the direct annual CO_2 benefit to 21,000 tons in 2030 and 5,000 tons in 2035. When direct non-CO_2 GHGs and upstream emissions associated with extraction and transmission of fuels are included, the direct GHG benefits of the Project are even greater; see **Table 3.2-1, Table 3.2-2** and **Table 3.2-11**.

Table 3.2-1 Annual GHG Emissions Reductions due to the Project (000 Tons)

Year	GHG Emissions Reduction (GWP20)[1][2]			Cumulative GHG Emissions Reduction (GWP20)
	Direct	Indirect		
		Increase in Renewable Generation	Upstream	
2023	72	--	32	104
2024	88	--	40	232
2025	57	--	24	314
2026	38	--	17	369
2027	40	--	18	427
2028	18	--	8	453
2029	27	--	12	492
2030	21	476	9	998
2031	15	646	7	1,666
2032	19	782	8	2,476
2033	7	979	3	3,464
2034	13	961	6	4,444
2035	5	990	2	5,441
Cumulative Total	**421**	**4,834**	**186**	**5,441**

(1) Direct - emissions reduction associated with the displacement of less efficient units, including displacement of units outside of the state associated with the generation of electricity imported into the state, by the highly efficient Project CTG which will generate electricity using less fuel.
Indirect (Increase in Renewable Generation) - emissions reduction associated with the Project allowing for an accelerated increase in renewable generation on the electric system by: providing economic backup electricity when renewable resources are unavailable and/or battery storage resources are insufficient; and, allowing a large amount of energy storage investment to be avoided and used to increase renewable generation.
Indirect (Upstream) - emissions reduction associated with decreasing upstream emissions associated with the production and transport of fuel used by the electric system to produce electricity.

(2) All values based on GWP20, as adopted in 6 NYCRR 496.

(3) Additional information, and breakdown of GHGs available in **Appendix F**, **Table 3.2-2 and Table 3.2-7**.

Although the generation output of the new unit declines over time as renewable resources are added to the electric system, and direct and upstream GHG reductions correspondingly decline, the new unit will remain a key resource in providing multiple system needs required for reliability and operability of the electric system. As a modern combustion turbine with quick start and fast ramping capability, the Project is well equipped to provide additional quick response capability to account for unexpected variations in renewable generation and additional fast ramping capability to meet future daily demand when renewable resources are unavailable (e.g., when the sun sets during evening peak load periods). The Project also will mitigate energy prices during severe weather events and provide fuel security when natural gas must be prioritized for residential and commercial heating.

B. Results in Indirect Reduction in GHG Emissions

In addition to direct reductions in GHG emissions, the Project will also be responsible for further GHG emission reductions by (1) decreasing upstream emissions associated with the production and transport of fuel used by the electric system to produce electricity, and (2) allowing for an increase in renewable generation on the electric system by providing needed backup electricity when renewable resources are unavailable or battery storage resources are insufficient.

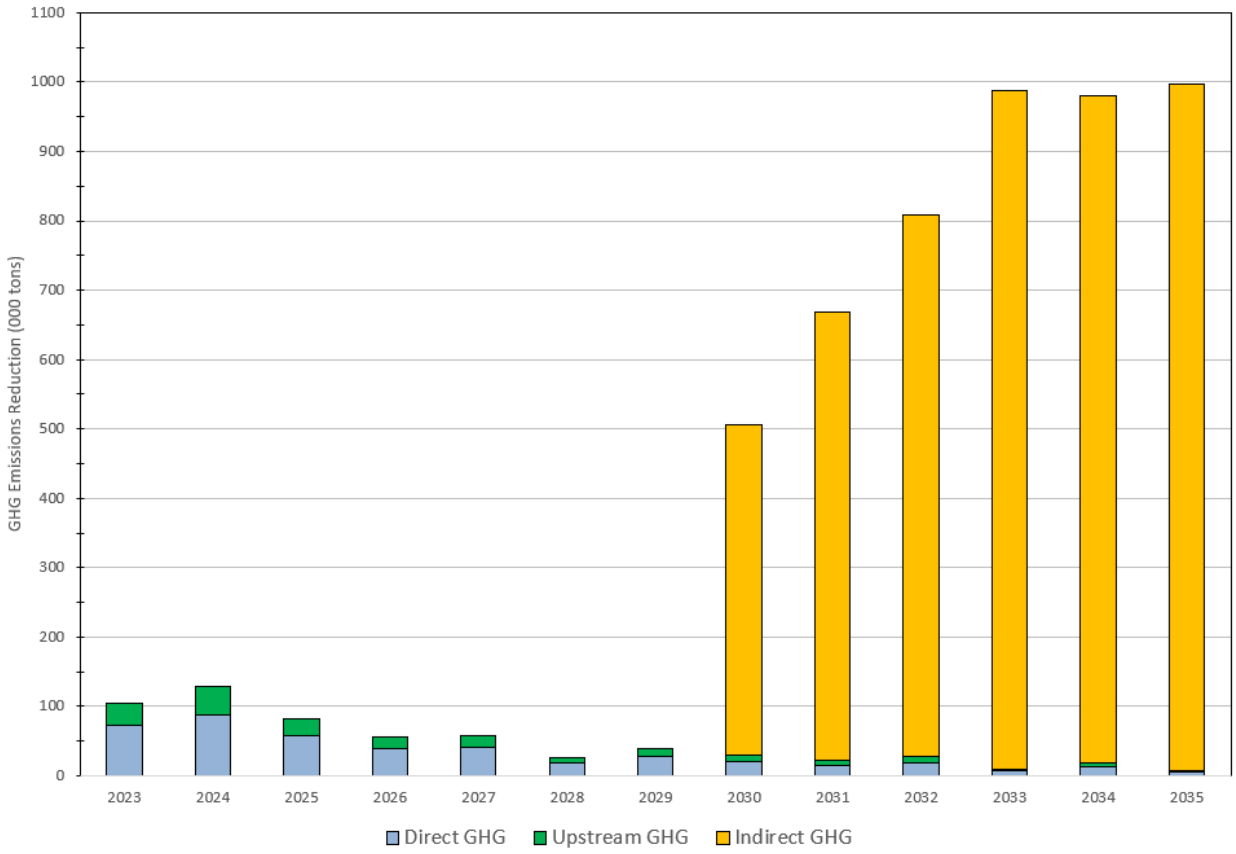
The Project's efficiency will cause a decrease in upstream emissions from the electric system by displacing generating units that are less efficient and therefore use more fuel to produce the same amount of power. The average decrease in upstream GHG emissions from the electric system caused by the Project are estimated to be 14,298 tons per year on average during the 2023-2035 timeframe (see **Table 3.2-1** and **Table 3.2-11**).

As explained above in this Section 3.2.1.2, the new unit's quick start and fast ramping ability also allows for an increase of renewable generation on the New York State and New York City electrical system by providing needed backup supply when renewable resources are unavailable and/or when battery storage resources are insufficient. In addition, as overall system decarbonization accelerates, the Project provides indirect GHG emission reductions by providing economic capacity and flexible operating capabilities to the system allowing a large amount of energy storage additions to be avoided (Section 5.2 of the Navigant/Guidehouse GHG Report, and Section 3 of the Supplement, both in **Appendix E**). The monetary savings from avoiding the storage investment can be used to both reduce costs for ratepayers and accelerate procurement of downstate renewable energy projects, which leads to large indirect GHG reductions, particularly during the 2030-2040 time period when the electrical system is rapidly transitioning to meet CLCPA targets. These indirect GHG emissions reductions from the Project during the 2030-2035 timeframe are estimated to be between 476,000-990,000 tons per year see **Table 3.2-1,** and **Figure 3.2-1**.

As further explanation, in the mid to longer-term (2030-2040), a meaningful portion of the capacity needed in New York City to backup intermittent renewable generation is expected to be provided by battery storage systems. However, an important role remains for a small amount of low emission gas-fired generation to maximize GHG reductions on the system at minimal cost – particularly during the final transition to a zero-carbon electrical system in 2040. In an electrical system with battery storage providing most or all of the needed marginal capacity, the battery storage resources will require longer duration capability to provide the same capacity value. Since longer duration battery systems are significantly more expensive, as the amount of battery storage on the system increases and the amount of natural gas generation decreases, the cost to provide reliable electric service goes up (Section 5.2.2 of the Navigant/Guidehouse GHG Report, and Section 3 of the Supplement, both included in **Appendix E**).

The ability of limited, efficient, gas-fired generation to lower system costs can be used to accelerate additional renewable resources being brought onto the system. If half of New York City's current peaking resources were replaced with battery storage, the battery storage cost would be $6,240/kW, whereas the cost for a combustion turbine to provide the same capacity value, and the backstop needed to allow increased renewables on the system, would be $1,154/kW (less than 20% of the equivalent battery storage cost). These cost savings can then be used to accelerate wind or solar resources to replace existing intermediate and baseload fossil-fuel fired electric generation, resulting in significant additional GHG emission reductions that would far outweigh the GHGs from the Project in a manner maximizing benefits and minimizing costs as required by the CLCPA (see Section 5.2.2 of the Navigant/Guidehouse GHG Report, and Section 3.2 of the Supplement, in **Appendix E**).

Figure 3.2-1 GHG Reduction Benefits of Astoria Replacement Project

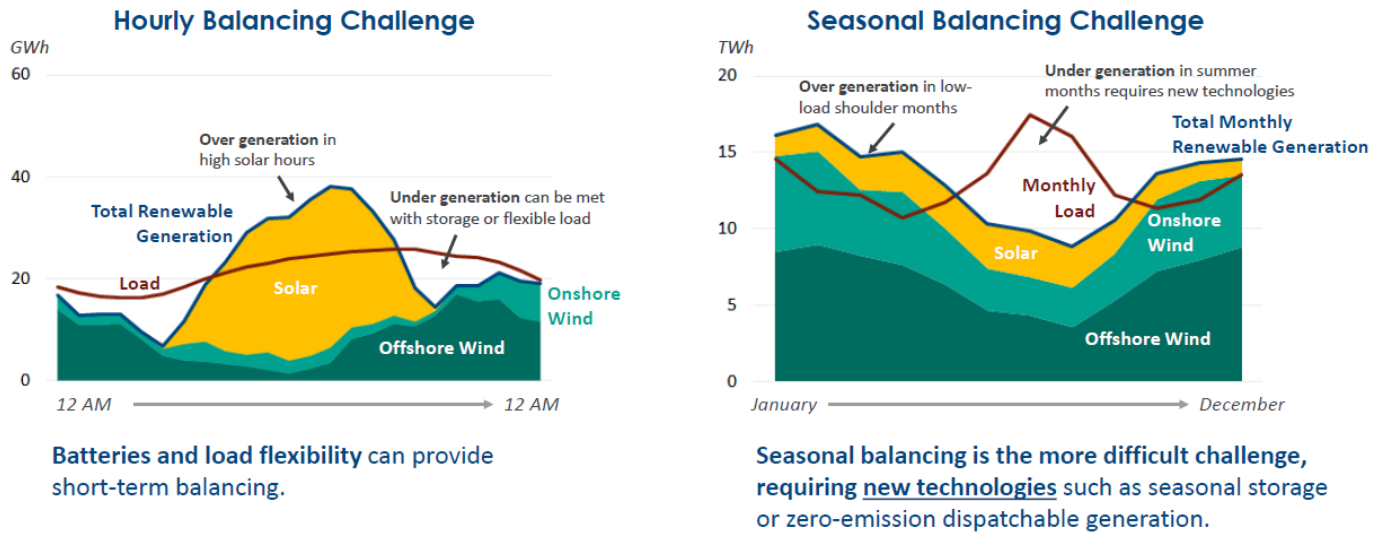


C. Facilitates the Reliable Transition to a Zero Carbon Electric Grid

The NYISO, NYSERDA and the Public Service Commission have all hired third party consultants to study the most efficient path to a zero carbon electric grid. A common conclusion from these studies is that significant amounts of dispatchable flexible generation will be required to backup intermittent renewable energy to ensure the reliability of the future electric grid. For instance, in June 2020 the Brattle Group issued a report entitled "New York's Evolution to a Zero Emission Power System"[51] which includes **Figure 3.2-2** describing why balancing supply and load will be challenging.

[51] https://www.nyiso.com/documents/20142/13245925/Brattle%20New%20York%20Electric%20Grid%20Evolution%20Study%20-%20June%202020.pdf/69397029-ffed-6fa9-cff8-c49240eb6f9d

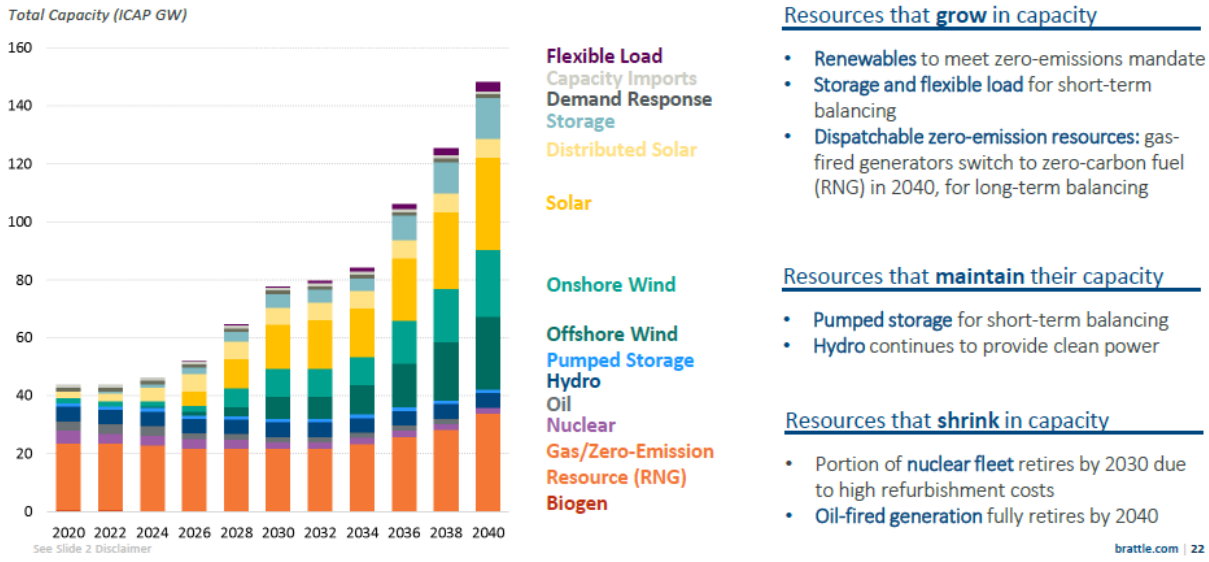
Figure 3.2-2 Challenges Balancing Supply and Load



Sources and Notes: Illustrative examples. Load data is from NYISO's 2020 "High Electrification" CLCPA Load Case forecast. Generation capacities in both examples set such that total renewable generation over the period matches load. Left: Forecast for 8/19/2020; capacity of 63 GW assumed of each renewable type. Right: Capacity of 22 GW assumed for each type.

As indicated, battery storage and demand response can provide short-term balancing, but seasonal balancing is more difficult, cannot be met with battery storage and requires new technologies such as zero emission dispatchable generation. Next Brattle specifically looked at how New York's resource mix needs to change over the next 20 years. As depicted in **Figure 3.2-3**[52], gas fired generating resources not only remains an important component of New York's generating fleet over the next 20 years, but actually grow in size to provide long-term balancing services for intermittent renewables before switching to zero carbon fuel in 2040.

Figure 3.2-3 Evolution of New York's Generation Fleet



[52] *Id.*

Similarly, the Analysis Group's September 2020 report entitled "Climate Change Impact Phase II" (Analysis Group, 2020) assesses power system reliability in 2040. Step one in that analysis was establishing the necessary resources to maintain a reliable electric system while meeting the requirements of the CLCPA.

As can be seen in **Figure 3.2-4** (Table ES-1; Analysis Group, 2020), the report concludes New York will require over 32 GW of dispatchable zero emission resources in 2040 as compared to just over 23 GW of existing dispatchable gas fired resources today (NYISO 2020a). Which means even if every existing dispatchable gas-fired unit in the New York Control Area continued operating until 2040 and then switched over to a zero-carbon renewable fuel, the system would still need another 8,000 MW of dispatchable zero emission resources to remain reliable. These dispatchable resources are needed in addition to more than 15 GW of energy storage new build.

Figure 3.2-4 Generation Capacity and Storage

Table ES-1: Generation Capacity, CLCPA Resource Set

Nameplate Capacity by Zone, MW	A	B	C	D	E	F	G	H	I	J	K	Total
Land-based Wind	10,815.9	1,566.9	7,726.2	7,774.5	7,316.4	-	-	-	-	-	-	35,200.0
Offshore Wind	-	-	-	-	-	-	-	-	-	14,957.8	6,105.2	21,063.0
Solar (Behind-the-meter)	1,408.5	436.4	1,192.8	138.2	1,345.5	1,653.4	1,367.3	121.2	179.4	1,343.1	1,692.2	10,877.8
Solar (Grid Connected)	11,496.0	1,312.0	7,170.0	-	4,536.0	9,322.0	5,272.0	-	-	-	154.0	39,262.0
Hydro Pondage	2,675.0	-	-	856.0	-	-	41.6	-	-	-	-	3,572.6
Hydro Pumped Storage	-	-	-	-	-	1,170.0	-	-	-	-	-	1,170.0
Hydro Run-of-River	4.7	63.7	70.4	58.8	376.2	282.5	57.1	-	-	-	-	913.4
Nuclear	-	581.7	2,782.5	-	-	-	-	-	-	-	-	3,364.2
Imports	-	-	-	1,500.0	-	-	-	-	-	1,310.0	-	2,810.0
Storage	4,232.0	20.0	3,160.0	4,168.0	2,296.0	292.0	84.0	-	-	1,096.0	252.0	15,600.0
Price Responsive Demand (Summer)	949.9	205.2	510.1	357.7	211.1	433.9	246.3	58.6	134.9	1,940.8	187.6	5,236.0
Price Responsive Demand (Winter)	619.0	133.7	332.4	233.1	137.5	282.7	160.5	38.2	87.9	1,264.7	122.3	3,412.0
DE Resources	465.4	674.2	1,513.4	370.0	312.7	3,390.4	6,887.2	79.8	-	11,848.1	6,595.4	32,136.6

As an efficient quick start, fast ramping standby/backup generator that is expected to be able to convert to renewable fuel in the future, the Project is exactly the kind of resource these studies conclude is needed to safely, reliably, efficiently and economically support New York's transition to a zero carbon electric grid - fully consistent with the limits, targets and goals of the CLCPA.

D. Incorporates Energy Storage

The Replacement Project includes the proposed addition of an approximately 24 MWe BESS, which would ultimately replace the remaining P&W combustion turbines enabling black start capability for the site. The use of BESS to provide black start capability will result in GHG reductions from the shutdown of the aging, natural gas/ULSK fired P&W turbines in the amount of an additional 1,559 tons per year.

The Project will also preserve the Site, including its valuable Zone J electrical interconnections, for future additional stand-alone battery energy storage capacity[53].

Summary of Project's Consistency with the Limits, Targets, and Goals of the CLCPA

In summary, the Project is consistent with the limits, targets, and goals of the CLCPA and will play a key role in New York meeting the GHG reduction standards established by the CLCPA, ECL Article 75 and Part 496. These statements are based on the Project:

[53] NRG has already initiated early development efforts for an onsite 79.9 MW stand alone battery storage system (Q830 in NYISO's electric interconnection queue). In addition, the Applicant notes it has sponsored a 1.5 MW mobile battery storage demonstration project in partnership with Con Edison on the Site as part of New York's Restoring the Energy Vision ("REV") initiative. The project, known as Storage on Demand, is currently under construction and expected to be operational by summer 2021.

- Replacing 24 50-year-old operating P&W CTGs with a new, more efficient, state-of-the-art simple cycle dual-fuel CTG, resulting in annual reductions in direct and upstream GHG emissions from displacement of other less efficient electrical generating units;
- Facilitating further indirect GHG emission reductions due to its quick start and fast ramping capability, which allows additional renewable generation to be reliably interconnected to the New York bulk power system by providing needed electricity when intermittent resources are unavailable and/or when battery storage resources are insufficient;
- Minimizing the cost of reducing GHG emissions in New York City by supplying high value capacity in Zone J at less than 20 percent of the cost if marginal capacity were to be provided by battery storage systems alone, particularly during the 2030-2040 time period when the electrical system is rapidly transitioning to meet CLCPA targets;
- Incorporating energy storage technology at the site, with the attendant reduction in GHGs, through the proposed use of an approximately 24 MWe BESS for black start capability, which ultimately are proposed to replace two P&W combustion turbines currently using natural gas and fuel oil; and
- Preserving the site and its valuable electrical interconnections in Zone J for additional stand-alone energy storage applications in the future.

The Project is part of a cost-effective path for New York to meet the CLCPA and Part 496 GHG emission reduction requirements and the CLCPA's targets to increase renewable generation and achieve a zero GHG emission New York electrical system, while maintaining reliability. In the near-term, the Project will add an efficient, low-emitting resource to the New York electrical system, resulting in a reduction of direct GHG emissions and a reduction in upstream GHG emissions. In the mid to longer term (2030-2040), as other renewable resources are added to the system, maintaining efficient low capacity factor dual fuel generation in New York City is important to minimize system cost as technology develops to reach the ultimate CLCPA targets and to allow for renewables to be added to the system in a cost effective manner. The Project is best suited to fill this role and is forecasted to cause a combined direct, upstream and indirect reduction in GHG emissions through 2035[54] of over 5,000,000 tons (see **Table 3.2-1** and **Figure 3.2-1**).The Project's 2030 and 2050 GHG emissions summarized in **Table 3.2-2** are consistent with, and will not interfere with the attainment of, the CLCPA, ECL Article 75 and 6 NYCRR Part 496 GHG reduction requirements. In fact, the Project will assist the State in meeting the CLCPA emission reduction requirements. In 2030 alone, the Project will cause a direct reduction in Statewide Greenhouse Gas Emissions of 21,000 tons of CO_2e, 9,000 tons of CO_2e upstream, and an indirect reduction of 476,000 tons CO_2e due to the Project being able to facilitate additional renewables to come on-line. From 2023-2030 the total cumulative Statewide Greenhouse Gas Emission reductions from the Project are projected to be 998,000 tons, as follows: 362,000 tons (direct); 160,000 tons (upstream); and, 476,000 tons (indirect based on the renewable resources that the Project would allow to come onto the system). These reductions in Statewide Greenhouse Gas Emissions from the Project are consistent with the CLCPA, ECL Article 75 and Part 496 requirement that the State reduce Statewide Greenhouse Gas emissions by 40% from 1990 levels by 2030. In 2050, it is assumed that the Project combustion turbine will either have transitioned to a zero-carbon fuel or will have shut down subject to the CLCPA provisions regarding safe and adequate electric service.[55]

The CLCPA and Section 66-p of the Public Service Law ("PSL") also require the PSC to establish a program that requires: an increase in renewables to 70% in 2030; and, the Statewide electricity demand system to meet a zero-emissions target in 2040. Although the program has not been fully developed by the PSC yet, the Project is consistent with the CLCPA and Section 66-p, since the Project will facilitate the addition of renewable generation to the electric system, and the combustion turbine will either transition to a zero

[54] While the Navigant report only analyzed GHG emission reductions attributable to the Project through 2035, additional GHG emission reductions would continue through 2040.

[55] The PSC is required by CLCPA, and PSL 66-P(2) to establish a program that requires a zero-emission statewide electrical system by 2040, by June 30, 2021 unless PSC determines that the target needs to be modified based on considerations included in PSL Section 66-p . This program has not yet been established.

carbon fuel, or stop operating by 2040 subject to the CLCPA provisions regarding safe and adequate electric service.

A summary of the Project's GHG emissions, and the emission reductions that the Project will cause, are included in **Table 3.2-2.**

Table 3.2-2 Project GHG Emissions in 2030 and 2050 (GWP20)

Type and Source of Emissions		2030 Emissions GHG/CO_2e	Cumulative 2023-2030 GHG/CO_2e	Cumulative 2023-2039 GHG/CO_2e	2050 Emissions GHG/CO_2e
Direct Emissions (tons)	Emissions from replacement generation that would be required without the Project	75,021	1,379,555	1,722,797	0
	Project Emissions	(-) 53,982	(-) 1,017,472	(-) 1,267,811	0
	Direct Emissions Reductions	**= 21,039**	**= 362,083**	**= 454,986**	Note (4)
Upstream Emissions (tons)	Emissions from replacement generation that would be required without the Project	33,872	628,484	786,275	0
	Project Emissions	(-) 24,840	(-) 468,268	(-) 583,437	0
	Upstream Emissions Reductions	**= 9,032**	**= 160,215**	**= 202,838**	Note (4)
Indirect Emissions (tons)	**Indirect Emissions Reductions** From the Project facilitating renewables being added to the system	**476,000**	**476,000**	**8,740,667**	Note (4)
Total Emissions Reductions (tons) = Direct + Upstream + Indirect		**506,072**	**998,299**	**9,398,490**	Note (4)

(1) Basis for calculations provided in **Appendix F**.

(2) Based on Navigant/Guidehouse dispatch study, 2.5% estimated capacity factor 2030.

(3) Upstream emissions from the extraction, processing, and delivery of natural gas and ULSD.

(4) In 2040, it is assumed that the Project combustion turbine will either have transitioned to a zero-emission fuel or will have shut down subject to the CLCPA provisions regarding safe and adequate electric service. This is why cumulative emissions reductions are not shown through 2050.

Future Physical Climate Risk

Section 17-B of the CLCPA requires applicants for specific permits, including Title V permits, to demonstrate that future physical climate risk has been considered. Future physical climate risk includes sea-level rise, storm surge and flooding due to the projected impacts of climate change. As discussed further in Section 3.2.3 and Section 3.4.2, future physical climate risk was considered and the Project's design avoids, minimizes and mitigates these risks.

The Project has been designed to be consistent with the relevant sea-level rise projections in Part 490 of Title 6 of the New York Code of Rules and Regulations and the 2018 Draft New York State Flood Risk Management Guidance for the Implementation of the Community Risk and Resiliency Act ("2018 Guidance"). The 2018 Guidance is used to determine suitable locations for construction of a proposed structure, given future physical climate risks associated with sea-level rise, storm surge and flooding. The 2018 Guidance provides recommended design elevations taking into account these risks. The Project was designed consistent with the 2018 Guidance recommendations.

Disadvantaged Communities

The CLCPA seeks to ensure that disadvantaged communities are not disproportionately burdened. One of the components of the CLCPA, therefore, is the identification of disadvantaged communities. Section 75-0101 defines disadvantaged communities as "communities that bear burdens of negative public health effects, environmental pollution, impacts of climate change, and possess certain socioeconomic criteria, or comprise high-concentrations of low- and moderate- income households, as identified pursuant to section 75-0111 of this article."

The CLCPA directs New York State's Climate Justice Working Group ("CJWG") to establish criteria for defining disadvantaged communities. While this process is ongoing, until new criteria are established, New York State has identified interim criteria for disadvantaged communities[56], which includes communities:

- Located within census block groups that meet the Housing and Urban Development ("HUD") 50% Area Median Income ("AMI") threshold[57], that are also located within the DEC PEJAs; and,
- Located within New York State Opportunity Zones[58].

The following census block groups located in Queens County within one mile of the Project site[59] meet the interim criteria for disadvantaged communities: 103-4, 113-1, 113-2, 113-3, and 105-1. **Figure 3.2-5** shows the CLCPA interim disadvantaged communities located within the one-mile study area (i.e., those areas meeting one or both of the criteria listed above).

[56] As listed on NYSERDA's website https://www.nyserda.ny.gov/ny/disadvantaged-communities.

[57] Top quartile of census block groups in New York, ranked by the percentage of LMI Households in each census block. LMI Households are defined as households with annual incomes at or below 50% of the Area Median Income of the County or Metro area where the Census Block Group resides.

[58] A low-income census tract with an individual poverty rate of at least 20% and median family income no greater than 80% of the area median. New York State is participating in the new Opportunity Zone community development program, offered through the Tax Cuts and Job Acts of 2017. The federal program encourages private investment in low-income urban and rural communities. Based on analyses by Empire State Development ("ESD"), New York State Homes and Community Renewal ("HCR"), New York State Department of State ("DOS") and the state's Regional Economic Development Councils ("REDC"s), New York State has recommended 514 census tracts to the U.S. Department of the Treasury for designation as Opportunity Zones.

[59] Refer to Section 3.3.5 for a discussion of the one-mile radius study area.

Figure 3.2-5 CLCPA Disadvantaged Areas Located within One Mile Study Area

A comparison of the CLCPA interim disadvantaged communities shown in **Figure 3.2-5** with the updated PEJA shown in **Figure 3.3-3** shows general agreement in the areas covered by each program. As such, the Applicant's EJ analysis fulfills the disadvantaged communities' component of the CLCPA. The EJ analysis is included in Section 3.3 and establishes that the Project will not disproportionately burden disadvantaged communities.

Potential for the Project to Use a Renewable Fuel in the Future[60]

Astoria is specifically not relying on a transition to a renewable fuel to demonstrate consistency with the CLCPA as the Project is already consistent due to its resultant reductions in statewide GHG emissions. However, due to anticipated advances in technology, the Project is well positioned to use zero-carbon renewable hydrogen ("green hydrogen") instead of natural gas by 2040.[61] Renewable energy from wind and solar resources can be used to create carbon-free hydrogen (a.k.a. "green hydrogen") through electrolysis (i.e., splitting water into hydrogen and oxygen).[62] The primary benefit of green hydrogen is that it can be used as fuel to produce electricity when needed, without any associated onsite or upstream GHG emissions.

The feasibility of the Project transitioning to green hydrogen fuel in the future requires an analysis of: (i) the ability of the power generation equipment to successfully operate on hydrogen fuel, (ii) the ability to deliver hydrogen fuel to the Project site and (iii) the capability of renewable energy resources to economically produce adequate quantities of hydrogen fuel to operate the Project.

Power Generation using Green Hydrogen

General Electric ("GE"), the Project's turbine supplier, is a world leader in gas turbine operation on fuels that contain hydrogen. The GE fleet includes 25 existing gas turbines that have operated on fuels with at least a 50 percent hydrogen blend.[63] These turbines have already accumulated over one million operating hours of experience.[64] As confirmed by GE, the Project's Frame 7HA.03 combustion turbine already has the ability to operate on hydrogen fuel.[65] A letter from GE, included as **Appendix L**, outlines three stages of technology development for the Project's Frame 7HA.03 combustion turbine to be able to operate on 100% hydrogen fuel.

Stage 1 enables hydrogen capability of up to a 10 percent blend with natural gas. Such operation is possible today with the addition of a hydrogen fuel blending skid.

Stage 2 enables hydrogen capability of up to a 50 percent blend with natural gas. Such operation is also possible today with the addition of a fuel blending skid, increased fuel piping sizes, and upgrades to materials and control systems.

Stage 3 enables 100 percent hydrogen capability. While operation above a 50 percent hydrogen blend is not possible today, GE has identified a technical path forward over the next 15 to 20 years to develop a combustion system for the 7HA.03 turbine enabling the use of 100 percent hydrogen

[60] It should be noted the Project is not seeking a permit to operate on hydrogen fuel at this time. It is expected that such future operation will require permit modifications.

[61] If the Project does not transition to a zero-carbon fuel by 2040, then it will comply with the CLCPA by ceasing operation subject to the statute's provisions regarding safe and adequate electric service.

[62] Bulk power systems with high penetration rates of renewable resources are forecast to have periods of time when total renewable generation exceeds system load. Creating hydrogen fuel during these periods would avoid the need to turn off (curtail) renewable energy maximizing carbon benefits to the system. See "Power to gas: addressing renewable curtailment by converting to hydrogen", September 2018, Frontiers in Energy; (https://www.researchgate.net/publication/327848474_Power_to_gas_addressing_renewable_curtailment_by_converting_to_hydrogen)

[63] Fuel blends are on a percent volume basis

[64] Power to Gas: Hydrogen for Power Generation GEA33861 at pg 13. Hydrogen for Power Generation Whitepaper

[65] Appendix L – GE Letter dated February 2, 2021.

fuel. That path is expected to include an upgraded combustion system with new fuel nozzles, advanced materials, premix cooling system and associated control system modifications.

Delivering Green Hydrogen to the Site

The majority of today's hydrogen is produced and consumed on the same site. Given green hydrogen will likely be produced close to large renewable energy systems, none of which are expected to be located within New York City, green hydrogen fuel will need to be transported to the Site.

Given the quantity of hydrogen required to operate the Project (12.47 $MMft^3$) and the need to eliminate all upstream GHG emissions in a future zero-carbon electric system, it is assumed the best way to transport green hydrogen to the Site would be the use of the existing natural gas pipeline network (upgraded as necessary for hydrogen fuel). This approach requires the necessary gas compression to deliver the hydrogen fuel to the Site to also be powered by green hydrogen.

Hydrogen can be distributed by pipelines in either its pure form or blended with natural gas. There are currently only about 1,600 miles of pipelines dedicated to hydrogen only use in the United States, most of which are located near large petroleum refineries and chemical plants in Illinois, California, and the Gulf Coast. There are none currently located in or proposed for New York State. However, research suggests that existing natural gas pipelines can also transport hydrogen in blends up to 10 to 20% without requiring any major modifications.

As of June 2019, there were 37 demonstration projects actively examining hydrogen blending in the natural gas pipeline system.[66] The highest concentration of hydrogen reported by any gas utility in the United States is in Oahu where Hawaii's natural gas pipeline contains approximately 12% hydrogen gas. More recently, Enbridge Gas announced a $5.2 million project in Ontario Canada which will blend green hydrogen into their existing gas network resulting in a reduction in GHG emissions.[67] Over the past two years, Enbridge has been converting excess energy from renewable sources into hydrogen gas using electrolysis. This green hydrogen will now be blended into Enbridge's gas distribution system for service to end use customers. In the United Kingdom, National Grid reports achieving a 20 percent blend of hydrogen and natural gas in their distribution network, which serves gas fired appliances in customer homes with no noticeable difference in performance.[68]

Clearly, progress is being made world-wide on adapting existing natural gas pipeline systems to a delivery mechanism for hydrogen.

Producing Adequate Quantities of Green Hydrogen

The GHG emission reduction benefits from the use of hydrogen are only achieved if the fuel is produced using renewable energy (green hydrogen). Uses of other forms of hydrogen could actually increase GHG emissions due to the lower overall efficiency in producing electricity. Renewable energy from wind, solar and hydro-electric resources can be used to create carbon-free hydrogen through a process known as electrolysis. Electrolysis involves splitting water into its fundamental components of hydrogen and oxygen.

As identified above, the Project would require approximately 12.47 $MMft^3$ of green hydrogen for full load operation. Based on current electrolysis technology, the amount of renewable energy required to produce the necessary quantity of fuel would be 1,825 MWh (see **Appendix L**). Due to the addition of large amounts of renewable energy in New York by 2040, the Project's expected annual capacity factor drops to 2.2 percent. Assuming an electrolysis system is installed in upstate New York to take advantage of large amounts of

[66] The Future of Hydrogen June 2019 prepared by the International Energy Agency (IEA) for the G20 Summit in Japan (the "IEA Report") at pg 73.

[67] Groundbreaking $5.2M hydrogen blending project aims to green Ontario's natural gas grid - Enbridge Inc.

[68] Green Hydrogen in Natural Gas Pipelines: Decarbonization Solution or Pipe Dream? | Greentech Media November 30, 2020.

expected land based wind development, then only 154 MW of wind energy would be needed for the electrolysis system to produce sufficient green hydrogen to operate the Project for the full year.[69]

Additionally, the global research and consulting firm Wood MacKenzie firmly believes there will be some form of low-carbon "hydrogen economy" in the future. "We believe that given the degree of explicit policy, corporate and social support that has blossomed in 2020, green hydrogen will be able to successfully scale and realize production cost declines of up to 64% by 2040."[70]

Given many of the world's leading countries have initiated efforts to develop a hydrogen economy[71], Astoria believes it will be technically and economically feasible that green hydrogen can be produced for, transported to and used at the Project Site by 2040.

Renewable Natural Gas ("RNG")[72]

A number of recent third party consulting reports point to the possibility of dispatchable natural gas fired generation in New York converting to the use of RNG in 2040 to continue providing long-term long duration backup service to intermittent renewable energy sources (i.e., wind and solar).[73] For the purposes of this discussion, RNG is defined as a pipeline quality gas derived from biomass or other renewable resources that is fully interchangeable with conventional natural gas.[74]

RNG does not result in zero onsite GHG emissions. As RNG is methane and fully interchangeable with conventional natural gas, onsite GHG emissions would remain the same whether the Project is operating on RNG or conventional natural gas. However, RNG may in the future be considered a carbon neutral fuel since it avoids greenhouse gas emissions that otherwise would occur from typical waste management practices (e.g., methane emissions from landfills, animal manure and food waste).

While the Climate Action Council has initiated discussions on RNG, it remains unclear if its use will be determined to be a zero-carbon fuel under the CLCPA. Since RNG is fully interchangeable with conventional natural gas, to the extent its use is ultimately considered compliant with a zero-carbon electric grid, then the Project will already have the capability to fully operate using the fuel.

Relative to the anticipated adequacy of supply, an American Gas Foundation ("AGF") Study estimates between 1,660 and 3,780 trillion Btu ("tBtu") of RNG can be produced annually for pipeline injection by 2040.[75] Just within New York State alone, RNG supply sources are estimated to produce between 53 and 105 tBtu/year in 2040.[76] Since the expected heat input to the Project in 2040 is less than 1 tBtu/year, it can be concluded that the potential supply of RNG would be adequate to support operation of the Project by that time.[77]

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[69] Based on a 26 percent capacity factor for land based wind resources in upstate NY see NYISO Report: NY Renewables – Overview and YTD Operation at Slide 7 Slide 1 (nyiso.com).

[70] *Hydrogen Production Costs: Is a Tipping Point Near?* Wood Mackenzie https://www.woodmac.com/our-expertise/focus/transition/hydrogen-production-costs-to-2040-is-a-tipping-point-on-the-horizon/

[71] IEA Report Table 1 at pg 21.

[72] At NYSDEC's request, a discussion of the Project's ability to operate on Renewable Natural Gas ("RNG") has also been included.

[73] E3 Study at pg 45, Brattle Study at slides 15 and 22, and Zero Emission Study at pg E-11.

[74]The American Gas Foundation defines RNG as "Pipeline compatible gaseous fuel derived from biogenic or other renewable sources that has lower lifecycle carbon dioxide equivalent (CO2-eq) emissions than natural gas." *Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment*, an American Gas Foundation study prepared by ICF – December 2019 (the "AGF Study at pg 1) https://gasfoundation.org/2019/12/18/renewable-sources-of-natural-gas/

[75] Ibid at pg 2

[76] Ibid at Appendix A.

[77] The expected heat input assumes the Project would operate at a 2.2% capacity factor in 2040 consistent with most third party studies, including the Guidehouse GHG Study.

While RNG is not currently available at the Project site to use in place of conventional natural gas, if the supply and delivery of the fuel to the Site become available in the future, then the Project will be fully capable of utilizing RNG in place of conventional natural gas.

Although the Project is expected to be capable of transitioning to a zero-emission fuel in the future, the Project as proposed is already consistent with the CLCPA. Therefore, a possible transition to green hydrogen or other renewable and/or zero-emission fuel is not being relied upon to show that the Project is consistent with, and will not interfere with the attainment of, the Statewide GHG Emission limits established in the CLCPA, ECL Article 75, or Part 496. If hydrogen or another zero-emission fuel is not feasible in the future, then, subject to the CLCPA provisions regarding safe and adequate electric service, the Project will stop operating in 2040 to meet the CLCPA targets.

3.2.1.3 Value of Carbon

The CLCPA directed NYSDEC to establish a value of carbon for use by State agencies. NYSDEC finalized its *Establishing a Value of Carbon Guidelines for Use by State Agencies* ("Value of Carbon Guidance") on December 30, 2020. The Value of Carbon Guidance uses a damages-based approach. The damages approach provides a monetary estimate of the impacts on society from activities that impact GHG emissions. A damages-based value of carbon puts the effects of climate change into economic terms to help decisionmakers understand the economic impacts of decisions that would increase or decrease emissions. At the request of NYSDEC, Astoria followed the approach outlined in the Value of Carbon Guidance for all net GHG emission impacts from the Project using a central discount rate of 2% (reported alongside 1% and 3% discount rates) to estimate the Project's benefits.

Based on the GHG emission reductions that will result from the Project (see **Table 3.2-1**), the Value of Carbon Guidance assessment shows a significant societal benefit from the Project ranging from 3.3 billion to 21.4 billion dollars over the 17-year operating period through 2039. **Table 3.2-3** provides a summary of the Project's 17-year (from 2023-2039) cumulative GHG reduction benefit based on 1%, 2% and 3% discount rates.

Table 3.2-3 Project GHG Net Benefit and Net Present Value

	GHG Reduction Benefit, $, thousands(1)		
17-year Cumulative Benefit	**3% discount rate**	**2% discount rate**	**1% discount rate**
CO_2	$3,292,736	$7,056,093	$21,299,432
CH_4	$33,158	$55,689	$119,690
N_2O	$543	$1,175	$3,428
Total GHG Benefit (2023-2039)	**$3,326,437**	**$7,112,956**	**$21,422,550**
Net Present Value (2021)	**$2,481,363**	**$5,933,561**	**$19,720,009**

(1) Basis for calculation in **Appendix F**. Note that for the purposes of these calculations, Project fugitive emissions were assumed to be zero as the equipment is not designed, or expected, to leak. Even if the leak assumptions used to calculate maximum permitted emissions were included, the impact on the value of carbon calculation would be minor and the benefits of the Project would remain significant.

3.2.1.4 Community Risk and Resiliency Act ("CRRA")

The CRRA requires applicants for some State permits to consider future physical climate risk due to sea-level rise, storm surge, and flooding. As discussed further in Section 3.2.3 and Section 3.4.2, the Project's future physical climate risk was considered, and the Project design avoids, minimizes and mitigates future physical climate risk consistent with Part 490 of Title 6 of the New York Code of Rules and Regulations and the 2018 Draft New York State Flood Risk Management Guidance for the Implementation of the Community Risk and Resiliency Act.

3.2.1.5 Regional Greenhouse Gas Initiative (6 NYCRR 242 – CO_2 Budget Trading Program)

RGGI is a multi-state CO_2 cap-and-trade program, which is implemented by New York pursuant to 6 NYCRR 242. RGGI applies to all fossil-fuel electric generating units with a nameplate capacity of 25 MW or more and requires applicable sources to obtain allowances sufficient to cover all of the CO_2 emissions from the electric generating unit. The proposed CTG will be subject to the requirements of RGGI, and the Applicant will purchase allowances to cover all CO_2 emissions from the new CTG.

3.2.1.6 CO_2 Performance Standards for Major Electric Generating Facilities (6 NYCRR 251)

6 NYCRR Part 251 applies to new or modified major electric generating facilities of 25 megawatts or more that commence construction after July 12, 2012. Therefore, Part 251 applies to the Project's CTG. Based on the maximum operation of the unit included in the Title V Modification Application (1,900 hours/year firing natural gas, 720 hours/year firing ULSD), the annualized CO_2e emission rate will be approximately 130 lb/MMBtu, which is well below the applicable Part 251 limit of 160 lb/MMBtu for simple cycle combustion turbines.

3.2.1.7 Executive Order 52 ("EO-52") – Statement of Administration Against Addition of Infrastructure that Expands the Supply of Fossil Fuels in New York City

EO-52 sets forth New York City's policy opposing the addition of infrastructure that expands the supply of fossil fuels. EO-52 does not prohibit replacement facilities like the Project. In particular, EO-52 states:

> "… the City will not support the ***addition*** of infrastructure within its energy shed that ***expands*** the supply of fossil fuels via pipelines or terminals for the transfer of fossil fuels or via construction of ***new*** fossil-fuel-based electric generating capacity."
>
> "In implementing this Executive Order, all agency heads are directed to … take into account potential ***economic impacts*** …" (emphasis added)

The Project is deemed to be consistent with EO-52 for the following reasons:

1. It does not result in the addition of any fossil-fuel-based electric generating capacity in New York City; instead it replaces the existing 502 MWe (summer rating of the existing turbines) at the Site with 437 MWe (summer rating of the replacement turbine);
2. It does not require the expansion of any fossil fuel supply; instead it uses existing natural gas pipelines and liquid fuel terminals without modification. Moreover, due to the increased efficiency of the new turbine, the Project actually results in a decrease in overall fossil fuel use;
3. It does not create any new fossil-fuel-based electric generating capability; instead it replaces old equipment with a net decrease in capability; and
4. It will have a positive economic impact by lowering electricity prices for New York City electricity customers (see Ratepayer Benefits in Section 1.4.2.2).

In summary, because the proposed Project uses existing supply infrastructure in support of replacing old electric generating units with smaller net electric generating capability, while lowering costs for New York City consumers, it is consistent with EO-52.

3.2.1.8 Local Law 97, 2019

On April 18, 2019, the New York City Council passed the Climate Mobilization Act. One piece of this is Local Law 97, which mandates reductions in citywide greenhouse gas emissions. Codified in Section 24-803(a)(1) of the NYC Administrative Code, Local Law 97 requires that:

> There shall be, at minimum, a 40 percent reduction in citywide emissions by calendar year 2030, and an 80 percent reduction in citywide emissions by calendar year 2050, relative to such emissions for the base year for citywide emissions.

These reduction goals enacted by Local Law 97 are to be "achieved through the applicable policies, programs and actions included in PlaNYC, the long-term sustainability plan developed and updated pursuant to section twenty of the New York city charter, and any additional policies, programs and actions to reduce greenhouse gas emissions that contribute to global warming." NYC Code, Section 24-803(a)(2).

Local Law 97 also requires substantial reductions in greenhouse gas emissions from city government operation and contains building emissions and energy conservation requirements.

As discussed further in Section 3.2.1.2, and shown in **Table 3.2-1** and **Table 3.2-2**, the Project will cause both direct and indirect reductions in greenhouse gas emissions by displacing higher emitting less efficient electric generating units while providing a firm capacity resource that facilitates the addition of renewables to the electric system. The Project is forecasted to cause a cumulative direct, upstream and indirect reduction in GHG emissions through 2035 of over 5,000,000 tons. Such reductions are consistent with the reductions required by Local Law 97.

3.2.1.9 OneNYC 2050

The relevant goals of the OneNYC Plan, released in April 2015 as the successor document to PlaNYC and updated in April 2019, include the reduction of air pollution and GHGs, and the achievement of carbon neutrality by 2050 and 100% electricity from clean sources by 2040. As further discussed in Section 1.2.6.3, and the Navigant/Guidehouse GHG Report included as **Appendix E**, the Project is consistent with these 2019 OneNYC 2050 Plan goals. By displacing other higher emitting electric generating sources, the Project will also result in a net improvement to air quality by reducing conventional air pollutants, including $PM_{2.5}$.

In the near term (2023-2035), the Project will cause a cumulative direct GHG emission reduction of 421,000 tons by displacing older, less efficient, and higher emitting generation resources. Because the Project is more efficient, it will also cause a cumulative decrease in upstream emissions from the electric system of 186,000 tons during the 2023-2035 timeframe. During this timeframe, the Project will also indirectly reduce GHG emissions due to the new unit's quick start and fast ramping ability, which allows for an increase of renewable generation on the New York State and New York City electrical system by providing needed backup supply when renewable resources are unavailable and/or when battery storage resources are insufficient. In addition, as overall system decarbonization accelerates, the Project provides indirect GHG emission reductions by providing capacity and flexible operating capabilities to the system allowing a large amount of marginal energy storage additions to be avoided until the cost of energy storage technologies become comparable with the Project. Combined, this leads to large indirect GHG reductions, particularly during the 2030-2040 time period when the electrical system is rapidly transitioning to meet CLCPA targets. The indirect GHG emissions reductions from the Project during the 2023-2035 timeframe are estimated to be between 476,000-990,000 tons per year (see **Table 3.2-1** and **Figure 3.2-1**). The Project is forecasted to cause a cumulative direct, upstream, and indirect reduction in GHG emissions through 2035 of over 5,000,000 tons.

In the longer term, the Project is able to be converted to use GHG-free hydrogen produced by renewable energy sources. By 2040, it is expected that the Project could continue generating electricity using hydrogen fuel should sufficient sources become available.[78]

OneNYC 2050 also seeks to advance equitable improvements in air quality, with particular focus on $PM_{2.5}$. As summarized in Section 3.3.10, the Project will decrease $PM_{2.5}$ emissions in NYC by approximately 9.8 tons in 2024 and an average of 3.9 tons annually over the period 2023-2035 by displacing other higher emitting electric generating units.

3.2.2 Assessment of the Project's GHG Emissions

3.2.2.1 Existing Facility GHG Emissions

The existing Facility currently consists of 31 older, peaking-only gas and oil-fired combustion turbines, including 24 P&W turbines and seven retired Westinghouse turbines, with a combined nameplate rating of 646 MWe (502 MWe not including the retired Westinghouse turbines). All of the existing units, with the exception of one P&W Twin Pac (consisting of two combustion turbines and a single generator), will be permanently shut down once the Project has completed its shakedown period. The two remaining P&W turbines will remain operational to make the site black start capable, but are proposed to be replaced by an approximately 24 MWe battery energy storage system.

GHG emissions from the existing Facility include direct and indirect (upstream) GHG emissions associated with operation of the existing P&W combustion turbines and, GHG emissions from mobile sources, including truck trips from deliveries and vehicle trips from commuting employees. The Facility typically receives less than 10 total truck trips per day including express shipping, fuel deliveries, and others. It also currently employs a staff of approximately 20 full time personnel. Most of these employees commute to work by car.

As shown in **Table 3.2-4**, the existing facility's direct GHG emission rate is 2,163 lb CO_2e/MWh for ULSK and 1,570 lb CO_2e/MWh for natural gas based on GWP20, while the direct GHG emission rate of the Project as modified is 1,612 lb CO_2e/MWh for ULSD and 1,120 lb CO_2e/MWh for natural gas. Since the Project is much more efficient than the existing facility, and therefore has lower direct and upstream GHG emissions per MW produced, it will displace other less efficient electric generators and result in an overall reduction in GHGs from the electric grid. As described in Section 3.2.1.2 A, all GHG emission reductions calculations for the Project assume as a baseline that the existing units retire on April 30, 2023 and commercial operation of the new unit commences on June 1,2023.

Table 3.2-5 provides a summary of the direct and indirect GHG emissions associated with current operation of the existing Facility.

[78] It should be noted the Project is not seeking to permit operation on hydrogen fuel at this time. Such operation will require a future amended permitting process.

Table 3.2-4 Direct GWP20 CO_2e Emission Factor Comparison – Existing Facility and Current Project (lb CO_2e/MWh)

Fuel Fired	Existing P&W Units (1)	Current Proposed Project GE 7HA.03 (2)
Natural Gas	1,570	1,120
Liquid Fuel (ULSK / ULSD)	2,163 (ULSK)	1,612 (ULSD)

(1) Calculated based on 25.71% efficiency as observed during air permit baseline period. CO_2 factors from Part 75, Table LM-3, CH_4 and N_2O factors based on 40 CFR Part 98

(2) Based on GWP20 consistent with Part 496; note that the proposed BACT limit for the new CTG (see Section 4.2.4 of the Air Permit Application) are based on IPCC AR4 100-yr GWPs consistent with Part 231.

Table 3.2-5 Direct and Indirect GHG Emissions – Existing Facility

Component	GHG Emissions (tpy) (1)			
	CO_2	CH_4	N_2O	CO_2e (GWP20)
Direct / P&W Units (2)	41,718	0.81	0.086	41,809
Indirect / Upstream (3)	8,667	124.02	0.106	19,112
Indirect / Mobile Source Emissions (4)	291	0.003	0.000002	291
Total	**50,676**	**124.83**	**0.192**	**61,212**

(1) Basis for calculations provided in **Appendix F**.
(2) Based on Air Permit Application baseline usage.
(3) Natural gas factors from Littlefield *et al*. (2019). Information for liquid fuel from Cooney, *et al*. (2020).
(4) Based on 20 staff commuters and 9 light commercial truck deliveries, and 1 large ULSD truck deliveries/day; 148 tpy, 107 tpy, and 36 tpy, respectively.

3.2.2.2 GHG Emissions from the Previously Approved Version of the Project

As discussed further in Section 1.0, the Applicant previously proposed to replace the Facility's existing combustion turbines with a 1,040 MW combined cycle combustion turbine, which was fully approved, and NYSDEC and the PSC issued the necessary permits and approvals for construction and operation.

As part of the 2010 environmental review of the Project, an assessment of proposed Project emissions of CO_2 was conducted based on publicly available information and was generally consistent with the DEC's Guide for Assessing Energy Use and Greenhouse Gas Emissions in an Environmental Impact Statement (NYSDEC, 2009). The annual direct CO_2 emissions for the previously approved version of the Project were

estimated at 3,865,000 tons (February 5, 2010 Title V air permit application). Maximum permitted direct GHG emissions from the Project CTG as currently configured would be 714,497 tpy of CO_2e (based on GWP20). When taking into account the anticipated operation of the Project (based on the Navigant/Guidehouse dispatch analysis in **Appendix E**), the direct GHG emissions from the Project are estimated at an annual average of 90,766 tpy CO_2e (20-yr GWP) through 2035 (see **Table 3.2-7**).

Taking into account the displacement of emissions from less-efficient, uncontrolled fossil-fueled electric generating units that was expected to occur as a result of the operation of the Project as previously configured, NYSDEC concluded in its 2010 Findings Statement that the Project's expected impacts would be to reduce CO_2 emissions by displacement of less efficient equipment.

3.2.2.3 Modified Replacement Project GHG Emissions

Project modifications will result in a smaller plant size than the previous configuration of the Project (437 MWe vs 1,040 MWe) and, because the Project now is proposed as a peaking facility, projected operations will be considerably less. The previously approved Project configuration was permitted to operate greater than 85% of the year (capacity factor), while the Project as modified would be permitted to operate approximately 30% of the year. Based on the dispatch analysis conducted by Navigant/Guidehouse as part of their GHG emissions report (**Appendix E**), the Project is expected to operate during the 2023-2035 timeframe at a range of capacity factors (0.5-19.5%) with an average annual capacity factor over this timeframe of approximately 4.4%. Due to renewable sources coming on-line, the capacity factor for the operation of the Project is expected to continue to decline post-2035.

Both direct, upstream and indirect GHG emissions associated with the Project as currently configured are identified and considered in this DSEIS, including:

- Direct and indirect short-term GHG emissions during construction of the Project;
- Direct and upstream GHG emissions from stationary sources during operation of the Project; and,
- GHG emissions from mobile sources during operation of the Project.

It should be noted that the existing facility is not included in this analysis of the GHG impacts from the Project. This analysis assumes that the existing facility stops operating on April 30, 2023 with or without the Project and does not credit the Project with the GHG emission reductions associated with the shutdown of the existing facility.

Direct and Indirect GHG Emissions During Construction

The construction period is anticipated to occur over a 25-month period from 2021 until March 2023. The 25-month period consists of approximately 20-months of actual construction activities and includes the shakedown period for the new equipment. Construction activities for the proposed Project will result in short-term GHG emissions from onsite construction equipment, truck trips associated with construction material, deliveries and construction workers. Power equipment and construction vehicles consume diesel fuel and produce GHGs. GHGs are also emitted during deliveries of construction materials to the site, and the contractor's employees commuting to the Project site.

Emissions of CO_2e from non-road construction equipment engines anticipated to be used during Project construction have been estimated using calculations based on the most recent version of USEPA's NONROAD model. Emission factors for on road engine emissions of CO_2 were obtained using USEPA's MOVES mobile source emission factor model documentation. **Table 3.2-6** summarizes the direct and indirect GHG estimated emissions that will be generated during construction of the Project.

Table 3.2-6 Direct and Indirect GHG Emissions - During Construction of the Project

Component	GHG Emissions (tons) (1)			
	CO_2	CH_4	N_2O	CO_2e (GPW20)
Off-road Engines	2,567	0.04	0.32	2,655
On-Road Emissions	1,723	0.02	0.0002	1,725
Total	**4,290**	**0.06**	**0.32**	**4,380**

(1) Refer to **Appendix F** for additional details on emissions calculations.

Direct and Indirect Upstream Operational GHG Emissions from Stationary Sources

The primary source of direct GHG emissions from Project operations will occur from combustion of natural gas, or ULSD when gas is unavailable, in the new H-class CTG. Direct GHG emissions would also be produced during operation of the emergency diesel generator, and the emergency diesel fire pumps. Indirect upstream GHG emissions associated with operation of the Project are the upstream emissions from the production and delivery of the fuel combusted by the CTG.

The Project has a much lower GHG emission rate than the existing facility. As shown in **Table 3.2-4**, the GHG emissions rate from the existing units are approximately 30% higher than the proposed Project CTG. Further, as discussed in the Navigant/Guidehouse report included as **Appendix E** (see Section 5 of the report and Section 3 of the Supplement), while the Project will cause direct GHG emissions through operation of the CTG, it will result in an overall reduction of GHGs from the electric system by directly displacing less efficient higher emitting generating units. The analysis conducted by Navigant/Guidehouse shows that the Project will cause a direct reduction of GHG emissions in 2023 of 72,000 tons, a cumulative reduction of direct GHG emissions of 421,000 tons during the 2023-2035 period, a total reduction in upstream GHG emissions of 186,000 tons and a total direct, upstream and indirect reduction in GHG emissions from the electrical system of over 5,000,000 tons during the 2023-2035 timeframe (see **Table 3.2-1**).

Quantification of GHG emissions presented in this section includes: (i) direct emissions from operation of the CTG and other Project combustion sources; (ii) upstream emissions associated with the production and transport of the fuels used by the CTG and other Project combustion sources; and, (iii) indirect mobile source emissions associated with operation of the CTG.

(i) Direct Operational GHG Emissions

The Air Permit Application contains annual emission limitations and a ULSD firing limit of 21.954 million gal/yr (the ULSD-gallon equivalent of approximately 720 hours/year at full load), which combined results in a maximum capacity factor for the Project of approximately 30%. However, the likely operating scenario based on the dispatch analysis conducted by Navigant/Guidehouse is the CTG operating at the capacity factors discussed in Section 3.1.6 above, or approximately 4.4% as an annual average over the 2023-2035 timeframe.

The potential direct CO_2e emissions from the operation of the Project include: CO_2 from operation of the CTG, emergency generator engine, fire system pump engines #1 and #2; CH_4 and nitrous oxide ("N_2O") emitted during combustion; and, fugitive emissions of methane and onsite natural gas components (connectors, valves, meters, and regulators) and SF_6 from onsite transformers.

Table 3.2-7 presents the annual direct CO_2e emissions from the Project's combustion sources, including the CTG and ancillary combustion sources, under a likely operating scenario, based on the Navigant/Guidehouse dispatch analysis, as well as under the maximum operating assumptions contained in the Air Permit Application. Consistent with 6 NYCRR 496, the CO_2e emissions associated with the Project were calculated based on the 20-year GWP included in 6 NYCRR 496.5.

Table 3.2-7 Direct GHG Emissions – During Operation of the Project (tpy) (4)

Scenario(1)	GHG Component	CTG	Emergency Generator Engine(2)	Fire System Pump Engine #1(2)	Fire System Pump Engine #2(2)	Fugitives	Project Totals
Maximum Potential Permitted Emissions	CO_2	712,160	204	48	73	-	712,484
	CH_4	18.77	0.008	0.002	0.003	107.56	126.34
	N_2O	2.88	0.0017	0.0004	0.0006	-	2.88
	SF_6	-	-	-	-	0.00083	0.00083
	CO_2e (GWP20)	714,497	205	48	73	9,050	723,872
Expected Operations	CO_2	90,547	21	5	7	-	90,580
	CH_4	1.68	0.001	0.0002	0.0003	0(3)	1.68
	N_2O	0.17	0.00017	0.00004	0.00006	-	0.17
	SF_6	-	-	-	-	0(3)	-
	CO_2e (GWP20)	90,733(1)	21	5	7	0(3)	90,766(5)

(1) Based on Navigant/Guidehouse dispatch study, 4.4% expected annual average capacity factor for 2023-2035.

(2) Maximum permitted based on 500 hr/yr, expected based on 1-hr week normal operation for maintenance; or 52 hrs/yr operation.

(3) Equipment will not be designed or expected to leak.

(4) Basis for emission calculations provided in **Appendix F**.

(5) Fugitive emissions not included as equipment is not designed, or expected, to leak; if equipment fugitives conservatively included at the maximum potential emission rate, total CO_2e emissions would be 99,816 tpy (90,766 + 9,050).

While there will be direct GHG emissions associated with the operation of the Project, the Project will reduce the overall direct GHG emissions from the electrical system by displacing less efficient electric generating units. (See **Table 3.2-1**, **Table 3.2-2** and the Navigant/Guidehouse report included as **Appendix E**).

(ii) Upstream Indirect Operational GHG Emissions

Production and transportation of natural gas and liquid fuel results in upstream indirect GHG emissions associated with the extraction and transportation of fuels.

Appendix F contains the upstream emission calculations as described below.

The upstream GHG emissions associated with the use of natural gas were estimated using life cycle analysis data developed by the National Energy Technology Laboratory; *Life Cycle Analysis of Natural Gas Extraction and Power Generation* (NETL, 2019)[79]. The life cycle analysis begins with all construction and operation activities necessary to extract natural gas from the earth, including intermediate gathering, processing, and transport steps, and ends with distribution of the natural gas to end users, including utility and industrial users as well as small-scale commercial and residential users.

All stages of the NETL life cycle analysis include GHG emissions from vented gas, fugitive components, and products of combustion including flaring. The extraction portion of the study looked at different geographical areas of the country to account for differences in geology and technologies used. NETL report Exhibit F-1 emission factors for CO_2, CH_4, and N_2O, which relate to extraction from the Appalachian Basin including New York and Pennsylvania, were used to calculate GHG emissions associated with extraction. Emission factors from Exhibit F-31 of the NETL report were used to calculate upstream emissions from the rest of the life cycle stages, including gathering, processing, transport, storage, and distribution. Since the NETL report uses GWP20 factors that are slightly different than Part 496 GWP20 factors, CO_2e was calculated for each individual GHG based on the NETL report emission factors, and then adjusted to be consistent with Part 496 GWP20 emission factors (see **Table 3.2-8**).

Table 3.2-8 Natural Gas Upstream Emission Factors (lb/MMBtu)

Fuel	CO_2	CH_4	N_2O	Total CO_2e
Natural Gas	24.82	0.357	0.0003	54.88

Upstream emissions from the use of petroleum products (ULSD) were estimated using supporting information from a journal article prepared by some of the same authors of the NETL natural gas life cycle analysis report; *Updating the U.S. Life Cycle GHG Petroleum Baseline to 2014 with Projections to 2040 Using Open-Source Engineering-Based Models* (Cooney et al., 2016)[80]. This article provides GHG emissions from well-to-tank, covering crude production and transportation, refining, and product transportation.

Similar to the NETL natural gas analysis, life cycle emissions for petroleum products are provided based on geography by the Petroleum Administration for Defense District (PADD). PADD1 includes the East Coast, including New York. This geographic breakdown accounts for the distribution of different crude oil sources, production methods, and refinery technologies and provides the well-to-tank emission factors for diesel for PADD1 (Table SI-45 of Cooney et al. 2016). The CO_2e emission factors provided by Cooney et al. are not broken down into individual GHGs and use GWP20 factors that are slightly higher than those in Part 496. To obtain individual values for CO_2, CH_4, and N_2O, the individual GHGs (CO_2, CH_4 and N_2O) were estimated using a study conducted by ICF International for the Consortium of State Oilheat Associations Greenhouse Gas Project[81] which reviewed the life cycle of heating oil. The ICF analysis reviewed the same type of production, transportation, refining, and delivery steps as the Cooney et al. analysis, but also provided a breakdown of individual GHGs (CO_2, CH_4 and N_2O). The values of each individual GHG for ULSD were calculated using the relative GHG fractions from the ICF analysis applied to the total Cooney et al emission factors using the equation (see **Table 3.2-9**):

*Individual GHG = lb/MMBtu CO_2e * GHG fraction / Part 496 GWP20*

[79] https://www.netl.doe.gov/energy-analysis/details?id=3198
[80] https://pubs.acs.org/doi/pdf/10.1021/acs.est.6b02819
[81] https://noraweb.org/wp-content/uploads/2016/11/GHG-Resource-Analysis-for-residential-Boilers-Final-Report-9-7-08-2.pdf

Table 3.2-9 Petroleum Upstream Emission Factors (lb/MMBtu)

Fuel	CO_2	CH_4	N_2O	Total CO_2e
ULSD	24.02	0.26	0.0005	45.63

Table 3.2-10 provides estimates of the upstream indirect GHG emissions associated with operation of the Project.

Table 3.2-10 Upstream Indirect GHG Emissions Associated with Operation of the Project

Scenario	GHG Emissions (tpy) (1)			
	CO_2	CH_4	N_2O	CO_2e (GWP20)
Maximum Permitted –Upstream	134,969	1,805	1.93	287,099
Expected – Upstream (2)	18,891	272	0.23	41,771

(1) Basis for upstream fuel emissions provided in Appendix F.
(2) Based on Navigant/Guidehouse dispatch study, 4.4% expected annual average capacity factor 2023-2035.

While there will be upstream indirect GHG emissions associated with the fuel used by the Project, the Project will actually reduce the overall amount of fuel used by the NYISO electric system by displacing less efficient electric generating units that need more fuel to produce the same amount of power (See **Table 3.2-1**). It will, therefore, reduce indirect upstream GHG emissions associated with the production and transportation of fuels to New York used to produce power, which further decreases GHGs from the electric system, and increases the GHG benefit of the Project.

The analysis conducted to estimate the reduction in upstream indirect GHG emissions associated with the Project's displacement of the older, less efficient units is summarized in **Table 3.2-11**.

Table 3.2-11 Reduction in Annual Upstream Indirect GHG Emissions Associated with the Project

Scenario	GHG Emissions (tpy) (1)			
	CO_2	CH_4	N_2O	CO_2e (GWP20)
Project Expected – Upstream(2)	18,891	272	0.227	41,771
Displaced Units – Upstream	25,356	365	0.305	56,069
Net Annual Benefit Expected from Project (2023-2035)	**-6,465**	**-93**	**-0.078**	**-14,298**

(1) Basis for emissions provided in **Appendix F.**
(2) Based on Navigant/Guidehouse dispatch study, 4.4% expected annual average capacity factor 2023-2035.

(iii) Indirect Mobile Source Operational Emissions

Indirect operational emissions from non-stationary sources include trips generated by vehicles that are associated with the operation of the Project, including additional commuting employees, suppliers/vendors, and material delivery. To quantify these indirect emissions, CO_2 and CH_4, and N_2O emission factors were obtained for various vehicle categories using the USEPA's MOVES mobile source emission factor model. Emission factors were multiplied by the estimated vehicle miles travelled for each category.

There will be fewer mobile sources associated with operation of the Project than what was evaluated and approved in 2010, which results in less GHG emissions. There will be fewer full-time personnel than the 2010 configuration of the Project, thus, the commuter expectation will be less than both the current number and the number projected for the previously approved Project configuration. Typical truck trips associated with operation of the Project will also remain below those associated with the existing facility, and truck trips associated with fuel deliveries will be less than what was anticipated with the previously approved Project configuration.

The indirect CO_2e emissions from commuters and truck deliveries associated with operation of the Project are provided in **Table 3.2-12**.

Table 3.2-12 Indirect GHG Emissions from Vehicle Trips to the Project

Trip Type	Trips per Day	Miles Per Round Trip	Annual CO_2 Emissions (tons) (1)	Annual CH_4 Emissions (tons) (1)	Annual N_2O Emissions (tons) (1)	Annual CO_2e (GWP20) Emissions (tons)
Commuting	15	40	108	0.0007	0.000008	108
Light Truck Deliveries	5	50	57	0.0004	0.000005	57
Heavy Truck Deliveries	1	50	35	0.0016	0.00002	35
Total Vehicle Emissions			**200**	**0.003**	**0.00003**	**200**

(1) Estimated with emission factors obtained from USEPA MOVES emission factor model.

3.2.3 Future Physical Climate Risk

Future physical climate risk includes sea-level rise, storm surge and flooding projected to occur based on the impacts of climate change. Analysis and mitigation of these risks is required by the CLCPA, the CRRA, as well as NYSDEC regulations and guidance. The impacts of future physical climate risk associated with

the Project were considered, and mitigation measures are included in the Project design to reduce the potential impact of these risks on the Project now and into the future.

Section 17-B of the CLCPA requires applicants for specific permits, including Title V permits, to demonstrate that future physical climate risk has been considered. The 2014 Community Risk and Resiliency Act ("CRRA") also requires applicants for certain permits to demonstrate they have considered future physical climate risk due to sea-level rise, storm surge and flooding.

As part of the 2010 environmental review of the Project, an assessment of sea level rise was conducted. This assessment showed that at a grade elevation level of approximately 17 feet amsl, the Project site would be well protected from minor sea level fluctuations.

The modified Project's future physical climate risk was considered in this DSEIS as it has been designed to be consistent with the relevant sea-level rise projections in Part 490 of Title 6 of the New York Code of Rules and Regulations and the 2018 Draft New York State Flood Risk Management Guidance for the Implementation of the Community Risk and Resiliency Act ("2018 Guidance"). The 2018 Guidance is used to determine suitable locations for construction of a proposed structure, given future physical climate risks associated with sea-level rise, storm surge and flooding. The 2018 Guidance provides recommended design elevations that take into account and mitigate these risks.

The high sea level rise projection included in Part 490.4(b) for 2050 and the additional freeboard per the 2018 Guidance were used to determine the elevation for the Project. The base flood elevation ("BFE") at the Project site is 13 feet (NAVD-88). The Project grade elevation was designed based on the 2018 Guidance, by adding the Part 490 sea-level rise projection for 2050 (2.5 feet) to the additional 3 feet of freeboard recommended in the 2018 Guidance. This resulted in a Project total elevation of 18.5 feet (13 feet + 2.5 feet + 3 feet). New Project structures will be constructed with a minimum grade elevation of 18.5 feet amsl.

Based on the minimum planned grade elevation of new Project equipment at 18.5 feet amsl, the Project will be protected from future physical climate risks.

3.2.4 Avoidance, Mitigation and Minimization of Potential Impacts

The Project will avoid and minimize GHG emissions by implementing BACT for GHGs. As discussed in more detail in Section 3.1.9, two control technologies for GHG emission reduction are proposed as BACT: (1) high-efficiency generating technology; and, (2) low-carbon fuels. It will also operate as a peaker facility such that it is expected to operate at a capacity factor of approximately 4.4% average annually over the 2023-2035 timeframe, with its operations limited pursuant to requested Title V permit emission limits equivalent to a capacity factor of approximately 30% annually. Due to the Project CTG's high efficiency and quick ramp-up rate, GHG emissions are further reduced.

The Project is proposing to replace the existing units with an H-class CTG, which provides the highest efficiency of any available comparably sized CTG. The Project will also be designed to maximize generation efficiency by minimizing sources of internal power consumption and maximizing net generation to the grid. The Project's CTG will have a heat rate of 9,544 Btu (HHV)/kW-hr (gross) at full-load ISO conditions for natural gas firing, and 9,850 Btu (HHV)/kW-hr (gross) at full-load ISO conditions for ULSD firing. Due to the high efficiency of the CTG, and as discussed further in Sections 1.1 and 3.1.5, it will also displace other higher emitting generation units and their associated upstream emissions, thus having an overall reduction of GHGs from the electric grid (see **Table 3.2-1** and **Figure 3.2-1**).

The Project will utilize natural gas as a fuel, with limited operation on ULSD when natural gas is unavailable. In order to ensure reliable service to the region, the Project is requesting emission limits that equate to operation up to the equivalent of approximately 1,900 hours per year on natural gas and limited operation on ULSD up to the equivalent of approximately 720 hours/year. The H-class CTG is also expected to be

fully convertible to operate utilizing hydrogen created from renewable sources as fuel to generate zero-carbon electricity, if and when green hydrogen fuel is available in the future.[82]

Project modifications also will result in a smaller plant size (437 MWe vs 1,040 MWe) as compared to the Project as previously approved. Because the Project configuration is now proposed as a peaking facility, projected operations will represent a considerably smaller portion of the year, resulting in less GHG emissions.

As discussed in the Navigant/Guidehouse GHG Report and Supplement (**Appendix E**), the Project will cause an overall reduction in annual direct and upstream GHG emissions from the electrical system due to its efficiency and displacement of other higher emitting sources. The Project will also provide a capacity resource to the electrical system that allows more renewable generation to be added, while maintaining reliability in an efficient and cost-effective manner, resulting in further GHG emission reductions.

Nevertheless, assuming that the Project is deemed to be inconsistent with or that it will interfere with the attainment of the statewide GHG limits, as described in Section 1.4.1, the Project is justified given that it:

1. addresses reliability shortfalls in New York City;

2. reduces costs for electricity customers in New York City by providing economic capacity (without a ratepayer guaranteed support contract);

3. displaces higher emitting sources such that it will result in an overall net reduction in air emissions in the New York City area, including a reduction in statewide GHG emissions;

4. facilitates the integration of renewable energy resources by providing long-term, long duration backup power; and

5. preserves the Site's black start capability to facilitate electrical system restoration in New York City following major power outages.

Further, if deemed necessary, GHG emissions can be mitigated. As a starting point, Astoria will upgrade the starting system for the two P&W combustion turbines being retained for black start service. Presently, the twenty-four (24) existing P&W units use compressed natural gas to power their starting motors. Torsional force created by expanding compressed natural gas across a starting motor causes the turbine rotor to spin at sufficient speed to initiate fired operation of the units. After exiting the starting motor, the expanded natural gas is exhausted directly to the atmosphere. 0.53 tons of natural gas (methane) is required to start up each turbine, which results in 44.9 tons of CO_2e emissions per start.

The Project will include upgrading the starting system on each of the two retained P&W turbines to use compressed air instead of using compressed natural gas. This upgrade involves the installation of a new air compressor, receiver tank, turbine starting motor and associated piping and controls. Sufficient compressed air will be stored in the new receiver tank to start up each combustion turbine multiple times. Similar to the existing system, the compressed air will expand across the new starting motor to initiate operation of the turbines. The only direct emissions from the new starting system will be air instead of raw natural gas. As a result, each turbine start will result in a reduction of 44.9 tons of CO_2e emissions. Since both retained turbines are expected to start up at least once per month for testing in accordance with Con Edison's system restoration program requirements, the total GHG emissions savings will be 1,077 tons of CO_2e per year.

[82] It should be noted the Project is not seeking to permit operation on hydrogen fuel at this time. Such operation will require a future amended permitting process.

Additional GHG mitigation for the Project could involve a declining carbon emissions cap, which would entail a condition in the Facility's air permit that would limit the amount of carbon emissions that could be emitted by the Facility, with the limit declining to zero in 2040. Other options include carbon offsets, the future replacement of the two P&W combustion turbines with energy storage at the Site, or, the use of hydrogen or renewable natural gas once commercially available.

Future Physical Climate Risk is mitigated by designing the Project at a minimum elevation of 18.5 feet and is therefore consistent with the CRRA and 2018 guidance, to avoid, minimize and mitigate future physical climate risk.

3.3 Environmental Justice Analysis

NYSDEC's CP-29, Environmental Justice and Permitting, requires permit applications for major projects or major modifications to conduct an environmental justice ("EJ") analysis if the proposed action is in or near a potential environmental justice area ("PEJA"). The NYSDEC issued CP-29 on March 19, 2003. A PEJA is defined as a minority and/or low-income community that may bear a disproportionate share of the negative environmental consequences resulting from industrial operations or the execution of programs and policies. In addition, where a PEJA is identified by the preliminary screen, the applicant is required to submit a written enhanced public participation plan ("EPPP") as part of its complete application.

In 2017, New York City adopted Local Law 60 & 64 to codify environmental justice into City decision-making. Local Law 60 requires a citywide study of environmental justice be conducted. The results of this study will be made available to the public and placed on the City's website. Local Law 64 requires the establishment of an Environmental Justice Advisory Board, comprised of EJ advocates, academics, and public health experts to work with the City on identifying and addressing environmental injustices. In addition, City agencies must work with the Advisory Board to develop plans to address environmental injustices in communities of color and low-income communities in consultation with the impacted communities. These bills do not create any new enforceable requirements for the regulated community.

3.3.1 2010 Environmental Justice Analysis

A comprehensive EJ analysis was previously conducted for the Project and was documented in the 2010 FEIS. That analysis confirmed the location of areas located within a one-mile radius of the Project within Queens County (the EJ Study Area) that meet the PEJA criteria based on the 2000 census data (for both low income and minority). As such, and in accordance with CP-29, the following analyses were conducted to determine whether potential disproportionate adverse environmental impacts were likely to affect a PEJA:

- an evaluation of the existing environmental burden on the PEJA;
- an evaluation of the potential additional burden of any disproportionate adverse impacts directly related to the Project; and
- an evaluation of the health-related community conditions in accordance with New York State Department of Health ("NYSDOH"), Guidance for Health Outcome Data Review and Analysis Relating to NYSDEC Environmental Justice and Permitting (NYSDOH, 2017).

The Applicant also previously prepared and implemented an EPPP to inform the interested public about the Project. The EPPP was originally submitted to the NYSDEC on February 23, 2009 and was approved by the NYSDEC on February 27, 2009. The Applicant submitted an updated EPPP on February 15, 2010, which included the required certification. Thereafter, NYSDEC determined that the Applicant's public outreach was consistent with CP-29 (FEIS, Section 4.10.5).

Based on the foregoing, NYSDEC concluded that the Project would not contribute any additional environmental burden on the nearby PEJA (FEIS, Section 11.0). Furthermore, the NYSDEC concluded that "the Astoria community does not demonstrate health outcome statistics that are atypical of the larger

metropolitan area, and that the proposed Repowering Project will have no net effect with respect to increasing the number or size of environmental facilities located within the study area" (Findings, Section 11.b).

3.3.2 Overview

In accordance with CP-29, identification of PEJAs is based on U.S. Census Bureau data for population, race/ethnicity, and poverty that have been tabulated by the Bureau on a census block group basis.[83] The most recently available population data (including race/ethnicity) is from the 2010 U.S. Census. However, income data are not available from the 2010 Census. Therefore, these data were obtained from the U.S. Census Bureau's most recent (2018) American Community Survey ("ACS"). This survey is conducted each year from a sample of the nation's population. For the 2018 five-year ACS, five years of data from 2014-2018 were combined and averaged. This approach is consistent with the most recent NYSDOH guidance on evaluating health outcome data as part of an EJ analysis (NYSDOH, 2017).

A review of 2010 census data (race/ethnicity) and 2018 ACS data (low income) again confirms the presence of six census block groups meeting the PEJA criteria within the EJ Study Area, although the specific block groups meeting the PEJA criteria has changed[84]. As such, the prior EJ analysis for the Project has been updated as part of this DSEIS given the passage of time and changes in circumstances as well as to reflect Project modifications. Specifically, this section includes an updated evaluation of the existing environmental burden on the PEJAs and the potential additional burden of any disproportionate potential adverse impacts directly related to the Project as modified. The update to the health outcome data evaluation is provided in Section 3.3.8 of this document.

Data used in conducting the updated EJ analysis include:

- 2010 U.S. Census data, including data on total population, age distribution, and race/ethnicity (data.census.gov);
- 2018 ACS 5-year estimated data from the U.S. Census Bureau (average of data from 2014-2018) on income and percent of population with income below poverty level (data.census.gov);
- Information on the existing community environmental burden, including the following located in Queens County within the EJ Study Area:
    - registered Resource Conservation and Recovery Act ("RCRA") treatment, storage, and disposal ("TSD") facilities;
    - facilities with air permits and Toxic Release Inventory ("TRI") reports;
    - sites undergoing remediation;
    - reported petroleum and hazardous chemical spills;
    - facilities with a SPDES permit; and
    - chemical, petroleum, and major oil storage facilities.

The Applicant has also updated and supplemented the 2010 EPPP for the Project and submitted a draft Supplemental EPPP in late April concurrently with the 2020 Air Permit and SPDES modification applications. The Supplemental EPPP proposes additional outreach to Project stakeholders as well as a commitment to hold an additional public informational meeting. The Supplemental EPPP and the quarterly

[83] A census block group is a statistical division of a census tract that consists of clusters of blocks and generally contain between 250 and 500 housing units. Census tracts are small, relatively permanent statistical subdivisions of a county that generally have a population size between 1,200 and 8,000 people.

[84] 7Using 2018 ACS data for race/ethnicity as well as for low income still shows the presence of six census block groups meeting the PEJA criteria.

reports detailing the Applicant's additional stakeholder outreach, and its July 16, 2020 and January 21, 2021 public informational meetings are provided in **Appendix G**.

3.3.3 Project Description

A complete description of the Project as presently configured is provided in Section 1.1.1 of this DSEIS. As discussed in Section 1.1.1, the Applicant is proposing to modify its previously approved Project and replace 31 existing older, peaking-only gas and oil-fired combustion turbines at the Facility with a new state-of-the-art simple cycle combustion turbine. In 2010, the Applicant proposed to replace the existing CTGs with a 1040 MWe combined cycle combustion turbine project consisting of four GE 7FA units. The Project, as modified, will replace the existing CTGs with a new state-of-the-art simple cycle dual-fuel peaking CTG which will be a highly efficient, quick start, fast-ramping, GE H-Class 7HA.03. All of the existing units, with the exception of one P&W Twin Pac (consisting of two combustion turbines and a single generator), will be permanently shut down once the Project has completed its shakedown period. The remaining P&W Twin Pac will remain operational solely to enable black start capability for the Site, but is proposed to be replaced by an approximately 24 MWe battery energy storage system. The P&W Twin Pac uses natural gas as its primary fuel with ULSK as backup.

3.3.4 Project Setting and Community Profile

Section 1.1.1 provides a description of Project setting and community profile. **Figure 3.3-1** identifies the Astoria neighborhoods located in the vicinity of the Site.

The proposed Project modifications will not result in land use changes or alterations in character to the Astoria ConEd Complex. A review of aerial images from September 2009 and April 2020 (refer to **Figure 1.1-2** and **Figure 1.1-3**, respectively, in **Section 1.0** of this DSEIS) demonstrate relatively minor changes in land use or density since the 2010 SEQRA Findings. Most of the area south of the Astoria ConEd Complex was rezoned under the 2010 Astoria Rezoning (ULURP No C 100199 ZMQ) which was adopted on May 25th, 2010. However, this zoning change was largely to protect the existing density within the neighborhood (i.e., a "downzoning"). There are currently no pending zoning map amendments to change any land use or zoning on parcels in this neighborhood. The most recent zoning map amendment within the neighborhood was the "38-01 23rd Avenue Rezoning" (ULURP 180315 ZMQ) which mapped a C2-3 commercial overlay on an existing R5D zoning district. This zoning map amendment did not change any available floor area ratios ("FAR") in the district.

3.3.5 Determination of Potential Environmental Justice Areas

NYSDEC's CP-29 defines a minority community as "a census block group, or contiguous area with multiple census block groups, having a minority population equal to or greater than 51.1% in an urban area" and defines a low-income community as "a census block group, or contiguous area with multiple census block groups, having a low-income population equal to or greater than 23.59% of the total population." A minority population is one that is identified or recognized by the U.S. Census Bureau as Hispanic, African-American or Black, Asian and Pacific Islander or American Indian. A low income population is one that has an annual income that is less than the poverty threshold as established by the U.S. Census Bureau.

For the analysis conducted in support of the Project as approved in 2010, a one-mile radius centered on the existing Facility was selected for the EJ analysis. As agreed to by the NYSDEC and NYSDOH, the EJ analysis was limited to that portion of the one-mile radius located in Queens County. This EJ Study Area is located entirely within the larger ZIP Code 11105 area, which was the area evaluated in the previously conducted NYSDOH Health Outcome Data ("HOD") Analysis (referred to as the HOD Study Area as described in Section 3.3.8)[85]. Six Census Block Groups within the EJ Study Area showed minority and/or

[85] As discussed in Section 3.3.8, the health outcome data (HOD) analysis was conducted on a ZIP code basis in accordance with NYSDOH guidance. Demographic data used in the HOD analysis were obtained from the U.S. Census data on a ZIP code basis.

income levels based on the 2000 Census data that met the PEJA criteria and were within ZIP Code 11105 as shown in **Figure 3.3-2**. Demographic data for these Census Block Groups and Queens County are provided in **Appendix H**.

The methodology to determine the PEJA for this Project is consistent with CP-29 and is the same as the methodology used for the Project as previously permitted. Consistent with the previously approved EJ analysis, and supported by the results of the current dispersion modeling analysis that shows the maximum modeled concentrations for all pollutants and averaging periods (with the exception of the 1-hour averaging period for SO_2) are located within ZIP code 11105, the EJ Study Area has not changed and continues to be that portion of the area located in Queens County within one mile of the Facility. Census Block Groups meeting the PEJA criteria were identified based on updated Census data as discussed in Section 3.3.1 and are shown in **Figure 3.3-3**. A comparison of **Figure 3.3-2** and **Figure 3.3-3** shows that while the number of Census Block Groups meeting the PEJA criteria has not changed, the shape of the PEJA has.

Specifically, Census Tract 107[86], Block Group 1, Census Tract 111, Block Group 1, and Census Tract 113, Block Group 1 no longer exceed either the PEJA low income or minority thresholds, while Census Tract 105, Block Groups 1, 2, and 3 now exceed one or both of the PEJA thresholds. The current PEJA Census Block Groups are located within about ½ mile from the Site. Furthermore, as discussed in Section 3.3.5, the Project will not cause any adverse environmental impacts to any neighborhood, regardless of whether the neighborhood meets the criteria as a PEJA.

[86] The 2000 Census data identified Census Tract 107.01, Block Group 1 as a low-income community based on a very small population (114 individuals); however, the 2010 Census data (as well as the 2018 ACS data) shows no population for this area and, as such, it does not qualify as a PEJA.

Figure 3.3-1 Project Setting

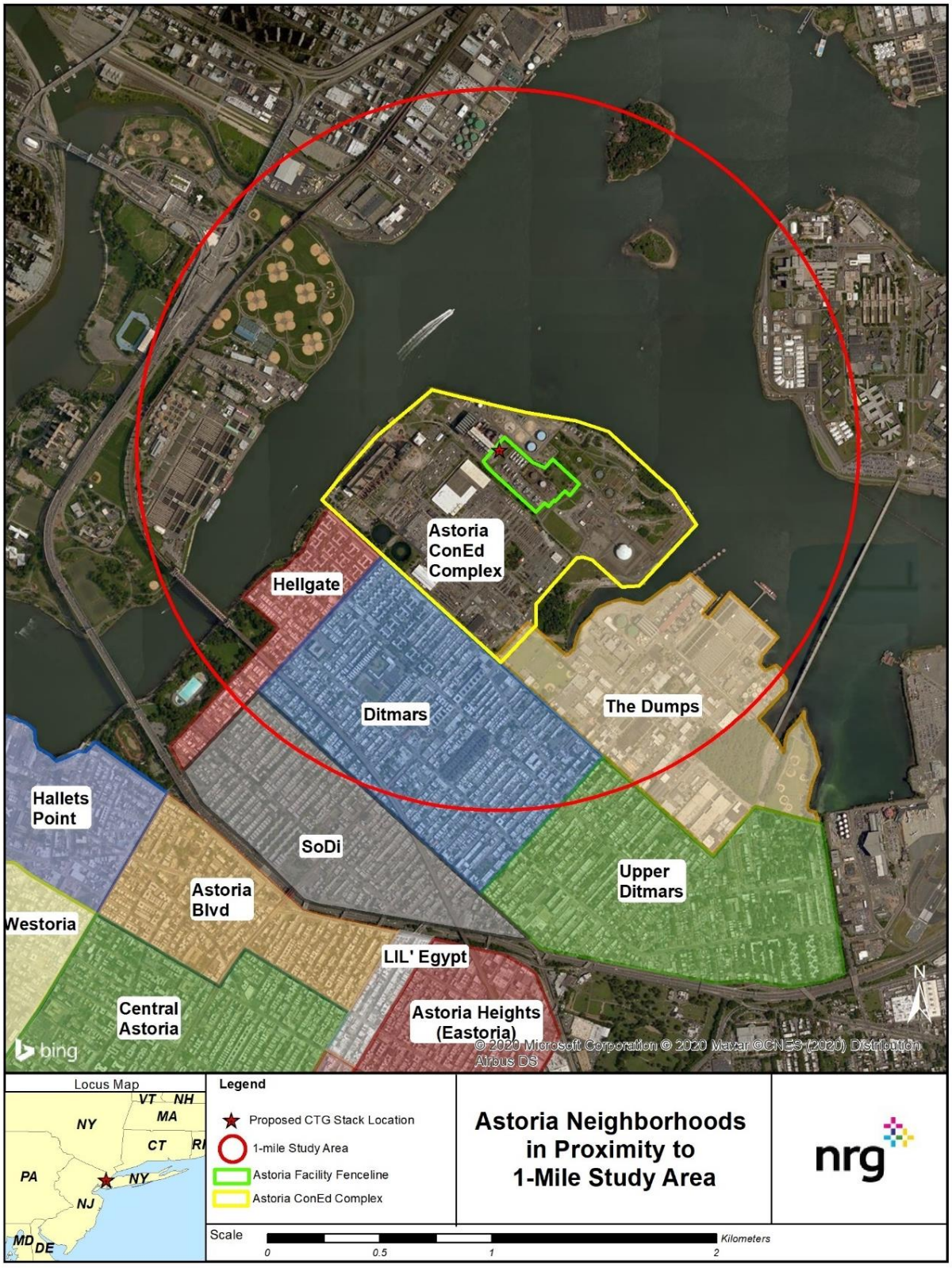


Figure 3.3-2 Potential Environmental Justice Areas Identified for the Project as Previously Approved

Figure 3.3-3 Updated Potential Environmental Justice Area

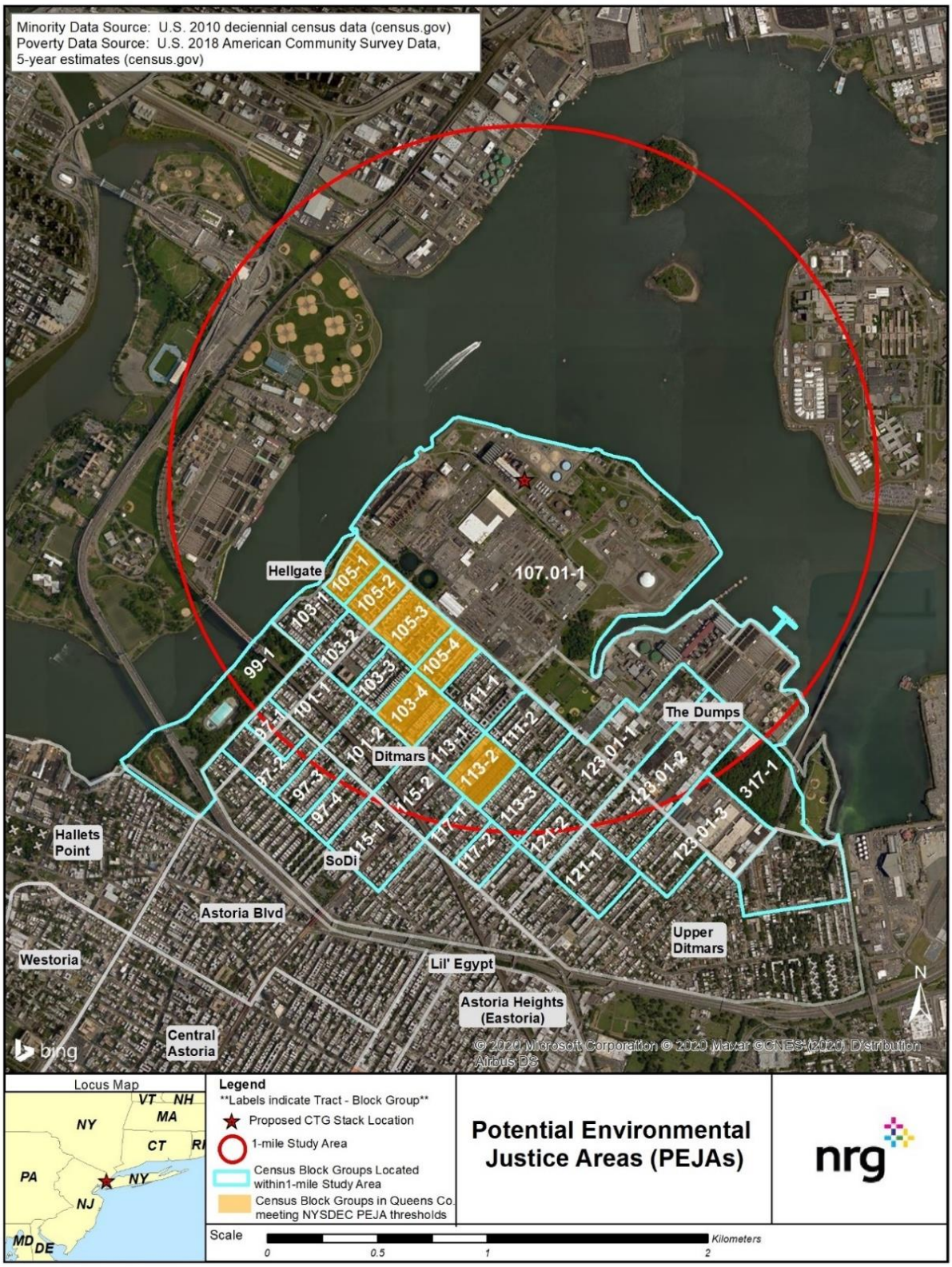


Table 3.3-1 provides the U.S. Census Bureau-based demographic data for the updated PEJA Census Block Groups as well as for Queens County and NYC. As shown in **Table 3.3.1**, only one Census Block Group (Tract 105, Block Group 2) meets the PEJA low-income criteria, while all six of the Census Block Groups (as well as Queens County and NYC) meet the PEJA minority criteria. This is in contrast to the previous analysis which showed that four of the six Census Block Groups exceeded either or both of the PEJA criteria. A comparison of **Table 3.3-1** to the census data summarized for the 2010 EJ analysis shows that the total population in the PEJA Census Block Groups has decreased by approximately 10%. Furthermore, while the aggregate percent of the population within the PEJA Census Block Groups has remained essentially the same (58% compared to 59% from the 2010 EJ analysis), the percent of low income population has decreased significantly (from 29% to 15%).

Table 3.3-1 Updated Demographic Data for Potential Environmental Justice Area

Statistic	Tract 103 Block Group 4		Tract 105 Block Group 1		Tract 105 Block Group 2		Tract 105 Block Group 3		Tract 105 Block Group 4		Tract 113 Block Group 2		Queens Co., NY		New York City, NY	
	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
Total Population[1]	949		955		1,018		1,442		829		1,796		2,230,722		8,175,133	
Age Distribution[1]																
<5	63	6.6	56	5.9	50	4.9	98	6.8	31	3.7	80	4.5	132,464	5.9	517,724	6.3
5 - 14	90	9.5	133	13.9	122	12.0	163	11.3	73	8.8	127	7.1	247,172	11.1	941,313	11.5
15 - 19	36	3.8	58	6.1	77	7.6	64	4.4	37	4.5	70	3.9	139,096	6.2	535,833	6.6
20 - 44	446	47.0	340	35.6	389	38.2	600	41.6	336	40.5	999	55.6	849,284	38.1	3,189,717	39.0
45 - 64	218	23.0	241	25.2	259	25.4	363	25.2	217	26.2	327	18.2	576,560	25.8	1,997,388	24.4
65+	96	10.1	127	13.3	121	11.9	154	10.7	135	16.3	193	10.7	286,146	12.8	993,158	12.1
Race/Ethnicity																
One Race[2]	905	95.4	895	93.7	975	95.8	1381	95.8	785	94.7	1741	96.9	2,129,809	95.5	7,849,232	96.0
White	539	56.8	593	62.1	555	54.5	937	65.0	561	67.7	1025	57.1	886,053	39.7	3,597,341	44.0
Black or African-American	17	1.8	96	10.1	155	15.2	35	2.4	30	3.6	46	2.6	426,683	19.1	2,088,510	25.5
American Indian & Alaska Native	3	0.3	10	1.0	1	0.1	0	0.0	1	0.1	3	0.2	15,364	0.7	57,512	0.7
Asian	269	28.3	64	6.7	97	9.5	198	13.7	106	12.8	426	23.7	511,787	22.9	1,038,388	12.7
Hawaiian/Pacific Islander	1	0.1	5	0.5	0	0.0	0	0.0	0	0.0	1	0.1	1,530	0.1	5,147	0.1
Some Other	76	8.0	127	13.3	167	16.4	211	14.6	87	10.5	240	13.4	288,392	12.9	1,062,334	13.0
Two or more races	44	4.6	60	6.3	43	4.2	61	4.2	44	5.3	55	3.1	100,913	4.5	325,901	4.0
Total Minority (Race)[3]	410	43.2	362	37.9	463	45.5	505	35.0	268	32.3	771	42.9	1,344,669	60.3	4,577,792	56.0
Hispanic or Latino[4]	165	17.4	407	42.6	410	40.3	530	36.8	317	38.2	535	29.8	613,750	27.5	2,336,076	28.6
Not Hispanic or Latino[4]	784	82.6	548	57.4	608	59.7	912	63.2	512	61.8	1261	70.2	1,616,972	72.5	5,839,057	71.4
Not Hispanic or Latino - White alone[4]	456	48.1	381	39.9	344	33.8	638	44.2	365	44.0	753	41.9	616,727	27.6	2,722,904	33.3
Total Minority (Race/Ethnicity)[5] *	493	51.9	574	60.1	674	66.2	804	55.8	464	56.0	1043	58.1	1,613,995	72.4	5,452,229	66.7
EJ Area based on % Minority (≥ 51.1%)	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Income																
Median household income 2018 ($)[6]	64,193		26,399		35,726		85,000		59,261		82,917		64,987		62,972	
Persons below poverty 2018[7]	30	4.5	245	21.5	307	33.2	151	11.7	169	16.8	206	9.0	295,165	13.0	1,570,754	18.9
EJ Area based on % below Poverty (≥ 23.59%)	No		No		Yes		No		No		No		No		No	
EJ Area based on % Minority and/or % below Poverty	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	

Notes:
(1) Source: 2010 Decennial, data.census.gov, DEC Summary File 1, Table P12
(2) Source: 2010 Decennial, data.census.gov, DEC Summary File 1, Table P3
(3) Sum of the values for One Race Alone (excluding White alone) plus Two or More Races
(4) Source: 2010 Decennial, data.census.gov, DEC Summary File 1, Table P5
(5) Total Minority as defined by the New York State Dept. of Environmental Conservation Commissioner's Policy 29: African-American, American Indian/Alaskan, Asian, Hawaiian/Pacific Islander, Some Other Race, Two or More Races, and the ethnicity Hispanic or Latino. It is calculated by subtracting the Not Hispanic or Latino - White Alone from the Total Population.
(6) Source: American Community Survey data, data.census.gov, Table B19013, 2018: ACS 5-year Estimates
(7) Source: American Community Survey data, data.census.gov, Table C17002, 2018: ACS 5-year Estimates

3.3.6 Existing Environmental Burden to the Community

A potentially significant factor in determining whether an EJ community is disproportionately impacted is to assess the existing environmental burden to the PEJA in the EJ Study Area in comparison to non-EJ communities in Queens County within the EJ Study Area. As can be seen in **Figure 3.3-1**, the minority and poverty elements of the EJ Study Area and the Astoria community are interspersed with census tracts and block groups that are not minority or economically disadvantaged populations. The overall portion of the population of Astoria within the EJ Study Area falls well outside of the characteristics of EJ review criteria (poverty and minority) and are subject to the same net environmental burden as are the persons living within the defined EJ areas. This finding is unchanged from the 2010 EJ analysis as supported by the 2010 Findings Statement.

Table 3.3-2 summarizes the number of facilities/sites located in Queens County within the EJ Study Area that contribute to the environmental burden. The data in **Table 3.3-2** shows that the environmental burden to the PEJA is significantly lower than to the rest of the EJ Study Area. Specifically, there are no sites with air permits (Title V or Air State Facility), SPDES permits, TRI reporting facilities, chemical bulk storage facilities, major oil storage facilities, or reported petroleum/hazardous chemical spills. Furthermore, the remediation activities at the one remediation site (located within PEJA Census Block Group 113-2) have been completed (refer to the text following **Table 3.3-3**).

Table 3.3-2 Existing Environmental Burden in Queens County within the EJ Study Area

Environmental Burden	Number of Facilities		Data Source(1)
	Total	Located within PEJA	
Sites with Title V Air Permits	6	0	1
Sites with Air State Facility Permits	1	0	1
Sites with SPDES Permits	16	0	2
TRI Reporting Facilities(2)	3	0	3
RCRA TSD Facilities	58	4	4
Remediation Sites	4	1(4)	5
Chemical Bulk Storage Facilities(3)	3	0	6
Petroleum Bulk Storage Facilities(3)	137	31(5)	6
Major Oil Storage Facilities(3)	4	0	6
Reported petroleum and hazardous chemical spills	9	0	7

(1) Data Source (accessed online 07/16/2020 – 07/19/2020):

- http://www.dec.ny.gov/chemical/32249.html
- https://www.dropbox.com/sh/hz3spt98h4d88ue/AADmNLcYxcpZQFeWUNAxGMi9a?dl=0&preview=IndexSPDES.xlsx
- https://enviro.epa.gov/enviro/ez_build_sql_v2.get_table
- https://enviro.epa.gov/facts/rcrainfo/search.html
- https://www.dec.ny.gov/cfmx/extapps/derexternal/haz/results.cfm?pageid=3
- https://www.dec.ny.gov/cfmx/extapps/derexternal/index.cfm?pageid=4
- https://www.dec.ny.gov/cfmx/extapps/derexternal/spills/results.cfm?pageid=2

(2) Based on 2018 reporting.

(3) Does not include unregulated/closed or inactive registrations.

(4) Remediation activities at the site (21-25 31st St.) have been completed.

(5) The vast majority of PBS located within a PEJA are small residential oil storage tanks.

An array of facilities with environmental activities is located in the EJ Study Area. The major air emission sources (i.e., those holding a Title V air permit) posing environmental burdens for the community include:

- Astoria Energy LLC, 17-10 Steinway Blvd.;
- Astoria Generating Station, 18-01 20th Ave.;
- ConEd Astoria Facility, 20th Ave. and 21st St.;
- NYPA Combined Cycle Power Project, 31-03 20th Ave.;
- Astoria Gas Turbine Power LLC, 31-01 20th Ave.; and,
- Steinway & Sons (piano manufacturing), 1 Steinway Pl.

The location of these facilities, which were also in operation in 2010, is shown in **Figure 3.3-4**. All of these facilities are isolated from direct contact with the community through restricted access and security and, with the exception of Astoria Energy, are located within the Astoria ConEd Complex. Although none of these facilities is located within the PEJA, as was the case in 2010, the primary environmental burdens to the community (including both PEJA and non-PEJA) continue to result from air emissions from point, mobile, and non-point sources throughout the densely populated and heavily industrial portions of Queens, the Bronx, Brooklyn, and Manhattan, as well as these large power plants and long-range transport (particularly important with respect to ozone as discussed in Section 3.1.2.2). However, emissions from these facilities do not disproportionately impact the air quality in the PEJA compared to the non-PEJA.

In its 2017 proposed revision to the New York SIP for the 2008 ozone NAAQS for the New York-Northern New Jersey-Long Island NY-NJ-CT metropolitan area (New York Metropolitan Area, or "NYMA"), the NYSDEC noted that this area has been subject to significant levels of ozone pollution that have been transported to the area from upwind sources. As the entire metropolitan area of NYC falls within the non-attainment designation for ozone (NOx and VOCs are ozone precursor compounds)[87], the PEJA and non-PEJA population of Astoria, like all others in the region, are exposed to these non-attainment pollutants and associated high ozone concentrations. Therefore, the PEJA population within the Study Area PEJA is not disproportionately exposed to ozone concentrations above the NAAQS.

There are two additional industrial facilities located in Queens County within the EJ Study Area that have the potential for environmental impacts:

- NYCDEP Bowery Bay Wastewater Treatment Plant, 43-10 Berrian Blvd. (Air State Facility permitted source of air emissions; wastewater discharge); and
- JB Waste Oil Co., 1818 41st St., (wastewater discharge).

These facilities were also in operation in 2010[88]; none of these facilities is in the PEJA.

The environmental burden due to remediation activities was also considered. **Table 3.3-3** lists the facilities and **Figure 3.3-5** depicts their locations within the study area.

[87] The area was also classified as nonattainment for $PM_{2.5}$ in 2010 but has since been reclassified to attainment.

[88] The Chemical Waste Disposal Corp. and Chemical Solvents Distillers Co. facilities located at 42-14 19th Ave. were in operation in 2010 but have since shut down.

Table 3.3-3 Facilities Located in Queens County within the EJ Study Area Included in Cleanup Programs

Facility/Site	Program	Status
Mystic Transportation, 19-39 Steinway St.	Voluntary Cleanup Program	No further action required at this time
21-25 31st St.	Brownfields Cleanup Program	Closed
ConEd Astoria Manufactured Gas Plant	State Superfund	Active
Triumvirate Environmental, 42-14 19th Ave	RCRA Corrective Action	Active

Only one site listed in **Table 3.3-3** is located in an EJ community (21-25 31st St.), and remediation activities have been completed at that site, indicating that the environmental burden to the community from this source has decreased. The remainder of the facilities are located in census block groups that do not meet NYSDEC PEJA thresholds. Therefore, the remediation activities in the study area do not disproportionally affect the EJ community. The 2010 DEIS described similar remediation activities present in the study area.

Petroleum and hazardous chemical spills that can impact the waters of the state must be reported to the NYSDEC. According to the NYSDEC Spills Incidents Database (https://www.dec.ny.gov/cfmx/extapps/derexternal/index.cfm?pageid=2), there were 9 spills reported in the past year (July 16, 2019 – July 16, 2020) in Queens County within the EJ Study Area. All of these spills occurred within the Astoria ConEd Complex.

Finally, the HOD Analysis documented in Section 3.3.8 clearly shows that the Astoria population residing within Zip Code 11105 (i.e., the HOD Study Area) continues to not reflect an unusual health outcome profile and, in fact, continues to be generally healthier with respect to asthma, cancers, and low birth weight than the selected zip code comparison areas as well as in comparison to all of Queens County and all of NYC.

3.3.7 Project Impacts, Benefits and Mitigations

The discussion of the Project's impacts in the EJ Study Area provided below shows that implementation of the Project as currently configured will not cause adverse or disproportionate impacts in the PEJA. Because the Project will replace the existing turbines at the Astoria Gas Turbine Power facility, there is no additional burden on the community. Moreover, the Project has been designed to provide environmental benefits as well as significant economic benefits to the community during construction and operation.

Figure 3.3-4 Locations of Major Air Emission Sources within the EJ Study Area

Figure 3.3-5 Locations of Remediation Sites within the EJ Study Area

The Project will:

- Fully address the local reliability shortfall in the Astoria East load pocket;
- Significantly reduce air emissions, including a reduction in GHGs (refer to Table 3.1-7);
- Facilitate the integration of renewable energy resources by providing long-term, long duration backup power supply;
- Lower costs to electricity customers in New York City by providing economic capacity (without a ratepayer guaranteed support contract);
- Contribute to New York's Energy Storage Goals by proposing to incorporate a 24 MWe battery storage system;
- Be capable of providing System Restoration Service;
- Minimize impacts to open space, wildlife, wetlands and waterbodies by utilizing an existing, pre-disturbed site located in the Astoria ConEd Complex (refer to Section 1.1);
- Allow for the displacement of much less efficient and dirtier peaking units during high energy demand periods;
- Improve emission dispersion due to a higher stack;
- Reduce water use and wastewater discharge from the Project as previously approved (refer to Section 3.3.7.2);
- Lower predicted project sound levels at residential receptors (refer to **Table 3.3-4**);
- Improved visual/aesthetic impacts as compared to the Project as previously approved, resulting from a decrease in the number of combustion turbine units and stacks from four to one (refer to **Figure 3.3-7** and **Figure 3.3-8** for a comparison of the Project renderings); and,
- Have a shorter construction period - 25 months (20 months of physical construction) as compared to the previously approved two-phase construction period totaling 60 months (refer to Section 3.3.7.15).

Given the foregoing, additional mitigation measures in the Project design are not required.

3.3.7.1 Air Quality

Implementation of the Project would result in improved air quality in Astoria and beyond.

Ambient air quality in the vicinity of the Facility has improved since 2010. In 2008, the U.S. Environmental Protection Agency ("USEPA") classified the area surrounding the Facility as not meeting the NAAQS (i.e., nonattainment) for $PM_{2.5}$ and O_3. The entire NYMA was, and continues to be, classified as a severe O_3 nonattainment area and, as such, the PEJA is not disproportionately impacted by this nonattainment classification (refer to Section 3.3.5 for additional discussion). $PM_{2.5}$ was reclassified as in attainment on December 12, 2012. Currently, the USEPA classifies the area surrounding the Facility as nonattainment for O_3 only.

As discussed in Section 3.1 of this DSEIS, permanently retiring the P&W combustion turbines (with the exception of one P&W twin pack that will be retained to enable black start capability only) will result in substantial reduction in NOx and CO emissions at the Facility. Annual emissions for the Project as modified are lower than emissions for the Project as previously approved. Dispersion modeling of Project emissions shows that maximum predicted concentrations are below the SILs[89] for criteria pollutants and the SGCs

[89] Maximum modeled concentrations of the new or modified sources that are less than the SIL for a particular pollutant and averaging period are considered by the NYSDEC and USEPA as "insignificant" for that pollutant and averaging period, provided that the difference between existing air quality and the NAAQS is greater than the SIL as it is for this Project.

and AGCs for air toxic compounds at all locations (both at ground level and elevated receptors). As shown in **Figure 3.3-6**, all maximum modeled concentrations occur outside the PEJAs.

The primary air emission source associated with the Project is the new GE H-Class 7HA.03 CTG (or equivalent). Emissions from the CTG will be minimized through a combination of advanced combustion technology, add-on emissions controls, and fuel selection, including:

- Low NOx combustion technology.
- Water emulsion to minimize NOx emissions during ULSD firing.
- Tempering air combined with conventional SCR to provide for additional NOx emissions control.
- Good combustion management systems coupled with catalytic oxidation to control of CO, VOCs and hazardous air pollutant ("HAP") emissions.
- Use of prompt start and fast ramp procedures minimizing the SU/SD emissions.
- Control system designed to achieve stack emissions compliant operation at any load between minimum emissions compliant load ("MECL") and base load across the prescribed ambient temperature range.
- The use of natural gas as the primary fuel and limited use of ULSD to minimize sulfate, fine particulate, and sulfuric acid formation.

Thus, the new CTG will meet the national targets for LAER for non-attainment pollutants and BACT for attainment pollutants, making the new unit among the lowest emitting units in the nation. In addition, emissions will be discharged from a 250-ft good engineering practice ("GEP") stack to improve air dispersion, as opposed to the 40-ft non-GEP stacks on each of the existing turbines. Benefits would occur for the community, because the Project will displace operation of much less efficient and dirtier peaking units during high energy demand periods, typically hot summer days most likely to result in smog formation from ozone precursors. As discussed in Section 1.4.1, the Project's new CTG offers the highest efficiency in its class and the Project incorporates design measures and air pollution control technologies to minimize air emissions that results in up 99% reductions in air emission rates. Because the NYISO dispatches the bulk power system based on the next lowest cost resource, the Project will displace older, less efficient generation in New York City. Therefore, there will be a net reduction of emissions in the New York City area associated with the Project's displacement of the older, less efficient units.

3.3.7.2 Water Resources

Water use (579 gallons per minute ("gpm") peak and 27.6 million gallons per year) and wastewater discharge to Outfall 001 (6 gpm peak) for the Proposed Modification are considerably lower than corresponding data for the previously approved Project configuration (1,368 gpm peak and 39.3 million gallons per year water use and 50-80 gpm peak discharge).

Figure 3.3-6 Location of Maximum Modeled Concentrations for Project

The SPDES permit for the Project configuration previously approved allows limited discharge through Outfall 001 to the East River via a 24-inch unperforated pipe from the following sources: (1) the discharge from an oil-water separator ("OWS") system that treats stormwater collected within the diked containment areas of the ULSK tanks and the adjacent truck unloading area and (2) the reverse osmosis ("RO") water treatment system reject waste stream[90]. The Project as modified will include a second OWS unit to treat runoff generated in the new CTG power generation area. After construction has been completed, discharges to Outfall 001 will include flows from the existing and new OWS systems, evaporative cooler blowdown and limited quantities of stormwater runoff from the power generation area.

As with the 2010 Project, water will be sourced from existing connections to the New York City water supply. No water will be withdrawn from the East River.

3.3.7.3 Noise

In 2010, it was determined that Project noise levels would cause an increase of 1.0 A-weighted decibels ("dBA") or less at the nearby residential areas and, therefore, would be below the significance criterion established by NYSDEC noise guidance and the New York City Environmental Quality Review ("CEQR") Technical Manual.

Due to the limited changes in the character of the neighborhood, the residential receptors used in 2010 remain appropriate for purposes of assessing the modifications to the Project as they continue to be the closest residential receptors to the Project Site. Accordingly, both a new ambient noise survey and noise modeling study were conducted to confirm that anticipated noise levels at these receptors remained below significance levels for the Project as modified.

As shown in **Table 3.3-4**, the results establish that predicted sound levels at all three residential receptor locations from the Project as modified will decrease from those predicted in the 2010 analysis.

Table 3.3-4 Comparison of Proposed Project Modification to Previously Approved Project Configuration - Predicted Sound Levels

Noise Receptor	Previously Approved Project Configuration				Proposed Project Modification			
	Project Sound Level (L_{eq}, dBA)	Measured Early Morning Ambient Sound Level (L_{eq}, dBA)	Cumulative Sound Level (L_{eq}, dBA)	Increase Over Ambient (dBA)	Project Sound Level (L_{eq}, dBA)	Measured Early Morning Ambient Sound Level (L_{eq}, dBA)	Cumulative Sound Level (L_{eq}, dBA)	Increase Over Ambient (dBA)
N-1	51.3	58	58.8	0.8	47.5	50.9	52.5	1.6(1)
N-2	53.5	60	60.9	0.9	48.2	59.7	60.0	0.3
N-3	52.0	58	59.0	1.0	46.7	60.2	60.4	0.2

(1) Result slightly lower than provided in the Final Scoping Document due to the revised modeling associated with updated GA.

[90] Historically, Outfall 001 was connected to the Facility's stormwater drainage system, which collected stormwater runoff from outside the containment areas. This connection was plugged in the mid-1990s, and stormwater discharge was not included in the previously approved Project's SPDES permit.

The increase over ambient will also decrease at two receptors, with only one receptor location showing a small increase over ambient, due to a decrease in ambient noise since 2010 (refer to **Appendix I**). For all three receptors, increases over ambient remain below 2 dBA.

Similar to 2010, predicted Project noise levels remain below the significance criteria as the projected increases over ambient are well below the 6 dB(A) increase threshold triggering further assessment as provided in the NYSDEC Program Policy DEP-00-1 - Assessing and Mitigating Noise Impacts. They are also below the New York City CEQR Technical Manual 3 dB(A) threshold.

3.3.7.4 Aesthetic/Visual Resources

The Project as modified will be sited at the same Astoria ConEd Complex and have a considerably smaller footprint than what was previously evaluated and found not to result in adverse visual or aesthetic impacts. As in 2010, the Project will be located in a large, relatively flat tract of land used for more than 100 years for the generation of electricity.

The scope and size of the Project has been reduced as has the potential for adverse visual and aesthetic impacts. For example, as permitted in 2010, the CC-FAST combined cycle trains had four stacks, each of which were to be built to 250 feet. The Project, as modified, will have only one stack, at the same 250 feet height. This is a significant reduction in stacks that might be visible from off-site. Regardless, in all the surrounding boroughs that could view the Project, there are several existing stacks used by other power stations located in the Astoria ConEd Complex that are in the same viewshed as the proposed stack for the Project.

Further, unlike in 2010 when the configuration of the Project included new and additional fuel storage tanks, the Project as modified does not include any new fuel tanks, with the exception of a small kerosene tank that will not be visible from outside the Astoria ConEd Complex. Similarly, since the Project as modified has a simple cycle configuration, it does not require four large indirect dry cooling systems that were required for previously approved Project.

Visual comparisons of the Project as previously approved versus the Project as modified are shown below in **Figure 3.3-7** and **Figure 3.3-8**.

Figure 3.3-7 Rendering of Previously Approved Project Configuration

2010 Permitted Configuration (CC Fast – 1,040 MW Combined Cycle)

Figure 3.3-8 Rendering of Proposed Project Modification

3.3.7.5 Traffic/Transportation

The Facility typically receives less than 10 truck trips per day including fuel deliveries, express shipping, and others. It also currently employs a small staff of about 20 full time personnel. Most of these employees commute to work by car.

As previously configured, the Project anticipated no changes in operational traffic as compared to existing operations. Specifically, there was an anticipated operational staff of 24 personnel and typically 10-truck trips per day as well as additional truck trips associated with fuel deliveries up to three times per year. NYSDEC determined that this would not result in any significant adverse traffic or transportation impacts.

For the Project as modified, operational traffic is anticipated to be lower than evaluated and approved in 2010. There will be fewer full-time personnel and, thus, the commuter expectation will be less than both the current number and the number projected for the Project as previously approved. Typical truck trips will also remain below 10 per day but truck trips associated with fuel deliveries will be less than what was anticipated with the previously approved Project configuration due to the smaller size of the plant (437 MWe vs 1040 MWe) and because the plant will be a peaking facility that will operate a considerably smaller portion of the year. The Project as previously approved was permitted to operate in excess of 85% of the year, while the Project as modified will be permitted to operate up to approximately 30% of the year.

Although NYSDEC does not have a guidance document addressing traffic and transportation impact review, this level of anticipated traffic is below the New York City CEQR Technical Manual threshold and traffic has not been scoped for the Project as modified.

3.3.7.6 Geology, Soils and Topography

The Project Site has not been materially altered since 2010. There are no Project modifications that will affect the existing geology, soils or topography differently than assessed previously. It is noted that the footprint for new equipment and construction activities is smaller than the Project as previously approved. In addition, it is anticipated that any impacts to geology, soils, and topography will be insignificant since the Project is located on an existing industrial site that is fully utilized.

3.3.7.7 Natural Resources

There continues to be no significant biological, terrestrial, or aquatic ecological resources onsite. Consistent with the 2010 evaluation, the Project as modified does not include any cooling water intake structures. Therefore, no impingement or entrainment or thermal issues are of concern with respect to the Project.

As discussed in Section 3.3.7.2 above, the Project as modified will use existing Outfall 001 to discharge flows from the existing and new OWS systems, evaporative cooler blowdown and limited quantities of stormwater runoff from the power generation area to the East River. The projected discharge was assessed as part of the SPDES permit application and was found to be within regulatory limits.

3.3.7.8 Historic, Cultural, and Archeological Resources

According to the NYSDEC EAF Mapper, there have been no significant changes or new National Register of Historic Places (“NRHP”) listed historic resources identified at the site or in the area immediately surrounding the Site since the NYSDEC as Lead Agency issued the 2010 FEIS. Although the site is located within an area designated by NYS Office of Parks, Recreation and Historic Preservation (“NYSHPO”) as having potential sensitivity for archaeological resources, in 2010, as part of the SEQRA process, clearance was obtained from the NYSHPO confirming the Project would not result in adverse impacts upon cultural resources. Project activities will occur within the same existing previously disturbed property. The Applicant has consulted with the NYSHPO (refer to **Appendix B**), and while a formal notification has not been

received during preparation of this Draft SEIS, the CRIS website indicates the following NYSPHO comment: "*Previously reviewed and approved as 08PR01279*" (https://cris.parks.ny.gov/Default.aspx, last accessed October 20, 2020.

3.3.7.9 Socioeconomic Conditions

As in 2010, the Project as modified would have minimal impact on the PEJAs located within the EJ Study Area. The identified PEJAs in the community are several thousand feet from the Facility and well outside of the gated and secured Astoria ConEd Complex, thereby preventing any direct public contact with the Facility. As an already existing power plant within the complex, the Applicant will merely be replacing aging equipment with state-of-the-art equipment that has potential benefits to improve the reliability and cost of electricity delivered to the community and the region. No businesses or properties will be displaced.

As documented **Appendix C** and summarized in Section 1.4 of this DSEIS, the Value Added that is attributable to construction and operations and maintenance ("O&M") spending for the Project is approximately $156 million in the construction phase (starting in 2021) and approximately $10.6 million on an annual basis in the operations phase (in 2020$). The Project will support an estimated 1,036 local job-years during the construction phase and approximately 73 additional local annual jobs related to O&M spending during the operations phase.

Implementation of the Project is also projected to result in a decrease in power prices in NYC (Zone J). Over the course of 13 years (2023-2035) covered in the analysis conducted by Navigant/Guidehouse, power prices are projected to be lower by an annual average $0.12/MWh in 2020$, resulting in an expected $83.5 million total energy cost savings over the period, and an average annual cost savings of $6.42 million annually (in 2020$). The average reduction in New York Zone J capacity prices during its first 5 years of operation (Summer 2023 to Winter 2027/28) is approximately $2.67/kW-month (in 2020$), resulting in an estimated $1.55 billion (in real 2020$) of total nominal capacity cost savings. Notably, the Project does not require any subsidy from New York ratepayers or taxpayers.

3.3.7.10 Land Use, Zoning, Neighborhood Character, and Open Space

Based on the Project's location inside the Astoria ConEd Complex, which has been fully developed for utility and power generating facilities since approximately 1900, electric generation is an approved use under the Site's M3-1 zoning designation (heavy manufacturing) and the fact that no zoning variances or reclassifications would have been required by code or expected for this Project, NYSDEC determined in 2010 that the Project would not have an adverse impact on land use and zoning. There have been no changes since 2010 with respect to the Site's land use and zoning. As previously discussed, no changes in local public lands will occur as a result of the Project. Nor does the neighborhood have any direct contact with the Site as it is isolated from the public within the Astoria ConEd Complex.

3.3.7.11 Coastal Zone Consistency

Article 42 of the NYS Executive Law and its implementing regulations found at 19 NYCRR Part 600 require that a proposed project located within the coastal zone demonstrate that it is consistent with the state's coastal management policies, or if a Local Waterfront Revitalization Program ("LWRP") exists, with the LWRP. The NYC WRP designates the NYC's coastal zone and establishes its policies for the use and development of the city's waterfront within that designated zone. In general, these policies are designed to promote and balance economic development (including the preservation of industrial areas), environmental protection and public access to the waterfront. As discussed later in Section 3.4, the Project as currently configured is consistent with the policies of the City's WRP.

3.3.7.12 Odors

Turbine operations have been conducted at the Facility since the early 1970s. No significant odor concerns or complaints have previously been noted or reported with respect to Facility operations. As the proposed

SCCT technology is state-of-the-art and has been demonstrated successfully at other locations, no significant odor concerns are expected in conjunction with the Project.

3.3.7.13 Infrastructure and Solid Waste

While the demolition of the existing equipment will create solid waste and construction and demolition ("C&D") debris, the contractors will utilize best efforts to recycle/recover materials from the demolition debris. Metals recovery and recycling will be maximized since these materials retain value in the secondary metals market. Some equipment will have remaining effective life and may be recovered for its current use. Landfill of C&D debris will be minimized to the extent practicable. During normal operations, the Facility will continue to generate solid and hazardous wastes similarly to those generated by the previously configured Project and current operations. No significant increase in waste generation is expected.

3.3.7.14 Use and Conservation of Energy

The 2010 Findings Statement concluded that, because the Project would "use far less fuel than the existing NRG Astoria facility to produce the equivalent amount of electricity … equating "to lower incremental energy costs and emissions" there would not be an adverse impact on the use and conservation of energy resources. There is no change in the potential effect on use and conservation of energy since 2010. The Project as modified will use even less fuel than the previously approved Project configuration. This equates to even lower incremental energy costs and emissions. Furthermore, when dispatched, the Project will help avoid the need to operate more expensive and less efficient peaking resources and will facilitate the interconnection of additional renewable resources. Accordingly, the Project will not cause an adverse impact on the effect on use and conservation of energy within the PEJA.

3.3.7.15 Construction

Construction (including parking and laydown) will occur within the access restricted Astoria ConEd Complex, at least 0.5 mile from the closest Census Block Group meeting the PEJA criteria. The construction period for the Project as modified will be considerably less compared to the previously approved Project configuration (25-month construction period [with 20 months of physical construction activities] compared to a total of 60 months). This will result in lower construction-related impacts including air emissions, noise and traffic. Further, as in 2010, it is expected barge delivery during construction will be utilized for large equipment due to its cost efficiency, ease of access, and to avoid local ground delivery by truck.

Excavation will be limited to site preparation and installation of new foundations for the new equipment. Excavated soil will be reused onsite, or if necessary, removed off-site for appropriate disposal. Water from construction dewatering activities will be pumped to temporary holding tanks located near active excavation areas. The contents of the tanks will be monitored and discharged to Outfall 001 if it meets the applicable SPDES requirements. If the water is unacceptable for discharge to Outfall 001, it will be loaded into tank trucks for appropriate off-site treatment and disposal.

3.3.8 Health Outcome Data Analysis

3.3.8.1 Overview

In accordance with NYSDEC Policy CP-29, the Applicant previously collected and evaluated existing health related events data for the project Study Area (the host community) and compared that information in a qualitative and quantitative manner to data for the same health related events in similarly configured communities apart from the project Study Area in support of the Project (referred to as the HOD analysis). As stated in the 2010 Findings Statement, "The HOD analysis prepared for this Project concluded that the Astoria community does not demonstrate health outcome statistics that are atypical of the larger metropolitan area, and that the proposed Repowering Project will have no net effect with respect to increasing the number or size of environmental facilities located within the study area." The updated analysis confirms the conclusions of the 2010 analysis.

Pursuant to Policy CP-29, the Applicant has updated the 2010 DEIS evaluation of the health-related community conditions in accordance with NYSDOH's Updated Guidance for Health Outcome Data Review and Analysis Relating to NYSDEC Environmental Justice Requirements for CP-29 and 6 NYCRR Part 487 (updated October 2014, revised January 2015, links updated June 2017, referred to as the updated HOD Guidance). The updated HOD Guidance provides the methodology to collect and evaluate existing health related events data for the Project study area (the host community) and to compare that information in a qualitative and quantitative manner for the same health related events in similarly configured communities apart from the Project study area. The updated HOD Guidance notes that the population of an impact study area may be more vulnerable to the effects of environmental exposures if it has a higher rate of health-related outcomes than comparison areas.

As noted in Section 4.11 of the April 16, 2010 DEIS, the NYSDOH guidance does not address causative factors in the health events data reported (such as heredity, age, lifestyle, nutrition, housing, health care, occupation, etc.) as do the Community Health Profiles prepared by the New York City Department of Health and Mental Hygiene ("NYCDHMH"). The Long Island City and Astoria Community Health Profiles (NYCDHMH, 2018) do address known causation factors such as smoking, obesity, physical activity levels, HIV/AIDS status, mental illness, drug and alcohol usage, and other important factors that may cause or contribute to significant health effects. The reader is guided to the broad array of community health related information available through the NYCDHMH and the NYSDOH for more information on causation factors, epidemiological data interpretations, and other related community health information. The Community Health Profile for Long Island City and Astoria contains the information and its interpretation from the NYCDHMH most relevant to the Astoria community. A brief listing of reading and source materials is presented in **Appendix H** for further inquiry.

The updated HOD Guidance lays out a methodology to perform this assessment for the study and comparison areas. Tabular displays of demographic and health outcome data have been prepared. The table of demographic data includes information on age, sex, race/ethnicity, population density, and income (median household income and percent of population with annual income below the poverty level as defined by the U.S. Census Bureau) for the HOD Study Area (host community) and each comparison area. Per the updated HOD Guidance, the HOD Study Area and comparison areas are identified on a ZIP code basis because health outcome data for small areas are tabulated at the NYSDOH website by ZIP codes. The rates of health outcomes in the HOD Study Area are compared to rates in the comparison areas by calculation of rate ratios and confidence intervals. The guidance focuses on use of readily available and mandatory hospitalization records compiled by the NYSDOH for zip code areas in New York State as well the New York State Cancer Registry.

The analyses of the health events rate ratios and the Community Health Profile information presented below support the conclusion that the overall health status in the HOD study area is comparable or better than the comparison ZIP code areas, Queens County, and all of New York City.

3.3.8.2 Selection of HOD Study Area and Comparison ZIP Code Areas

The host community ZIP code for the Project is 11105. This ZIP code covers the area including all of the ConEd Astoria Complex and the residential/commercial area from 20th Avenue south to 24th Avenue/Astoria Blvd approximately 1.2 miles from the Project site. Based on the air quality dispersion modeling for the current project configuration (refer to Section 3.1 of this SDEIS), the maximum annual impacts occur within this ZIP code. Consistent with the 2010 HOD analysis and updated HOD Guidance, the HOD Study Area for the updated HOD analysis is ZIP code 11105.

The following comparison areas were selected in accordance with Section I.D.b of the updated HOD Guidance:

- the county in which the study area is located (i.e., Queens County);

- a large regional comparison area (i.e., New York City);
- an area, composed of ZIP codes, with population densities (based on population data from the 2010 Decennial Census) of ± 10% of the ZIP code 11105 population and located in the same general geographic area (e.g., county or contiguous counties) (referred to hereafter as Similar ZIP Code Area); and,
- a comparison area composed of the ZIP codes that surround and are contiguous to the study area (referred to hereafter as Surrounding ZIP Code Area).

The first three comparison area categories are the same as used in the HOD analysis conducted for the 2010 DEIS; the fourth category was added in response to the updated HOD Guidance. **Figure 3.3-9** shows the locations of the Similar ZIP Code Area, while **Figure 3.3-10** shows the Surrounding ZIP Code Area used in the updated HOD analysis. **Appendix H** shows the population densities of all ZIP code areas located in Queens based on 2010 Decennial Census data (data from the 2020 Decennial Census are not yet available from the U.S. Census database). **Table 3.3-5** lists the ZIP code comparison areas meeting the ± 10% population density criteria that were selected for the updated HOD analysis based on a review of the population density data; the ZIP code areas for the 2010 HOD analysis (which were selected based on the 2000 Decennial Census data) are included for comparison.

Table 3.3-5 List of ZIP Code Areas Meeting Population Density Criteria

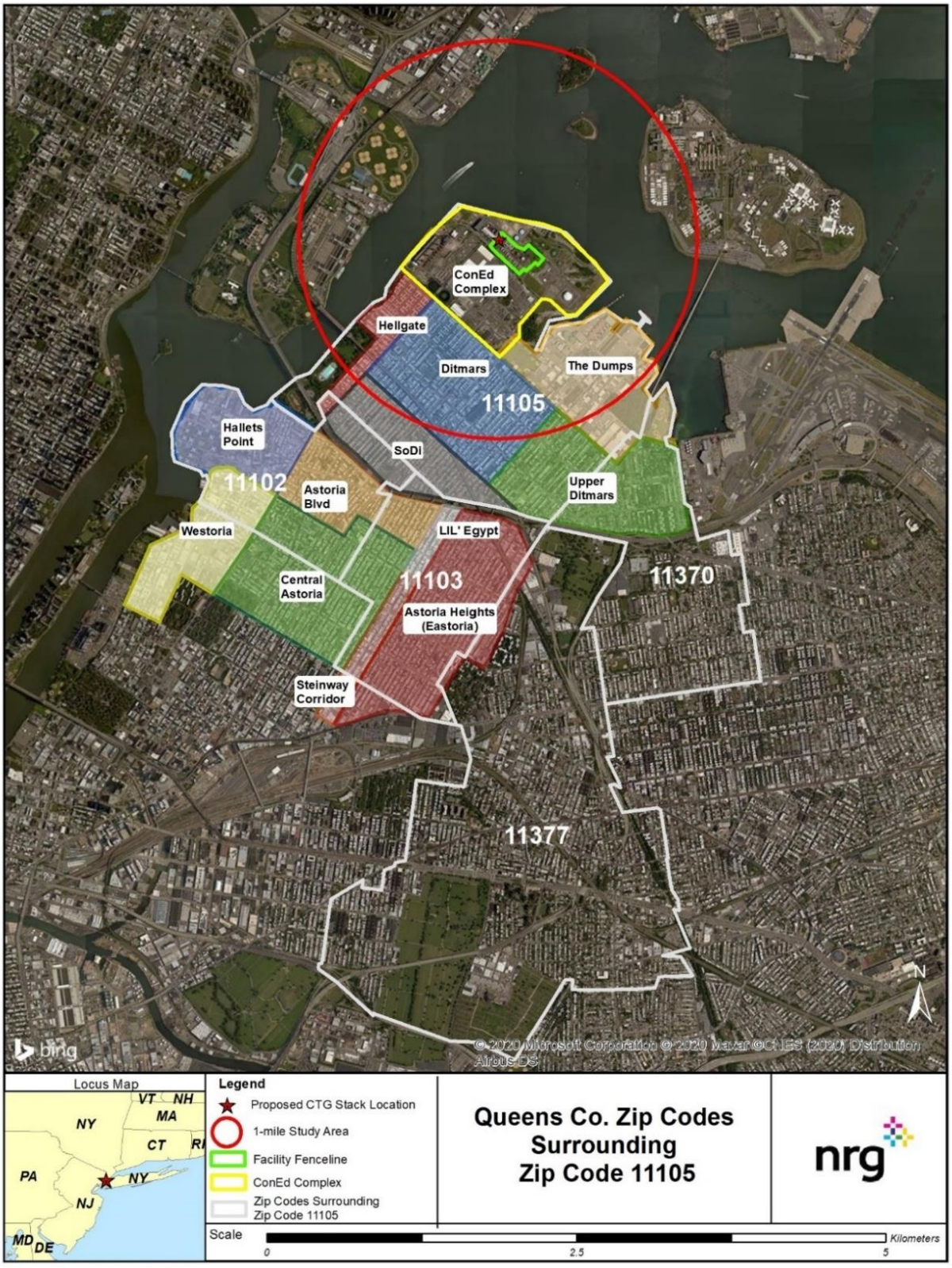
Updated HOD Analysis		2010 HOD Analysis	
ZIP Code	**Community**	**ZIP Code**	**Community**
11412	Saint Albans	11354	Flushing
11418	Richmond Hill	11375	Forest Hills
11420	South Ozone Park	11385	Ridgewood
11423	Hollis	11417	Ozone Park
11428	Queens Village	11428	Queens Village
11433	Jamaica	11432	Jamaica
11436	Jamaica		
11691	Far Rockaway		

The selection of the ZIP code comparison areas for the 2010 and current HOD analyses was different due to the different population densities of ZIP code 11105 (the HOD Study Area): 22,487 persons/square mile persons/mi2) (2010 census data) vs. 26,543 persons/mi2 (2000 census data).

The following ZIP codes were selected for the Surrounding ZIP Code comparison area based on the example provided in the updated HOD Guidance: 11102, 11103, 11370, and 11377.

Figure 3.3-9 Locations of the Similar ZIP Code Area

Figure 3.3-10 Locations of the Surrounding ZIP Code Area



3.3.8.3 Demographic Data for the HOD Study Area and Comparison Areas

Table 3.3-6 summarizes the updated data on age, sex, race/ethnicity, population density, and income (median household income and percent of population with annual income below the poverty level for the HOD Study Area and each comparison area; a comparison of these data to the 2010 HOD analysis is provided in **Appendix H**. A discussion of these data is provided below.

Population data for the current HOD study were obtained from the U.S. Census Bureau website (https://data.census.gov/cedsci/). Consistent with the updated HOD guidance, poverty and income data were obtained from the U.S. Census Bureau's most recent (2018) five-year American Community Survey ("ACS"). This survey is conducted on a sample of the nation's population each month. For the 2018 five-year ACS, five years of data from 2014-2018 are combined and averaged[91].

HOD Study Area

The HOD Study Area had a 2010 population of 36,688 (a 13% decrease relative to the 2000 U.S. Census). The racial makeup in 2010 was predominantly white (75% compared to 70% in 2000) with minorities (25% in 2010 compared to 30% in 2000) predominantly Asian and Hispanics, as defined by the U.S. Census Bureau. Low rise single family and rental housing continue to predominate with few buildings exceeding four stories. Extensive commercial development continues to exist throughout the area including neighborhood stores, restaurants, and service businesses. The portion of the HOD Study Area north of 20th Avenue is comprised of the Astoria ConEd Complex housing power plants and non-residential utility facilities and has no permanent population. Estimated 2018 median household income for the HOD Study Area was about $74,000 (compared to about $38,700 in 2000) and the total component of the population below poverty level dropped from 16.2% in 2000 to 10.6% in 2018.

Comparison Areas

The weighted-average population density for the Similar ZIP Code Area and the Surrounding ZIP Code Area were 21,552 persons/mi^2 and 30,614 persons/mi^2, respectively, in 2010 compared to 22,481 persons/mi^2 for the Study Area. Population densities in 2010 have decreased relative to 2000 in both the HOD Study Area and for the Similar ZIP Code Area (demographic data for the Surrounding ZIP Code Area was not developed for the 2010 DEIS). Gender distribution in 2010 for the Similar ZIP Code Area generally correlated well with the gender distribution for the HOD Study Area and were similar to 2000 values. However, the gender distribution for the Surrounding ZIP Code Area was opposite that of the HOD Study Area (i.e., more males than females)[92]. Age distributions for 2010 varied more significantly with the most apparent differences in the 5-14 and 20-44 age groups; this finding is also consistent with the 2000 data. Racial makeup in 2010 also varied more widely with the most apparent variability in the Black/African American and white racial groups. Total minority population in 2010 was about 90% and 70% for the Similar and Surrounding ZIP Code Areas, respectively, compared to about 35% for the HOD Study Area (the CP-29 threshold for minority population is 51.1%). The 2010 value is lower than the 2000 value (40.4%) for the HOD Study Area but higher for the Surrounding ZIP Code Area (58%). Additional demographic profile information was also collected for each comparison zip code. Weighted 2014-2018 average median household income for the Similar and Surrounding ZIP Code Areas was $63,073 and $44,589, respectively, compared to $73,959 for the Study Area. The current (2014-2018 average) HOD Study Area and Similar ZIP Code Area persons below poverty percentages (10.6% and 14.0%, respectively) were below the CP-29 defined low-income community of 23.59% of population. However, the

[91] The use of the most recent five-year ACS income data (instead of the 2007-2011 ACS data referenced in the Updated HOD Guidance) is consistent with the approach used in the HOD analysis for the 2019 Danskammer Energy Project.

[92] Population data from the 2010 Decennial Census for ZIP code 11370 (East Elmhurst) shows a male/female split of 61.8%/38.2%.

Surrounding ZIP Code Area persons below poverty percentage (29.8%) was above the low-income community threshold.

A review of the data in **Table 3.3-6** shows that the HOD Study Area as a whole does not meet either the minority or low-income criteria for selection as a Potential Environmental Justice Area ("PEJA"), whereas the minority criteria is exceeded for both the Similar and Surrounding ZIP Code Areas; this conclusion is consistent with the 2010 DEIS.

3.3.8.4 Community Health Data Profiles for the HOD Study Area and the Comparison Areas

Methodology

Per the updated HOD Guidance, the following health outcome data that are the most recently available from the NYSDOH were used in the updated HOD analysis:

- Asthma:
  - Emergency department visits for asthma from the Statewide Planning and Research Cooperative System ("SPARCS") available at http://www.health.ny.gov/statistics/ny_asthma/index.htm
  - 2012-2014 emergency department visits were used for the updated HOD analysis compared to 2004-2006 hospital discharges for the 2010 HOD analysis;
- Cancer:
  - Cancer incidence for male and female colorectal, female breast, male and female lung and bronchus, and male prostate cancer from the New York State Cancer Registry available at http://www.health.ny.gov/statistics/cancer/registry/zipcode/index.htm
  - 2005-2009 data were used for the updated HOD analysis compared to 1999-2003 data for the 2010 HOD analysis; and,
- Low Birth Weight ("LBW"):
  - LBW from the New York State County/ZIP Code Perinatal Data Profile available at http://www.health.ny.gov/statistics/chac/perinatal/index.htm
  - 2014-2016 data were used for the updated HOD analysis; this category was not evaluated as part of the 2010 HOD analysis.

Table 3.3-6 Demographic Profile of HOD Study Area and Comparison Areas – Health Outcome Data Analysis

	Part 1: Study Area (Zip Code 11105)		Part 2: Similar Zip Code Area[9]		Part 3: Surrounding Zip Code Area[10]		Part 4: Queens Co., NY		Part 5: New York City, NY	
			Total	Total	Total	Total				
Statistic	**Value**	**%**	**Value**	**%**	**Value**	**%**	**Value**	**%**	**Value**	**%**
Total Population[1]	36,688		275,318		202,431		2,230,722		8,175,133	
Land area (mi^2)[2]	1.632		12.8		5.537		109.24		303.32	
Population/mi^2	22,481		21,552		36,560		20,420		26,952	
No. of households[7]	15,363		87,175		68,130		779,234		3,154,103	
Sex[1]										
Male	17,881	48.7	130,025	47.2	106,188	52.5	1,079,803	48.4	3,882,544	47.5
Female	18,807	51.3	145,293	52.8	96,243	47.5	1,150,919	51.6	4,292,589	52.5
Age Distribution[1]										
<5	1,640	4.5	18,517	6.7	10,267	5.1	132,464	5.9	517,724	6.3
5 - 14	2,718	7.4	37,600	13.7	18,654	9.2	247,172	11.1	941,313	11.5
15 - 19	1,417	3.9	21,189	7.7	11,244	5.6	139,096	6.2	535,833	6.6
20 - 44	17,898	48.8	96,846	35.2	95,615	47.2	849,284	38.1	3,189,717	39.0
45 - 64	8,018	21.9	69,649	25.3	45,783	22.6	576,560	25.8	1,997,388	24.4
65+	4,997	13.6	31,517	11.4	20,868	10.3	286,146	12.8	993,158	12.1
Race/Ethnicity										
One Race[3]	35,388	96.5	258,027	93.7	193,896	95.8	2,129,809	95.5	7,849,232	96.0
White	27,698	75.5	50,764	18.4	95,936	47.4	886,053	39.7	3,597,341	44.0
Black or African-American	797	2.2	136,187	49.5	14,191	7.0	426,683	19.1	2,088,510	25.5
American Indian & Alaska Native	98	0.3	2,926	1.1	1,587	0.8	15,364	0.7	57,512	0.7
Asian	4,119	11.2	31,848	11.6	50,361	24.9	511,787	22.9	1,038,388	12.7
Hawaiian/Pacific Islander	21	0.1	368	0.1	113	0.1	1,530	0.1	5,147	0.1
Some Other	2,655	7.2	35,934	13.1	31,708	15.7	288,392	12.9	1,062,334	13.0
Two or more races[3]	1,300	3.5	17,291	6.3	8,535	4.2	100,913	4.5	325,901	4.0
Total Minority (Race)[4]	8,990	24.5	224,554	81.6	106,495	52.6	1,344,669	60.3	4,577,792	56.0
Hispanic or Latino[5]	7,210	19.7	59,815	21.7	70,124	34.6	613,750	27.5	2,336,076	28.6
Not Hispanic or Latino - White alone[5]	23,674	64.5	28,964	10.5	64,221	31.7	616,727	27.6	2,722,904	33.3
Total Minority (Race/Ethnicity)[6]	13,014	35.5	246,354	89.5	138,210	68.3	1,613,995	72.4	5,452,229	66.7
Income										
Median household income 2018 ($)[7]	73,959		63,073		62,630		64,987		62,972	
Persons below poverty 2018[8]	3,969	10.6	41,212	14.0	22,687	12.8	295,165	13.0	1,570,754	18.9
Persons above poverty 2018	33,379		253,323		155,211		472,429		1,222,706	
Total population 2018[8]	37,348		294,535		177,898		2,272,240		8,304,816	

Notes:

(1) Source: 2010 Decennial, data.census.gov, DEC Summary File 1, Table P12

(2) Sources: zip codes - https://www.zip-codes.com/county/; county zip codes - https://www.health.ny.gov/statistics/vital_statistics/2006/table02.htm

(3) Source: 2010 Decennial, data.census.gov, DEC Summary File 1, Table P3

(4) Sum of the values for One Race Alone (excluding White alone) plus Two or More Races

(5) Source: 2010 Decennial, data.census.gov, DEC Summary File 1, Table P5

(6) Total Minority as defined by the New York State Dept. of Environmental Conservation Commissioner's Policy 29: African-American, American Indian/Alaskan, Asian, Hawaiian/Pacific Islander, Some Other Race, Two or More Races, and the ethnicity Hispanic or Latino. It is calculated by subtracting the Not Hispanic or Latino - White Alone from the Total Population.

(7) Source: American Community Survey data, data.census.gov, Table S1901, 2018: ACS 5-year Estimates

(8) Source: American Community Survey data, data.census.gov, Table S1701, 2018: ACS 5-year Estimates

(9) Similar zip codes are those with population densities within +/ 10% of the population density for zip code 11105; for the 2020 Modified project - zip codes 11412, 11418, 11420, 11423, 11428, 11433, 11436, and 11691

(10) Data for zip codes surrounding Study Area zip code (11105) is a required component of the 2020 analysis per updated NYSDOH guidance for the 2020 Modified Project - zip codes 11102, 11103, 11370, and 11377; note that zip code 11371 qualifies as a surrounding zip code, but this zip code is for LaGuardia International Airport and there are no data for this zip code

Since the 2010 HOD analysis was conducted, data on low birth weight and asthma emergency department visits have become available by ZIP code. In accordance with the updated HOD Guidance, emergency department visit data were used rather than asthma hospital discharge data because asthma emergency department visits are more frequent than asthma hospital discharges, leading to potentially more stable rates for statistical analysis. However, in order to compare an updated asthma outcome to the reported 2010 outcome, updated asthma hospital discharge data were also summarized and are presented in **Appendix H**.

Updated health related data outcomes from NYSDOH's SPARCS database were obtained for the HOD Study Area and the comparison areas. For the asthma health outcome, an occurrence rate in reported events per 10,000 population was calculated for each of three age groups (0-17, 18-64, and 65+) as well as a total over all age groups based on a weighted average approach. Rate ratios for the three age groups were then calculated for each comparison area (ratio of the rate of the HOD Study Area to the rate in the comparison population). The rate ratios over all age groups were calculated using a NYSDOH spreadsheet accessed from Section IV of the updated HOD Guidance. Along with the standardized incidence ratio ("SIR"), the 95% confidence interval ("CI") of the data was calculated using this same spreadsheet to allow for a comparison of disease rates between the study area and comparison areas. The 95% CI provides information on whether the SIR represents a statistically significant difference between the study area rate and the comparison area rate. It also indicates whether the observed number of cases is significantly different from the expected number or if the difference may instead be due to chance alone.

Updated health related data outcomes from the New York State Cancer Registry database were obtained for the HOD Study Area and the comparison areas. The number of new cases of the specific type of cancer in the total population of the ZIP code (all ages) for the years 2005-2009 is presented in the database as the observed number. For each ZIP code, an expected number of cases over all ages is also provided[93]. A SIR, which is the ratio of the number of cases observed to the number of cases expected, was then calculated for each cancer type for the HOD Study Area and each comparison areas. CIs using the spreadsheet provided in Section IV of the updated HOD Guidance were also calculated. Because of the way the cancer data are adjusted for age in NYSDOH's database, the cancer data for the Study Area cannot be compared directly to the cancer data for the comparison areas as was done for asthma and LBW; instead, since the expected number of cases is based on the cancer rate for New York State, the state is the comparison area for the HOD Study Area and for the comparison areas (NYSDOH, 2017).

The percent of LBW births during a three-year period by ZIP code were obtained from the New York State County/ZIP Code Perinatal Data Profile database. Using this information, the percentage of LBW births was then calculated for the HOD Study Area and each comparison area. A rate ratio, which is the ratio of the percent LBW in the Study Area to the percent LBW in the comparison area, was then calculated for each comparison area. Confidence intervals using the spreadsheet provided in Section IV of the updated HOD Guidance were also calculated.

The rate ratios (asthma and LBW) and SIRs (cancer) show whether the HOD Study Area has a significantly higher or lower rate than the comparison areas. The updated HOD Guidance recommends that if the SIR exceeds 1.0 for the HOD Study Area, or the rate ratio between the HOD Study Area and comparison areas exceeds 1.0, the statistics should be further reviewed to evaluate the statistical basis for the 95% CI and any other data statistical reliability issues. If the statistical analysis confirms that the calculated rates and ratios results are reliable and reflect SIRs or rate ratios exceeding 1.0, NYSDOH recommends that the health status of the community of concern should be taken into account by the NYSDEC in the permitting evaluation process.

[93] The cancer rate for the entire state of New York and the number of people in a ZIP code are used to estimate the number of people in each ZIP code that would be expected to develop cancer within a specified five-year period if the ZIP code had the same rate of cancer as the state.

Summary of Results

Asthma

A summary of the updated asthma HOD analysis is provided in **Table 3.3-7** In general, the majority of the updated ratios for both asthma emergency department visits and hospital discharges are less than 1.0, indicating that asthma rates in the HOD Study Area are less than or similar to rates in the comparison areas. The updated SPARCS asthma outcome data for the HOD Study Area shows a rate of emergency department visits of 51.5 per 10,000 population (total over all age groups). The asthma emergency department visit rate for individuals in the HOD Study Area is lower than both the county rate (51.5 versus 76.9 per 10,000) and the citywide rate (51.5 versus 138.3 per 10,000).

The Similar ZIP Code Area and Surrounding ZIP Code Area show updated rates based on emergency department visits of 137.9 and 57.7 per 10,000 for the total population, respectively, while the high rate group for both comparison areas is the 0-17 years at 221.0 and 110.3 per 10,000. The updated rate ratios based on emergency department visits comparing the HOD Study Area to the Similar ZIP Code Area ranged from 0.31 to 0.78 with a total rate ratio of 0.40. The updated data were also compared to the Queens County as a whole and to New York City data. The updated Queens County rate ratio total based on emergency department visits was 0.71.

The New York City comparison rate ratio total based on emergency department visits was 0.40.

A comparison between the 2010 HOD analysis and the updated asthma HOD analysis is provided in **Appendix H**. Although hospital discharge data for asthma are no longer required according to the NYSDOH updated HOD Guidance, updated hospital discharge data for asthma are summarized in **Appendix H** for the purpose of comparison with the type of data used in the 2010 HOD analysis.

Table 3.3-7 Updated Asthma HOD Analysis for HOD Study Area and Comparison Areas

Age Group (years)	Emergency Department Visits (2012-2014)	Population[1]	Rate[2]
Part 1: HOD Study Area			
0-4	ND[6]	ND[6]	ND[6]
0-17	114	5,613	67.7
18-64	374	25,599	48.7
65+	71	4,941	47.9
Total (all ages)	559	36,181	51.5

Age Group (years)	Emergency Department Visits (2012-2014)	Population[1]	Rate[2], [5]	Rate Ratio[3]	95% CI, Lower[4]	95% CI, Upper[4]
Part 2: Similar ZIP Code Area						
0-4	ND[6]	ND[6]	ND[6]	ND[6]	ND[6]	ND[6]
0-17	4,552	68,646	221.0	0.31	0.25	0.37
18-64	6,421	177,678	120.5	0.40	0.36	0.45
65+	622	33,851	61.2	0.78	0.61	0.99
Total (all ages)	11,595	280,175	137.9	0.40	0.37	0.44
Part 3: Surrounding Zip Code Area						
0-4	ND[6]	ND[6]	ND[6]	ND[6]	ND[6]	ND[6]
0-17	1,201	36,303	110.3	0.61	0.51	0.74
18-64	1,864	134,190	46.3	1.05	0.95	1.16
65+	270	22,184	40.6	1.18	0.92	1.49
Total (all ages)	3,335	192,678	57.7	0.93	0.85	1.01
Part 4: Queens County						
0-4	8,824	142,437	206.5	ND[6]	ND[6]	ND[6]
0-17	21,447	469,402	152.3	0.44	0.37	0.53
18-64	28,228	1,520,086	61.9	0.79	0.71	0.87
65+	3,283	308,263	35.5	**1.35**	**1.05**	**1.70**
Total (all ages)	52,958	2,295,535	76.9	0.71	0.65	0.77
Part 5: New York City						
0-4	55,031	556,206	329.8	ND[6]	ND[6]	ND[6]
0-17	137,504	1,789,718	256.1	0.26	0.22	0.32
18-64	191,828	5,550,579	115.2	0.42	0.38	0.47
65+	19,617	1,071,967	61.0	0.79	0.61	0.99
Total (all ages)	348,949	8,410,436	138.3	0.40	0.37	0.43

Source: Statewide Planning and Research Cooperative System (SPARCS) data as of September 2016. For years 2012-2014.

https://webbi1.health.ny.gov/SASStoredProcess/guest?_program=/EBI/PHIG/apps/asthma_dashboard/ad_dashboard&p=mp&ind_id=ad4%20&cos=1

Note: SIRs greater than 1.0 with lower CIs above 1.0 indicate the differences are not likely due to chance and are shown in bold type.

(1) Population based on rate and number of ED visits. Population = ED Visits/Rate/3 (years)*10000 (NYSDOH, 2017)
(2) Visits per 10,000 over 2012-2014.
(3) Rate in HOD Study Area (ZIP code 11105) is numerator, rate in comparison area is denominator. Rate ratio for all ages is an age-adjusted standardized rate ratio, using the 0-17, 18-64, and 65+ age groups, as calculated by NYSDOH (2017).
(4) Confidence intervals (CI) calculated by NYSDOH asthma spreadsheet per NYSDOH (2017).
(5) Part 2 and Part 3 Rates calculated based on total ED visits and total population for all comparison zip codes; Rate = ED Visits/3(years)/Population*10000 (NYSDOH, 2017).
(6) Data for this age group not provided on NYSDOH website on a ZIP code basis.

Cancer

A summary of the updated cancer HOD and analysis is provided in **Table 3.3-8**. A comparison between the 2010 HOD analysis and the updated cancer analysis is provided in **Appendix H**.

Table 3.3-8 Updated Cancer HOD Analysis for Study and Comparison Areas

Cancer Site	No. of Cases Observed	No. of Cases Expected[1]	Standard Incidence Ratio[2]	95% CI Lower[3]	95% CI Upper[3]
Part 1: HOD Study Area					
Colorectal Cancer (Male)	49	25	0.87	0.64	1.15
Colorectal Cancer (Female)	48	55	0.88	0.65	1.16
Brest Cancer (Female)	125	154	0.81	0.68	0.97
Lung & Bronchus Cancer (Male)	62	79	0.79	0.60	1.01
Lung & Bronchus Cancer (Female)	28	71	0.39	0.26	0.57
Prostate Cancer	106	177	0.60	0.49	0.72
Part 2: Similar ZIP Code Area					
Colorectal Cancer (Male)	306	296	1.03	0.92	1.16
Colorectal Cancer (Female)	324	335	0.97	0.86	1.08
Brest Cancer (Female)	804	991	0.81	0.76	0.87
Lung & Bronchus Cancer (Male)	336	413	0.81	0.73	0.91
Lung & Bronchus Cancer (Female)	312	438	0.71	0.64	0.80
Prostate Cancer	1,176	952	1.24	1.17	1.31
Part 3: Surrounding ZIP Code Area					
Colorectal Cancer (Male)	201	219	0.94	0.80	1.05
Colorectal Cancer (Female)	210	224	0.94	0.81	1.07
Brest Cancer (Female)	517	667	0.78	0.71	0.84
Lung & Bronchus Cancer (Male)	276	300	0.92	0.81	1.04
Lung & Bronchus Cancer (Female)	195	292	0.67	0.58	0.77
Prostate Cancer	465	690	0.67	0.61	0.74
Part 4: Queens County					
Colorectal Cancer (Male)	2,785	2,888	0.96	0.93	1.00
Colorectal Cancer (Female)	2,930	3,071	0.95	0.92	0.99
Brest Cancer (Female)	7,489	8,781	0.85	0.83	0.87
Lung & Bronchus Cancer (Male)	3,207	4,022	0.80	0.77	0.83

Cancer Site	No. of Cases Observed	No. of Cases Expected[1]	Standard Incidence Ratio[2]	95% CI Lower[3]	95% CI Upper[3]
Lung & Bronchus Cancer (Female)	2,854	3,993	0.71	0.69	0.74
Prostate Cancer	8,134	9,112	0.89	0.87	0.91
Part 5: New York City					
Colorectal Cancer (Male)	9,504	9,476	1.00	0.98	1.02
Colorectal Cancer (Female)	10,166	10,378	0.98	0.96	1.00
Brest Cancer (Female)	26,789	30,131	0.89	0.88	0.90
Lung & Bronchus Cancer (Male)	11,215	13,194	0.85	0.83	0.87
Lung & Bronchus Cancer (Female)	10,239	13,505	0.76	0.74	0.77
Prostate Cancer	28,608	30,050	0.95	0.94	0.96

Source: New York State Cancer Registry, Cancer Incidence by Zip Code, 2005-2009 (NYSDOH, 2011)

https://www.health.ny.gov/statistics/cancer/registry/zipcode/index.htm

Note: SIRs greater than 1.0 with lower CIs above 1.0 indicate the differences are not likely due to chance and are shown in bold type.

(1) The cancer rate for the entire state of New York and the number of people in a ZIP code are used to estimate the number of people in each ZIP code that would be expected to develop cancer within the five-year period 2005-2009 if the ZIP code had the same rate of cancer as the state.

(2) The number of observed cases is the numerator and the number of expected cases is the denominator.

(3) Confidence intervals (CI) calculated by NYSDOH (2017) cancer spreadsheet.

Cancer rates for the HOD Study Area and the four comparison areas are compared to the rates for New York State. For the HOD Study Area, the SIRs for all cancer types evaluated were equal to or less than one, indicating that cancer incidence rates in the HOD Study Area are consistent with or less than rates of cancer expected based on the statewide rates. Updated New York State Cancer Registry data shows SIRs ranging from 0.39 to 0.88 for different cancer types in the HOD Study Area; this is lower than the range for the 2010 HOD analysis (0.59 to 1.05). The highest updated SIR was 0.88 (colorectal cancer in females) with a 95% CI range from 0.65 to 1.16, compared to 1.05 (colorectal cancer in males) with a 95% CI range from 0.82 to 1.33 from the 2010 HOD analysis. The updated SIRs for the HOD Study Area are lower than the corresponding SIRs for the 2010 HOD analysis for all cancer types with the exception of female colorectal cancer (updated SIR of 0.88 vs. 2010 SIR of 0.60). The updated SIRs for the four comparison areas are also at or below 1.0 for all cancer types with the exception of male colorectal cancer (1.03) and prostate cancer (1.24) for the Similar ZIP Code Area.

Examining the data for lung cancer rates shows that the updated SIRs for the HOD Study Area are 0.79 for males (CI range 0.60 to 1.01) and 0.39 (CI range 0.26-0.57) for females and are less than one, indicating that lung cancer incidence rates in the HOD Study Area are consistent with or less than rates of cancer expected based on the statewide rates. These results are an improvement from the 2010 HOD analysis that showed SIRs of 0.88 (males) and 0.76 (females). The updated SIRs for the Similar and Surrounding ZIP Code Areas are 0.81 and 0.92 for males and 0.71 and 0.67 for females, respectively. The updated SIR for Queens County is 0.80 (compared to 0.83 from the 2010 HOD analysis) for males and 0.71 (compared to 0.76 from the 2010 HOD analysis) for females. The updated SIRs for New York City are 0.85 for males and 0.76 for females (compared to 0.87 and 0.80 from the 2010 HOD analysis). As can be seen from this comparison, the updated lung cancer SIRs for males in the HOD Study Area are of similar magnitude to those of the larger comparison areas, while the SIR for females in the HOD Study Area is considerably lower than those for the comparison areas.

Low Birth Rate (LBW)

A summary of the LBW HOD analysis is provided in **Table 3.3-9**. This condition was not a required component of the 2010 HOD analysis and, as such, there is no comparison between the current and 2010 HOD analysis.

As shown in **Table 3.3-9**, the %LBW for the HOD Study Area is lower than the %LBW for the four comparison areas, resulting in rate ratios below 1.0. Furthermore, the 95% CIs are below 1.0 with the exception of the Surrounding ZIP Code Area, where the CI range is 0.70-1.11, indicating the difference between the Study Area and this comparison area may be due to random variation.

Table 3.3-9 Low Birth Rate HOD Analysis for HOD Study Area and Comparison Areas

Area	Low Birth Weight Births (2014-2016)	Total Births (2014-2016)	% Low Birth Weight Births[1]	Rate Ratio[2]	Lower 95% CI[3]	Upper 95% CI[3]
Part 1: HOD Study Area	76	1,232	6.2			
Comparison Areas						
Part 2: Similar Zip Code	1,244	11,831	10.5	0.59	0.46	0.74
Part 3: Surrounding Zip Code	490	6,983	7.0	0.88	0.70	1.11
Part 4: Queens County	7,345	90,683	8.1	0.77	0.60	0.96
Part 5: New York City	28,116	346,993	8.1	0.77	0.60	0.96

Source: 2014-2016 New York State Vital Statistics Data as of June 2018.

https://www.health.ny.gov/statistics/chac/perinatal/county/2014-2016/index.htm

(1) Average annual rate of low birth weight (LBW) births per 100 live births.
(2) % LBW in study area is numerator; % LBW in comparison area is denominator.
(3) Confidence intervals (CI) calculated by NYSDOH (2017) low birth weight spreadsheet.

Evaluation of Health Outcome Information

As discussed in Section I(h) of the updated HOD Guidance regarding comparisons between the HOD Study Area and comparison areas, the more often the observations fall into the same pattern, the greater the likelihood that the observations suggest a real difference in health status between the HOD Study Area and comparison area populations. The updated HOD Guidance states that, if any of the following conditions listed below is met, consideration of additional options for the permitting conditions should be reviewed as part of the permitting process because of the health outcome data displays and comparisons. The greater the number of conditions that are met, the greater the likelihood is that the health status of the HOD Study Area is actually lower (i.e., worse) than that found in other areas.

1. A disease rate is higher in the HOD Study Area than in any comparison area population for any health outcome;
2. A disease rate is higher in the HOD Study Area than in multiple comparison area populations for any health outcome;
3. The confidence intervals are greater than 1.0;
4. There is a pattern of higher rates of multiple health outcomes in the HOD Study Area; and
5. Health outcomes that result from an acute exposure (e.g., asthma exacerbations) are elevated rather than those that result from a chronic exposure (e.g., cancer).

The HOD Study Area combined asthma rate per 10,000 emergency room visits is lower than the combined rates for the four comparison areas. This suggests that the Study Area does not experience a disproportionate asthma health impact compared to other communities in the New York City area. Further, the rate ratios for individual age groups in the HOD Study Area compare favorably with the other areas, with the exception of the Surrounding ZIP Code Area [18-64 years (1.05) and 65+ years (1.18)] and Queens County [65+ age group (1.35)]. The CIs for these Surrounding ZIP Code Area exceptions include 1.0, indicating that the difference between these rates may be due to random fluctuation (NYSDOH, 2017). However, the lower CI of the HOD Study Area rate ratio, when compared to the Queens County (65+ age group), is greater than 1.0, indicating that the difference between the rates for the HOD Study Area and Queens for this age group is not likely due to chance. Given that there does not appear to be an increased rate of asthma-related emergency department visits for the HOD Study Area in all other comparisons and because other age groups do not fall into this pattern of increased rates for the HOD Study Area, it is unlikely that this increase represents an impact that is related to outdoor-air environmental impacts. Thus, it is reasonable to conclude that the HOD Study Area continues to show an overall marked lower asthma event level than all of the comparison areas including the entire Queens County and the entire New York City areas. This is the same conclusion reached in the previous HOD assessment as documented in the 2010 DEIS.

Cancer rates are tabulated in a different way than the asthma data discussed in the above paragraph. For cancer rates, the HOD Study Area and comparison area rates are compared to the rates for New York State. For the HOD Study Area, the updated SIRs are below 1.0 for all cancer types, with the CIs below or including 1.0. This means that cancer incidence rates in the HOD Study Area are consistent with or less than rates of cancer expected based on the statewide rates.

Personal choice, health-related issues are identified from the 2018 Long Island City and Astoria Community Health Profile (which is an update to the 2006 Northwest Queens Community Health Profile) developed by the New York City Department of Health and Mental Hygiene. These personal health choices pose significant impact potentials for those engaging in this behavior by choice and clearly influence the community health events data. The 2018 Long Island City and Astoria Community Health Profile encompasses the Study Area, as well as other areas outside of the Study Area in Astoria, Astoria Heights, Queensbridge, Dutch Kills, Long Island City, Ravenswood and Steinway. Highlights taken directly from this profile are:

- The asthma emergency department visit rate among children ages 5 to 17 in Long Island City/Astoria is lower than the citywide rate (145 *versus* 223 per 10,000 children) and well below the NYC 2020 citywide goal (145 *versus* 210 per 10,000 children).
- There is a lower rate of premature death (death before age 65) for Long Island City/Astoria residents relative to NYC citywide rates, including for cancer (38.6 *versus* 46.2 per 100,000 people) and for heart disease (27.1 *versus* 32.9 per 100,000 people).

Our analyses of the health events rate ratios and the Community Health Profile information support the conclusion that the overall health status in the HOD Study Area is comparable or better than the comparison ZIP code areas, Queens County, and all of New York City. This is consistent with the conclusions reached in the previous HOD assessment as documented in the 2010 DEIS.

3.3.8.5 Avoidance, Minimization and Mitigation of Potential Impacts

If the results of the HOD analysis demonstrate that one or more of the conditions listed in Section 3.3.8.4 are met, the updated HOD Guidance recommends that an applicant perform an evaluation and implementation of pollution prevention options, including:

- chemical substitution (which for fossil fuel power generation projects means the use of low polluting fuels);

- changes in workplace practices, which include but are not necessarily limited to reduction in fugitive emissions;
- emission reductions achieved through a review and incorporation into the proposed facility's design BACT and LAER technology;
- implementation of a holistic, or entire facility, environmental management system; and,
- where available, the purchase of emissions offsets.

Although the updated HOD analysis demonstrates that the overall health status in the HOD Study Area is comparable or better than the comparison areas, the Project will meet and exceed the above recommendations to mitigate potential air quality-related burdens to the HOD Study Area, including those portions of the HOD Study Area that meet the EJ criteria.

Specifically, potential adverse air impacts have already been avoided and minimized through Project design, which includes a state-of-the-art air pollution control system (SCR for control of NOx emissions and oxidation catalyst for control of VOC and CO emissions that meet or exceed LAER and BACT for the respective nonattainment and attainment pollutants) that will minimize air emissions to the maximum extent practicable. The air quality impact analyses (refer to Section 3.1) that have been conducted demonstrated that operation of the Project would result in ambient concentrations of criteria and air toxic compounds that are well below health and welfare-based ambient air quality standards and guidelines. The Project will improve air quality conditions in the Study Area by reducing NOx emissions from the current facility, improving air dispersion with significantly greater stack heights, and through the fuel selection (use of natural gas as the primary fuel with ULSD as the secondary fuel).

3.3.9 How the EJ Analysis Responds to the CP-29 Requirements

3.3.9.1 Identification of Potential Environmental Justice Areas

A review of the 2010 U.S. Census data and 2018 ACS 5-year estimated data from the U.S. Census Bureau (average of data from 2014-2018) was performed to identify the PEJAs through determination of minority populations and income levels. Census data were reviewed to assess demographics including race, ethnicity, income, population density, and other characteristics for this EJ Analysis and for the HOD Analysis. Additionally, other demographic metrics were gathered as well including information on housing, property values, rental rates, and health outcome data. Consistent with the previously approved EJ analysis, the EJ Study Area continues to be that portion of the area located in Queens County within one mile of the Facility. However, a larger area encompassing all of Zip Code 11105 (i.e., the HOD Study Area) was used for the HOD analysis to be consistent with the NYSDOH's SPARCS, Cancer Registry, and Low Birth Rate data accumulation.

3.3.9.2 Determination of No Adverse or Disproportionate Impact to the PEJA

An analysis was conducted to assess the environmental burden to the PEJA in Queens County located within the EJ Study Area in comparison to non-EJ communities in Queens County within the EJ Study Area. As discussed in Section 3.3.6, the analysis demonstrated that:

- The overall portion of the population of Astoria within the EJ Study Area falls well outside of the characteristics of EJ review criteria (poverty and minority) and are subject to the same net environmental burden as are the persons living within the defined EJ areas.
- The Project will have no net effect with respect to increasing the number or size of environmental facilities located within the study area.
- An evaluation of the number of facilities/sites located in Queens County within the EJ Study Area shows that the environmental burden to the PEJA is significantly lower than to the rest of the EJ study area.

As discussed in Section 3.3.7, an evaluation of the Project's impacts in the EJ Study Area shows that implementation of the Project as currently configured will not cause adverse or disproportionate impacts in the PJEA. The new CTG will be equipped with state-of-the-art emissions controls and have a GEP stack built to 250 feet to improve air dispersion and reduce impacts, as opposed to the 40-foot stacks on each of the existing turbines. Furthermore, the Project will provide significant economic benefits to the community during construction and operation. This conclusion is consistent with the findings of the 2010 EJ analysis.

The HOD Analysis clearly shows that the Astoria population residing within the HOD Study Area continues to not reflect an unusual health outcome profile and, in fact, continues to be generally healthier with respect to asthma, cancers, and low birth weight than the selected zip code comparison areas as well as in comparison to all of Queens County and all of NYC.

3.3.9.3 Supplemental Enhanced Public Participation Plan

As noted in Section 3.3.1, the Applicant has updated and supplemented the 2010 EPPP for the Project and submitted a draft Supplemental EPPP to the NYSDEC in late April concurrently with the 2020 Air Permit and SPDES applications. The Applicant has submitted quarterly progress reports that summarize the progress to-date in implementing the plan to the NYSDEC. See **Appendix G**.

In accordance with CP-29 and NYSDEC's April 24, 2020 *Guidance on Commissioner's Policy 29 During the COVID-19 Public Health Crisis*, Astoria has held two virtual public participation meetings on July 16, 2020 and January 21, 2021 to provide the public an opportunity to learn about the Project and the environmental review process. Notification of this first meeting was published in the July 1 ENB. Both meetings were also noticed in local newspapers (Queens Chronical and Queens Gazette) and also mailed to Project stakeholders as identified in the Supplemental EPPP, **Appendix G**. As part of its virtual public participation plan, the Applicant established a Project email address, phone number and post office box to accept comments or questions from the public.

The Applicant has set up an on-line website for project information: www.cleanerpowerforastoria.com. The website contains a fact sheet about the Project provided in English and other languages; the Applicant's PowerPoint presentations for its two virtual meetings; Project documents including the air and SPDES permit applications, full EAF, the draft Supplemental EPPP, the draft scoping document; and other information on the Project. This DSEIS will be available on the website when noticed for public comment by the NYSDEC. Project materials have also been made available at the Astoria Public Library, Queens Branch.

The Applicant has met regularly with local community groups and elected officials with regard to the plant and the proposed Project, responded to public and media inquiries and sought to understand issues of importance to the neighboring community and other interested stakeholders.

3.3.10 COVID-19

According to the New York State Department of Health:

> SARS-CoV-2, a novel coronavirus, was first identified as the cause of an outbreak of respiratory illness in Wuhan, Hubei Province, China in 2019. There are many coronaviruses, all of which typically cause respiratory disease in humans. The World Health Organization ("WHO") named the disease caused by SARS-CoV2 "COVID-19."

COVID-19 was declared a pandemic on March 11, 2020 due to the number of countries affected by its rapid spread. This Section analyzes the concern that air emissions from the Project will cause the community near the Site to be more susceptible to increased severity of COVID-19 infection symptoms and worsened prognosis for COVID-19 patients.

3.3.10.1 Literature Review

It has been hypothesized that ambient air pollution generally, and $PM_{2.5}$ specifically, may be a risk factor for COVID-19 severity, including higher risk of mortality. Such hypotheses are based on reported statistical correlations between air pollution levels and many of the pre-existing conditions that have been associated with poor prognosis and death in COVID-19 patients (*e.g.*, respiratory and cardiovascular disease, asthma, diabetes), as well as study findings suggesting that air pollution exposure may impair early immune responses to infection (Wu *et al*., 2020). A growing number of epidemiological studies have investigated statistical associations between long- and short-term ambient air pollutant exposure levels and COVID-19 mortality rates, including the Adhikari and Yin (2020) study that focused on Queens, New York City, and other nationwide studies (*e.g.*, Wu *et al*., 2020). Interestingly, the methodologies used in many of these preliminary epidemiologic investigations have recently been carefully critiqued, and several shortcomings common to many of the analyses have been identified (Villeneuve and Goldberg, 2020; Heederik *et al*., 2020).

A review of one of the more prominent studies to link $PM_{2.5}$ air pollution with worsened COVID-19 outcomes (nationwide) – namely, the Wu *et al*. (2020) study that was initially released as a non-peer-reviewed preprint by researchers at the T.H. Chan Harvard School of Public Health in April 2020, and was published as a final peer-reviewed paper in November 2020 after extensive modifications– shows that this literature remains far too uncertain and limited to draw any reliable conclusions regarding the linkage between outdoor air pollutants such as $PM_{2.5}$ and COVID-19 outcomes generally, and certainly remains so for specific locales and populations. Additional detailed commentary on air pollution epidemiology studies related to COVID-19 susceptibility is provided in **Appendix H**.

3.3.10.2 Potential Impacts

Despite its uncertain and limited nature, the early literature has focused on long-term exposure to $PM_{2.5}$ as potentially exacerbating the severity of COVID-19 infection symptoms and worsening the prognosis for COVID-19 patients. (Wu *et al*., 2020). Thus, focusing on $PM_{2.5}$, there are two key reasons why $PM_{2.5}$ emissions from the Project would not be expected to significantly impact COVID-19 outcomes in communities nearby to the Facility, even if the science with regard to $PM_{2.5}$ and COVID-19 develops further.

First, as discussed in Section 3.1, there is a large margin between the background ambient $PM_{2.5}$ air quality in the region and the health-protective NAAQS (see **Table 3.3-10**), which are the levels of pollutants in the ambient air that have been determined to be protective of human health, including the health of sensitive subpopulations such as children, the elderly, and those with chronic respiratory problems. Further, even when adding the Project's modeled concentrations to the present-day ambient $PM_{2.5}$ background as shown in **Table 3.3-10**, the NAAQS for $PM_{2.5}$ are not exceeded, as the cumulative concentration represents only 53% of the 24-hour $PM_{2.5}$ NAAQS and 67% of the annual $PM_{2.5}$ NAAQS.

Table 3.3-10 $PM_{2.5}$ NAAQS Analysis for the Project

Pollutant	Averaging Period	Concentration (µg/m³)			NAAQS (µg/m³)	Percent of NAAQS
		Modeled Project Sources(1)	Ambient Background(2)	Total		
$PM_{2.5}$	24-hour	0.45	18	18.45	35	53%
	Annual	0.05	8	8.05	12	67%
See **Table 3.1-10**. See **Table 3.1-2**.						

Second, the Project will, in fact, result in a significant reduction in $PM_{2.5}$ emissions due to its displacement of older and less efficient power generation facilities. As discussed in Section 1.4.1, the Project's new CTG offers the highest efficiency in its class. In addition, the Project incorporates design measures and air

pollution control technologies to minimize air emissions that results in a reduction of $PM_{2.5}$ emission rates of approximately 36% and 68% for gas and liquid fuel use, respectively (see **Figure 3.1-1**). Because the NYISO dispatches the bulk power system based on the next lowest cost resource, the Project will displace older, less efficient generation in New York City, which will result in a reduction in overall air emissions after the Project is in operation, thus improving regional air quality. An analysis was conducted to estimate the reduction in $PM_{2.5}$ emissions in New York City associated with the Project's displacement of the older, less efficient units.

The existing units/plants that would likely be displaced by the new Project CTG were identified. Reported emissions and operational data obtained from USEPA's Emissions & Generation Resource Database (eGRID, https://www.epa.gov/egrid/egrid-technical-documents) were used to develop plant-wide $PM_{2.5}$ emission factors in lb/MWh for these units. For comparison, representative $PM_{2.5}$ emission factors and emissions for the Project CTG were developed using the maximum permitted $PM_{2.5}$ short-term (lb/hr) emission rate for the CTG and the dispatch projections developed by Navigant/Guidehouse for the years of 2023-2035.

The weighted average $PM_{2.5}$ emission factor for the displaced units is estimated at 0.1186 lb/MWh compared to a projected $PM_{2.5}$ emission factor of 0.0693 lb/MWh for the Project CTG (about 42% lower). Based on the projected dispatch of the new CTG, the Project's operation is forecasted to result in a direct reduction of up to 9.8 tons of $PM_{2.5}$ in 2024 and an average of 3.9 tpy of $PM_{2.5}$ over 2023-2035. The Project, therefore, will result in $PM_{2.5}$ emissions ***reductions*** in the area and thus contribute to local and regional ***improvements*** in $PM_{2.5}$ air quality.

3.3.10.3 Conclusion

A review of existing literature establishes that there is no expectation that construction or operation of the Project will cause increased COVID-19 susceptibility or severity for nearby communities. Some press accounts of research-in-progress have suggested a link between high ambient levels of $PM_{2.5}$ and COVID-19 outcomes, but at this time they are based on incomplete data and flawed methodologies. However, even if scientists conclude down the road that there is evidence of a causal connection between ambient $PM_{2.5}$ and either increased COVID-19 susceptibility or severity, the Project will not adversely affect COVID-19 health outcomes because (i) present-day ambient $PM_{2.5}$ levels in Astoria are a fraction of the NAAQS and (ii) operation of the Project actually ***reduces*** $PM_{2.5}$ emissions and will improve local and regional air quality.

3.4 Coastal Consistency / NYC Waterfront Revitalization Program

The Project is located within New York City's coastal zone designated by the NYS Department of State ("NYSDOS") and, as such, is subject to review for its consistency with the City's Waterfront Revitalization Program ("WRP"). In accordance with the guidelines of the 2014 *CEQR Technical Manual*, a preliminary evaluation of the Proposed Action's potential for consistency with the new WRP policies was undertaken. Actions located within the City's Coastal Zone generally require submission of the WRP Consistency Assessment Form ("CAF"). This form is intended to assist an applicant in certifying that a Proposed Action is consistent with the approved WRP. A copy of the completed CAF is provided in **Appendix J**.

The WRP establishes the City's policies for waterfront planning, preservation and development projects to ensure consistency over the long term. The goal of the program is to maximize the benefits derived from economic development, environmental conservation and public use of the waterfront, while minimizing any potential conflicts among these objectives. The WRP is authorized by New York State's Waterfront Revitalization of Coastal Areas and Inland Waterways Act, which was enacted in response to the Federal Coastal Zone Management Act and allows municipalities to participate in the State's Coastal Management Program by creating their own WRP.

The Project previously was evaluated to determine if it was consistent with the WRP. This evaluation considered the City's original WRP (circa 1982).[94] As part of the 2010 EIS, NYSDEC found that the Project was "consistent with the policies of the [L]WRP in that it maximizes the benefits derived from economic development and environmental management." NYSDEC, therefore, concluded that the Project "complies with all state and local coastal zone requirements."

This coastal consistency review is warranted for this supplemental SEQR assessment because of a change in circumstances since the 2010 FEIS and Findings Statement were issued. Since the NYSDEC determined that the Project was consistent with the policies of the WRP, in October 2013, the City Council approved a revised version of the WRP. The intent of these revisions was to update the policies based on new information and to reflect the City's objectives for waterfront revitalization, as embodied in Vision 2020, the NYC Comprehensive Waterfront Plan, released in 2011. In February 2016, the revised WRP was approved by New York State Secretary of State with the concurrence of the U.S. Secretary of Commerce.

The WRP establishes policies for development and use of the waterfront and coastal areas. The City's WRP is comprised of ten principal policies designed to maximize the benefits derived from economic development, environmental preservation, and public use of the waterfront, while minimizing the conflicts among those objectives. A Proposed Action may be deemed consistent with the WRP when it would not substantially hinder and, where possible, would promote one or more of the ten WRP policies dealing with: (1) residential and commercial development; (2) water-dependent and industrial uses; (3) commercial and recreation boating; (4) coastal ecological systems; (5) water quality; (6) flooding and erosion; (7) solid waste and hazardous substances; (8) public access; (9) scenic resources; and (10) historical and cultural resources.

The CAF requires a Proposed Action to be characterized according to a list of 45 sub-policies that fall under the ten major policy objectives. For each sub-policy, the action is to be characterized as to whether it will "promote," "hinder," or have no relevance to the policy. A "Promote" or "Hinder" response to any of the CAF questions indicates that a particular policy of the WRP may be relevant, thus warranting further examination. A "N/A" response indicates the particular policy is not applicable to the Proposed Action. Per the CAF, the following policies warranted further assessment: 1.1, 1.3, 1.5 and 6.1, 6.2, 7.1, 7.2, and 7.3. An assessment of the Proposed Action's consistency with each of these policies is provided below.

3.4.1 POLICY 1: Support and facilitate commercial and residential redevelopment in areas well-suited to such development.

1.1 Encourage commercial and residential redevelopment in appropriate coastal zone areas.

Policy 1 has not changed since the Project was previously found to be consistent with the New York City WRP. Modifications to the Proposed Action do not alter this analysis. The Proposed Action would continue to update the existing facility to meet current demands of the energy market, which will allow retention of existing jobs in an area zoned for manufacturing and industrial uses, and where there is a concentration of industrial activity. The Project site is still located within the larger approximate 300-acre Astoria Con Ed Complex. The entire Astoria Con Ed Complex has been fully developed for utility and power generating facilities since the 1890's and that has not changed since 2010.

[94] The 1982 WRP was subsequently amended in 2002 to update New York City's vision for its waterfront as reflected in the first Comprehensive Waterfront Plan (1992), companion Borough Waterfront Plans (1993-94) and new waterfront zoning. Per the 2010 EIS, the overall principles and requirements in the 1982 WRP were reinforced in the 2002 WRP, however, the new program consolidated the old policies into ten main categories. The 2002 WRP also clarified that a project is deemed consistent with the WRP if it will not substantially interfere with any of these policies and, where practicable, will advance one or more of the polices. Because the waterfront consistency analysis in the Berrians Environmental Assessment Statement ("EAS") was comprehensive and the analysis required for the Project was fundamentally the same, the 2010 EIS relied on the Coastal Zone Assessment (Appendix H) in the EAS for the Berrians Project (Appendix F of the 2010 EIS) included in **Appendix J** of this DSEIS.

Furthermore, the section of the coastal zone within the boundaries of the Project Area still does not contain any natural or topographic features that would hinder new redevelopment. Therefore, this area remains appropriate for the redevelopment of the power generation site that would be facilitated by the Proposed Action. As the Proposed Action would facilitate industrial redevelopment in an area currently characterized by industrial uses, it is therefore still consistent with this policy as determined by NYSDEC in its 2010 Findings Statement.

1.3 Encourage redevelopment in the Coastal Zone where public facilities and infrastructure are adequate or will be developed.

The Proposed Action encourages the redevelopment of an existing industrial use in a portion of the coastal zone where infrastructure and public facilities are adequate. As noted above, the Project site is located within the larger approximate 300-acre Astoria Con Ed Complex and the entire Astoria Con Ed Complex has been fully developed for utility and power generating facilities since the 1890's.

The Project Area is served by public transit via the Q100 bus route which has a stop located one block south of the Con Ed Complex, and the Ditmars Blvd station on the "N" and "W" subway lines is located about 0.5 mile to south. The Con Ed complex has sufficient onsite parking for employees as well. The Proposed Project would not require improvements to existing public infrastructure. As such, as was previously determined,[95] the Proposed Action would encourage redevelopment in an appropriate area within the coastal zone and is supportive of WRP Policy 1.3.

1.5 Integrate consideration of climate change and sea level rise into the planning and design of waterfront residential and commercial development, pursuant to WRP Policy 6.2.

See response to Policy 6.2, below.

3.4.2 POLICY 6: Minimize loss of life, structures, infrastructure, and natural resources caused by flooding and erosion, and increase resilience to future conditions created by climate change

6.1 Minimize losses from flooding and erosion by employing non-structural and structural management measures appropriate to the site, the use of the property to be protected, and the surrounding area.

The proposed Project would require the new construction to incorporate resiliency measures within its design, which may include elevating utilities; implementing energy-efficient measures; implementing dry and wet flood-proofing measures; and improving storm water management systems. In addition, the new structures associated with the Project would comply with "Appendix G: Flood-Resistant Construction" of the New York City Building Code. The Project grade elevation of 18 feet 6 inches accounts for 30 inches of sea-level rise projection and an additional 3 feet for freeboard (see Section 3.2.3).

As such, as was previously determined,[96] the Proposed Action would minimize losses from flooding and erosion and is consistent with WRP Policy 6.1.

6.2 Integrate consideration of the latest New York City projections of climate change and sea level rise (as published in New York City Panel on Climate Change 2015 Report, Chapter 2: Sea Level Rise and Coastal Storms) into the planning and design of projects in the City's Coastal Zone.

One of the most significant revisions to the WRP in 2015 was to incorporate the consideration of climate change projections for coastal flooding and sea level rise into the design and review of projects. Policy 6.2 requires all projects, except for maintenance and in-kind replacement of existing facilities, to identify

[95] The 2001 Coastal Zone Assessment evaluated a comparable policy (Policy 5) and concluded that the Berrians Project was consistent.

[96] The 2001 Coastal Zone Assessment evaluated a comparable policy (Policy 17) and concluded that the Berrians Project was consistent.

potential vulnerabilities to and consequences of sea level rise and coastal flooding over their lifespan and to identify and incorporate design techniques to address these risks.

Portions of the Site are located within the 1% Annual Chance Floodplain, as shown in both the Effective Flood Insurance Rate Map ("FIRM"), **Figure 3.4-1**, and the Preliminary Flood Insurance Rate Map ("PFIRM"), **Figure 3.4-2**, published by the Federal Emergency Management Administration ("FEMA").

The WRP Climate Change Adaptation Guidance document and corresponding Flood Elevation Worksheet were used to conduct the Policy 6.2 detailed assessment for the Project. The purpose of the Flood Elevation Worksheet is to assist the applicant in identifying vulnerabilities in the proposed project design by comparing critical design elevations to the future forecasted 1% Annual Chance Floodplain and to the future forecasted Mean High Water level.

As illustrated in **Figure 3.4-2**, FEMA's FIRM indicates that the proposed Project is located within the 1% annual chance flood hazard zone. The Project is in flood zone AE, with a Base Flood Elevation of 13 feet. The WRP calculator was completed for the Site and the forecast charts are shown in **Figure 3.4-3**. Using these projections, sea level at the Site will rise between 0.75-2.25 feet by the 2050's (expected lifespan of project is 30 years), depending on the level of projections.

A summary of the Project structures and dimensional information is provided in **Table 3.4-1**.

Table 3.4-1 Project Structure Dimensional Information

Designation on General Arrangement Drawing	Description	Length (ft)	Width (ft)	Height (ft)	Grade Elevation (ft amsl)(1)
001/002	Combustion Turbine	81	43	31	18.5
003	SCR Unit	55	57	60	18.5
005	Combustion Turbine Stack	28.5 (dia.)	28.5 (dia.)	250	18.5
021	Inlet Filter	41	59	94	18.5
012	Cooling Fan Module	62	53	20	18.5
004	Tempering Air Fan	70	40	28	18.5
022	Demin Water Tank	56 (dia.)	56 (dia.)	40	18.5
053	Raw Water Tank	40 (dia.)	40 (dia.)	34	18.5
033	Water Treatment Enclosure	136	60	30	18.5
099	Kerosene Tank	16	8	24.5(2)	32(3)
097	Battery Energy Storage System	485	40	10	18.5

1) Feet above mean sea level.
2) Height of tank above grade elevation.
3) Tank will be located on roof of existing P&W Unit #4 structure which is 16 feet above a grade elevation of 16 feet. Accordingly, the total base elevation of the tank above mean sea level is 32 feet.

Figure 3.4-1 Effective FEMA Floodplains

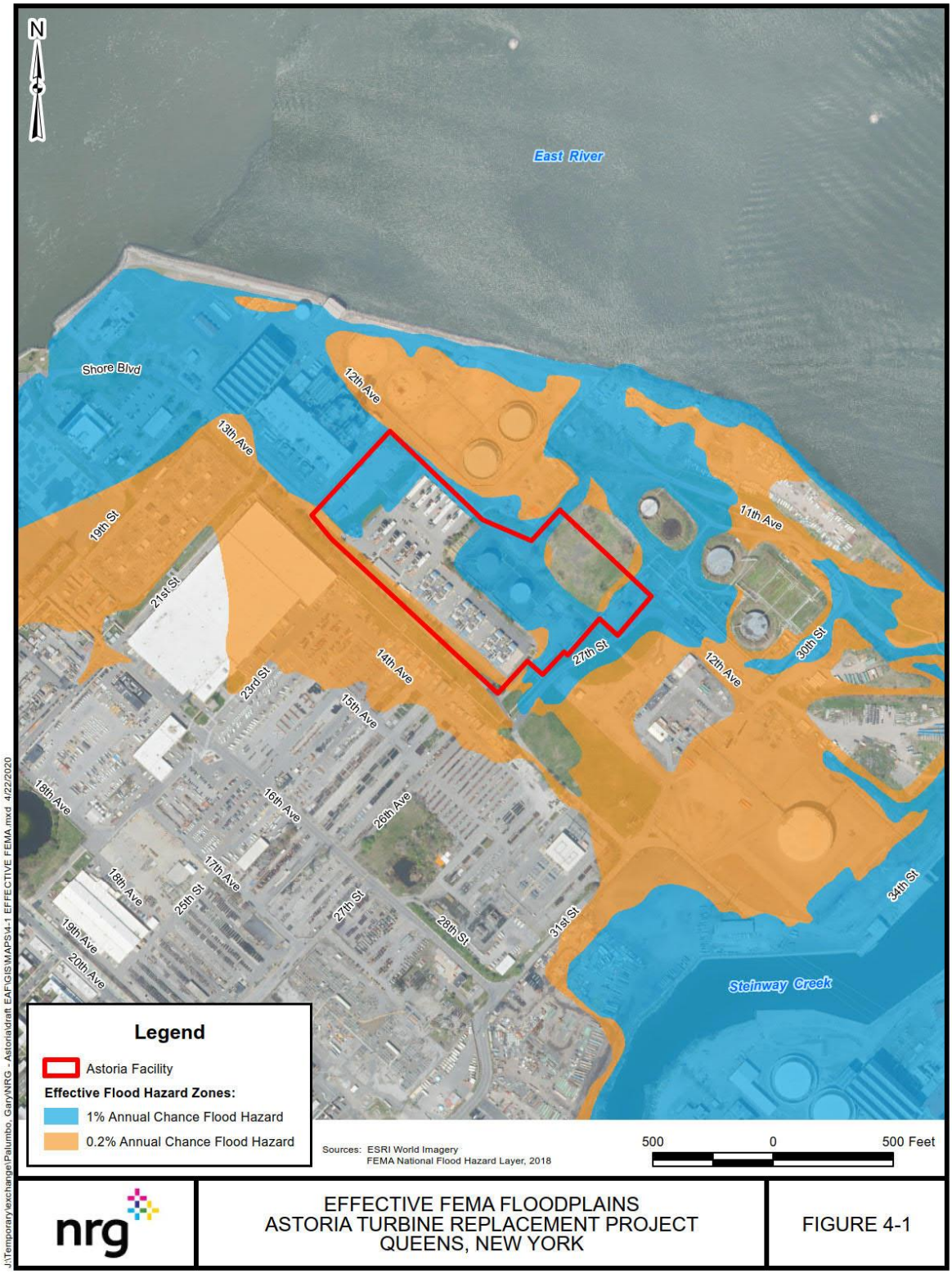


Figure 3.4-2 FEMA Preliminary Floodplains Map

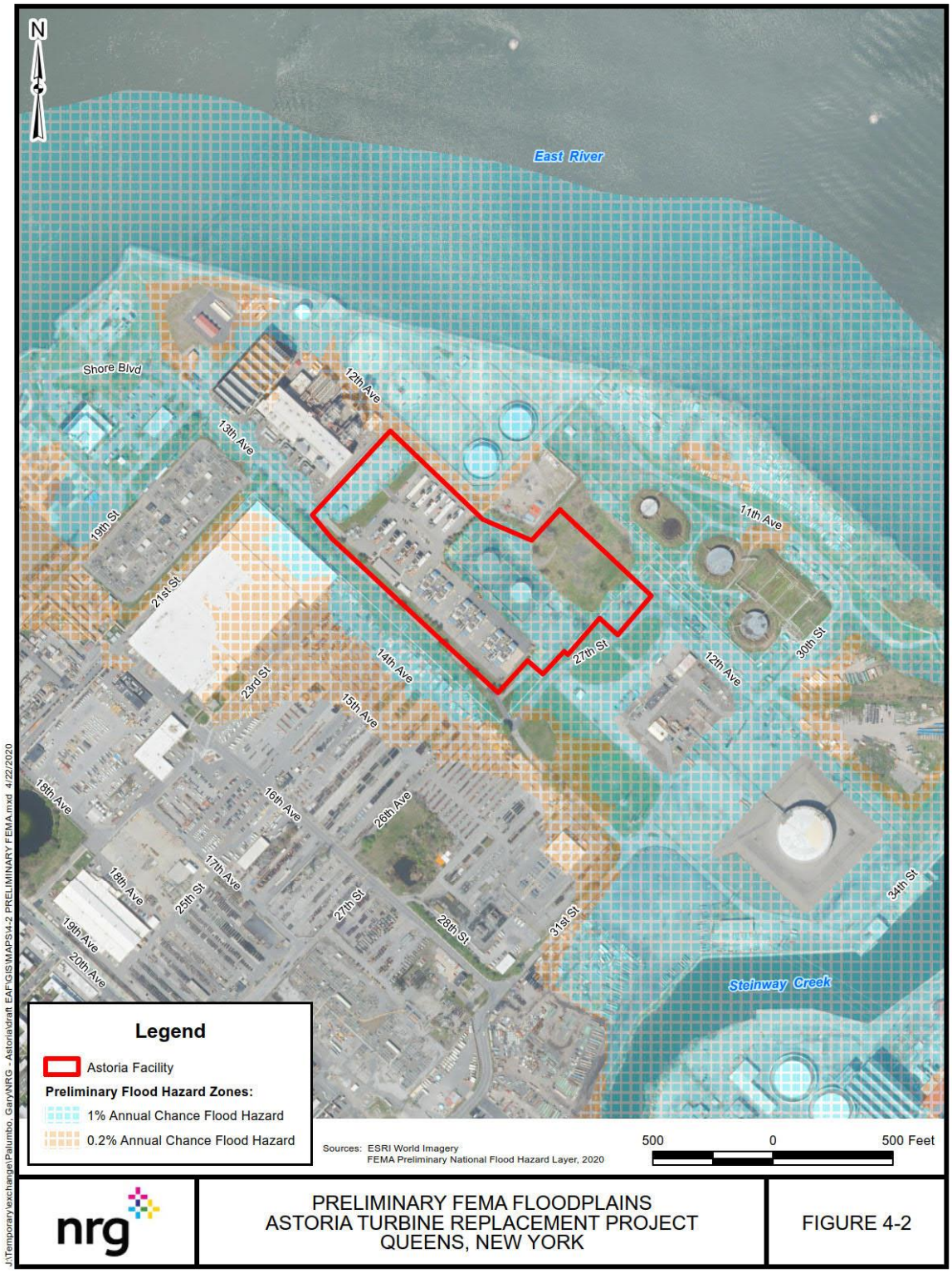
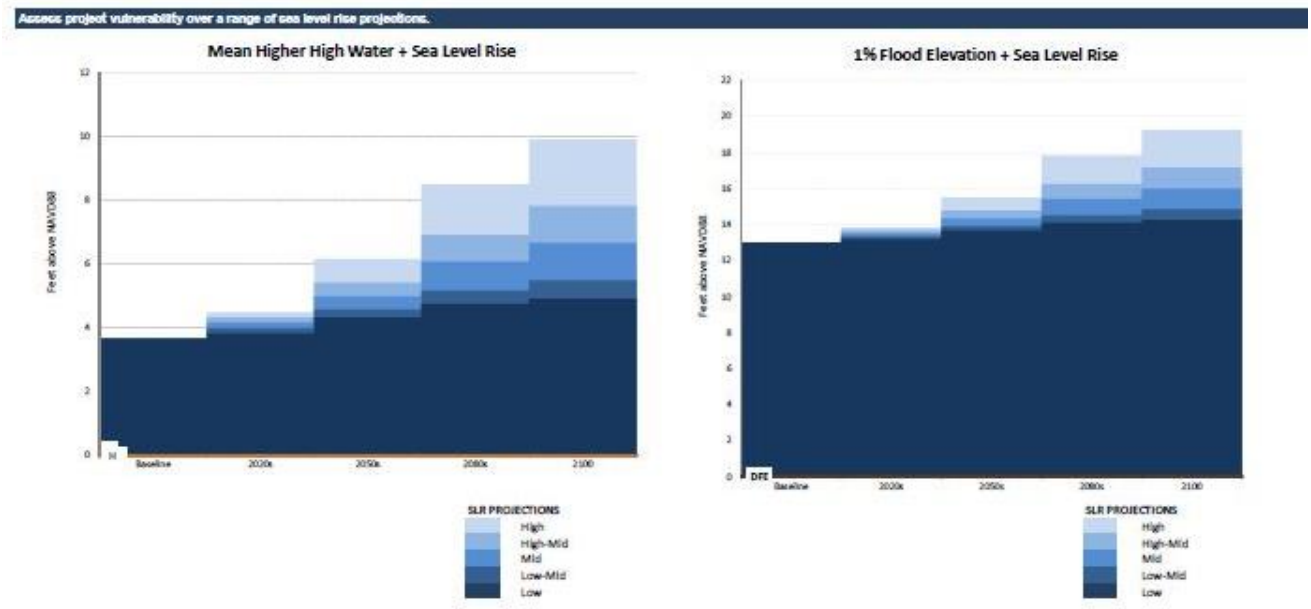


Figure 3.4-3 Sea Level Forecasts at the Project Site as Generated by WRP Calculator



As shown in **Table 3.4-1**, the new construction (with the exception of the small ULSK tank) will have a grade elevation of 18.5 feet amsl which is higher than the 1% Annual Flood Elevation plus the 2050's Sea Level Rise Projections. The ULSK tank will be constructed on top of an existing structure with an elevation of 32 feet amsl (grade elevation of structure is 16 feet amsl with a height above grade of 16 feet). Therefore, the proposed Project design is consistent with Policy 6.2.

The Project elevation is also consistent with the Community Risk and Resiliency Act, 6 NYCRR 490, and the Draft New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act (June 20, 2018). The guidance recommends that three feet of freeboard be added to the Base Flood Elevation and the Part 490 projected rise in sea level elevation. The Base Flood Elevation of the Project site is 13 feet and the Part 490 high projected sea level rise is 2.5 feet for New York City/Lower Hudson Region (which is higher than the WRP calculator projection of 0.75-2.25 feet). In addition to being consistent with the WRP, the Project also includes the three additional feet of freeboard contained in the Community Risk and Resiliency Act 2018 guidance. Therefore, the 18.5-foot grade elevation of the Project's structures is consistent with the Community Risk and Resiliency Act 2018 guidance and the WRP.

At the time of the 2010 EIS, the assessment of sea-level rise was based on then current guidance available from USEPA. The USEPA guidance had estimated that a sea level change up to 50 centimeters, or one-half meter, could occur over the next 100 years. A worst-case assumption was made of a 0.5 centimeter rise in sea level per year for 100 years, and assuming a 30-year equipment life (the effective life of the Project), sea level could rise up to 17.5 centimeters or 6.9 inches. At the time, it was concluded that this increase in sea level would have no impact on the existing facility and the new equipment given the existing grade elevation of the Site of approximately 17 feet amsl[97].

[97] In comparison, the current guidance begins with identifying the Base Flood Elevation ("BFE") of the site (13 feet for the Project). The BFE is the elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year. To determine the protective elevation for new construction, the BFE, projection of sea-level rise and margin for freeboard effects is summed.

Accordingly, the Project has integrated consideration of the latest New York City projections of climate change and sea level rise into its planning and design of the Project and is consistent with WRP Policy 6.2. Also see Section 3.2.3.

3.4.3 POLICY 7: Minimize environmental degradation and negative impacts on public health from solid waste, toxic pollutants, hazardous materials, and industrial materials that may pose risks to the environment and public health and safety

7.1 Manage solid waste material, hazardous wastes, toxic pollutants, substances hazardous to the environment, and the unenclosed storage of industrial materials to protect public health, control pollution and prevent degradation of coastal ecosystems.

7.2 Prevent and remediate discharge of petroleum products.

7.3 Transport solid waste and hazardous materials and site solid and hazardous waste facilities in a manner that minimizes potential degradation of coastal resources.

During construction, Best Management Practices (BMPs) will be utilized and all waste products generated will be disposed of in accordance with federal, state, and local laws. The Project consists of replacing existing equipment with modern technology within the same general footprint. Excavation will be limited to site preparation and installation of new foundations for the new equipment. Excavated soil will be reused onsite, or if necessary, removed off-site for appropriate disposal. Water from construction dewatering activities will be pumped to temporary holding tanks located near active excavation areas. The contents of the tanks will be monitored and discharged to Outfall 001 if it meets the applicable SPDES requirements. If the water is unacceptable for discharge to Outfall 001, it will be loaded into tank trucks for appropriate off-site treatment and disposal.

The Project will use the two existing 2,000,000-gallon nominal ULSK tanks to store ULSD as a back-up fuel for the CTG. In addition, a new ULSK storage tank with a capacity of 7,500 gallons will be provided to fuel one existing P&W Twin Pac for black start operations. A new 19% aqueous ammonia storage tank with a capacity of 20,000 gallons will be provided to store NH_3, the reagent for the SCR system that will be installed downstream of the new CTG for control of NOx emissions.

During normal operations, the existing facility generates solid and hazardous wastes. This will not change with the Project. Hazardous wastes such as electronic wastes will continue to be recycled as appropriate (batteries, light bulbs, old computer monitors). These waste streams are picked up 1 – 2 times per year. Other hazardous wastes including old switches containing mercury are removed (normally 1 – 3 per year) and replaced with non-mercury devices. Water from water wash will continue to be captured in tanks and oily wastes will be trucked offsite for disposal. All wastes will continue to be contracted to be hauled off site and ultimately disposed of in accordance with all applicable local and state regulations. Solid waste generated by the proposed project would include trash or garbage from the proposed facility and would be collected for disposal by a private hauler.

As was previously determined,[98] the Project is consistent with this policy.

3.5 Cumulative Impacts

Cumulative impacts are the collective result of the incremental impacts of an action that, when added to the impacts of other present and reasonably foreseeable future actions, would affect the same resources, regardless of what agency or person undertakes those actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time; although the impacts of individual actions taken separately might be minor, the impact of those same actions taken together may

[98] The 2001 Coastal Zone Assessment evaluated comparable policies (Policies 36 and 39 and concluded that the Berrians Project was consistent).

be substantial for one or multiple resources. According to the SEQR Handbook, cumulative impacts must be assessed when actions are proposed, or can be foreseen as likely, to take place simultaneously or sequentially in a way that the combined impacts may be significant. As with direct impacts, assessment of cumulative impacts should be limited to consideration of reasonably foreseeable impacts, not speculative ones.

3.5.1 Cumulative Impact Assessment Methodology

A cumulative impact analysis focuses on the resources that would be impacted by the past, present, and planned actions and considers impacts that take place on both spatial and temporal scales. On a spatial basis, impacts occur both within and outside the area of the Proposed Action. Time scales for a cumulative impact analysis are generally longer than for project-specific analysis of impacts. The general approach taken for the cumulative impact analysis in this DSEIS is to:

- Define other activities that could impact resources within the vicinity of the Proposed Action.
- Assess whether impacts from the Proposed Action overlap impacts (in time or space) from other activities, potentially creating any of the types of cumulative impacts.
- Total the impacts from the Proposed Action with other similar impacts if impacts are additive and if quantitative information is available or make a qualitative assessment of total impacts if quantitative information is not available.

The cumulative impacts analysis focuses only on impacts from other projects that when taken together cumulatively with the Proposed Action could result in potential impacts in areas such as transportation, air quality, and noise. The Proposed Action, by itself would not impact other resources based on their analysis in Section 3 - Existing Conditions, Potential Impacts and Mitigation Measures.

The SEQR Handbook (NYSDEC, 2020b) does not provide specific thresholds applicable for the spatial scale for a cumulative impact analysis. The NYSDEC dispersion modeling guideline (NYSDEC, 2019) discusses the need for and the approach to conducting a cumulative air quality impact analysis. Specifically, a cumulative air impact analysis is required for those criteria pollutants for which the Project's modeled concentrations are above the SILs. The spatial extent of the background sources that need to be included in the cumulative dispersion modeling analysis is based on the maximum distance from the Project where modeled concentrations are above the SILs. However, as discussed in Section 3.1, dispersion modeling shows that modeled Project concentrations are below all SILs. As such, the NYSDEC cumulative air quality impact analysis spatial guidance is not applicable to the Project. NYSDEC's noise assessment guideline (NYSDEC, 2001) also does not include a spatial threshold for cumulative impacts. The NYSDEC does not have any guidelines or policies pertaining to conducting transportation impact analyses.

With the absence of specific spatial thresholds for conducting cumulative impact analyses, the city *CEQR Technical Manual* was used as a resource to determine which other actions could create a cumulative impact with the Proposed Action. This cumulative impact analysis identified the geographic extent of potential cumulative impacts for each applicable resource type primarily based on the distance thresholds or criteria typically used to establish the study area for an assessment for an individual city action. Specific distance thresholds and/or criteria considered for air quality and noise resources include:

- Air Quality - at least 1000 feet from a project creating major or large stationary emission sources; and
- Noise – 1500 feet from a stationary noise source.

There is no specific spatial threshold in the *CEQR Technical Manual* for determining which projects to include in a cumulative transportation impact analysis.

For cumulative effects within the area from combined actions centered from the Proposed Action, this analysis determines the cumulative effect area radius based on 1) a doubling of the distance threshold

applicable for an individual project for onsite emission sources and 2) an overlap of potential traffic on a major road network selected for each project for offsite mobile sources.

Beyond these geographic extents, the Proposed Action's capacity to affect each resource would likely become negligible. Within these areas, other planned or proposed developments or actions could cumulatively affect the identified resources in addition to the Proposed Action. **Table 3.5-1** describes the geographic area of potential effects, where cumulative impacts from present and reasonably foreseeable future actions could potentially affect each relevant resource. Because the effects of past and present actions are reflected in baseline conditions, past and current projects are only specifically considered if their future operations would change over time.

3.5.2 Present and Reasonably Foreseeable Future Actions

To identify potential cumulative impacts, information on projects, developments, or activities that might overlap temporally or geographically with the Proposed Action were collected from various city and state agency web sites such as NYC Department of City Planning, NYC Department of Environmental Protection, New York City Department of Sanitation ("DSNY"), New York City Department of Parks and Recreation, New York City Department of Correction, Port Authority of New York and New Jersey, PSC, NYSDEC, borough planners, and other local publications. The following screening criteria in conjunction with the CEQR Technical Manual-established distance thresholds or criteria for a study area were used to perform an assessment of potential cumulative actions for:

- Projects that have submitted a site plan or preliminary document for review by a local planning agency or government agency;
- Projects with approved or ongoing permitting activities, as identified on a regularly maintained website of one of the governmental agency's identified herein; and
- Past and current projects are only specifically considered if their future operations would change over time.

Of the searched project records, the projects shown on **Figure 3.5-1** and listed in **Table 3.5-1** were selected for initial consideration after factoring in temporal proximity. The potential for cumulative impacts was considered for the construction and/or operational phase of these projects. The projects for which cumulative impacts are limited to the construction phase were screened for inclusion based on whether the construction periods for the project and the Proposed Action would overlap and the criteria listed in **Table 3.5-2**.

Other projects for which cumulative impacts could occur during the operational phase of the project were screened for inclusion based on the criteria listed in **Table 3.5-2**.

The outcome of the screening analysis is summarized in **Table 3.5-3**.

Figure 3.5-1 Locations of Other Projects Initially Considered for Inclusion in Cumulative Impacts Analysis

Table 3.5-1 Other Projects Initially Considered for Inclusion in Cumulative Analysis

Project Number[1]	Project Name	Project Description	Project Address	Location with Respect to Site	
				Distance (mi)	Direction
1	NRG Astoria Energy Storage 1[2]	NRG Astoria Storage LLC, a subsidiary of NRG Energy, Inc, proposes to develop, construct and operate a 79.9 MW / 319.6 MWh Lithium-Ion Battery Energy Storage System ("BESS") on an undeveloped portion of the Site and tie into the Astoria West 138kV.	31-01 20th Ave., Astoria	0.0	--
2	DSNY Queens District 1 Garage & Salt Shed	DSNY is proposing to relocate its existing Queens District 1 Garage currently located at 34-28 21st Street to an undeveloped site in northwestern Queens. DSNY will acquire approximately 9.8 acres to construct a 93,775 square foot garage building to store and maintain its Queens District 1 vehicles and other equipment, provide fueling, and provide employee support areas such as locker rooms, lavatories, and offices. Collection truck and plow attachment storage and accessory parking will be unenclosed. Construction is expected to be completed in 2023. CEQR Project #18DOS008Q.	31-11 20th Ave., Astoria	0.3	Southeast
3	Wildflower Studios	Proposed film production studio to be constructed within the right of way at the site of Steinway Piano; its current design plan has been submitted to the city council for review; construction expected to start in 2020 and be completed by summer 2022.	87 19th Ave, Astoria	0.6	South-southeast
4	Rikers Island Public Place Application	Project involves an application for re-use of the existing prison. No specific plan has been developed for re-use.	Rikers Island	0.8	East-northeast
5	5 Borough Complex and Garage Parking Lot Reconstruction	Reconstruction of the parking lot at the 5 Borough Complex and Garage on Randall's Island. Project scheduled to be completed by October 2020.	Randall's Island Park (20 Bronx Shore Rd., Manhattan)	1.2	Northwest
6	Astoria N/W Line Subway Station Renovations	Renovations to Astoria N/W Line Astoria Blvd. subway station. Renovations have been completed and the station is back in service. (https://new.mta.info/system_modernization/astoria)	Astoria Blvd. & 31st St.	1.4	South-southwest
7	Astoria Cove Rezoning (2030 Astoria Developers, LLC)	Development of the rezoned properties with a new mixed-use predominantly for residential use. Up to 1,701 residential units, 117,000 square feet of retail (including a 25,0000-square foot supermarket), a 456-seat elementary school, 142,000 square feet of publicly accessible open space, and 940 parking spaces. Construction expected to be completed in 2023. CEQR Project # 13DCP127Q.	8-51 26th Ave., Astoria	1.6	Southwest

Project Number[(1)]	Project Name	Project Description	Project Address	Location with Respect to Site	
				Distance (mi)	Direction
8	LaGuardia Airport Central Terminal Building Redevelopment Program	Port Authority is implementing LaGuardia Airport Central Terminal Building Redevelopment Program that includes: ○ Constructing a new central terminal building, airside apron, landside roadways, and parking garage within central terminal area. ○ Demolishing the existing facilities including the central heating plant in the central terminal areas and replacing with new facilities more efficiently designed and located to meet the latest federal standards for airport safety and security and to accommodate forecast passenger demand at acceptable levels of service. The LaGuardia project does not involve changes to the airfield runways or taxiways, air navigation aids, or aircraft flight procedures to or from the airport. Construction expected to be completed in 2022. CEQR Project # 15DME001Q.	LaGuardia Airport	1.5	East-southeast
9	Vernon Boulevard-Broadway Rezoning Project	Three mixed-use buildings in Astoria, Queens. The rezoning project will include new housing, local retail, food and beverage businesses, and community facilities.	A full block bounded by Vernon Blvd. and Broadway to the north, 11th St. to the east, 33rd Rd. to the south and 10th St. to the west in Astoria	2.1	Southwest
10	Ravenswood Battery Storage	A 316 MWe / 2528 MWh energy storage facility to provide peak capacity, energy, and ancillary services in New York City. Project to be built in three phases – 129 MW, 98 MW and then 89 MW – with the first phase complete by March 2021. There is no timetable given for deployment of second and third phases of the project.	38-54 Vernon Blvd., Long Island City	2.6	West-southwest
11	Asphalt Plant Natural Gas Burner	Various projects requiring air state facility permit applications; the closest is for a natural gas burner to be located at an asphalt plant in Flushing.	120-30 28th Ave., Flushing	3.2	East-southeast
12	East River ESS Battery Storage	An approximate 100 MWe battery storage system capable of charging from, and discharging into, the New York power grid. The battery system will be enclosed in multiple containers totaling approximately 130,680 square feet, located on a 4.4 acre parcel of land.	31-03 20th Ave., Astoria	0.2	Northwest

Project Number(1)	Project Name	Project Description	Project Address	Location with Respect to Site	
				Distance (mi)	Direction

(1) Refer to Figure 3.5-1.

(2) Additional BESS projects are being considered for the Site. They are not included here as they are still too speculative and not expected to proceed in the near future. To the extent that they do proceed, construction would not overlap with the Proposed Action such that there could be no significant cumulative impact during construction. As for potential cumulative impacts during operation, the analysis would be similar to that of NRG Astoria Energy Storage 1 such that no significant cumulative impacts would occur.

Table 3.5-2 Criteria Used in Selection of Other Projects for Inclusion in Cumulative Analysis – Construction Phase

Resource Type	Area of Potential Effect	Rationale
Transportation	The major road network overlapping with the Proposed Action.	Traffic impacts from construction workers and delivery vehicles and operational delivery vehicles would concentrate on major roads that access area associated with the Proposed Action. Cumulative impacts could occur on these roads directly affected by the Proposed Action.
Air Quality	0.4-mile radius for stationary source element. Overlapping roadway network for mobile source element.	CEQR Technical Manual-defined 1000-feet study area for stationary source in general for an individual action. The overlapping area is consistent with the traffic area of potential effects.
Noise	0.6-mile radius for stationary source element. Overlapping roadway network for mobile source element.	For stationary source cumulative impacts, CEQR Technical Manual-defined analysis radius of 1500 feet for an individual action is considered. For mobile source cumulative impacts, the overlapping area is consistent with the traffic area of potential effects selected.
Temporal Proximity	N/A	The extent that construction activities overlap the same timeframe.

Table 3.5-3 Outcome of Initial Screening Analysis for Inclusion of Other Projects in Cumulative Analysis

Project Number	Project Name	Applicable Project Phase(s)	Included or Excluded from Cumulative Impact Analysis	Basis for Exclusion
1	NRG Astoria Energy Storage 1 – 79.9 MW	Construction & Operation	Included	N/A
2	DSNY Queens District 1 Garage & Salt Shed	Construction & Operation	Included	N/A
3	Wildflower Studios	Construction	Excluded	Geographic distance from Project • Non-overlapping major road network • Project distance greater than thresholds for air and noise
4	Rikers Island Public Place Application	Construction & Operation	Excluded	Speculative nature of project and lack of temporal proximity • No specific plans for development of Rikers Island • Proposed Action will be completed before any anticipated commencement of work on any redevelopment at Rikers Island
5	5 Boro Complex and Garage Parking Lot Reconstruction	Construction	Excluded	Lack of temporal proximity • Reconstruction project will be completed prior to anticipated commencement of construction for Proposed Action No overlapping operational impacts
6	Astoria N/W Line Subway Station Renovations	Construction	Excluded	Lack of temporal proximity • Subway project completed prior to anticipated commencement of construction for Proposed Action No overlapping operational impacts
7	Astoria Cove Rezoning	Construction & Operation	Excluded	Lack of temporal proximity. Project approved in 2014 but since stalled and it is unclear whether or when project will proceed.[99]

[99] The Astoria Cove Rezoning would facilitate a proposal to develop a new approximately 2,189,068 gross square foot (gsf) mixed-use development on approximately 377,726 sf of lot area (the "project site"). The proposed project would be comprised of approximately 1,689 dwelling units (approximately 1,689,416 gsf of residential floor area), of which 295 dwelling units would be affordable; approximately 109,470 gsf of local retail space, including an approximately 25,000 gsf supermarket; a site for an elementary school with approximately 456 seats (PK-5); approximately 900 accessory parking spaces; and approximately 83,846 sf of publicly accessible open space. At the time the FEIS was issued for the project in 2014, the anticipated Build Year was 2023, with a projected nine-year construction commencing in 2022. Since that time, however, the proposed development has been stalled and it is unclear whether and when it will proceed. If the Astoria Cove Rezoning development project were to proceed, the only anticipated impacts due to the geographic distance from the Project would relate solely to transportation. During construction, no cumulative impacts are anticipated

Project Number	Project Name	Applicable Project Phase(s)	Included or Excluded from Cumulative Impact Analysis	Basis for Exclusion
8	LaGuardia Airport Central Terminal Building Redevelopment Program	Construction	Included	N/A
9	Vernon Boulevard-Broadway Rezoning Project	Construction & Operation	Excluded	Geographic distance from Project • Non-overlapping major road network • Project distance greater than thresholds for air and noise
10	Ravenswood Battery Storage	Construction	Excluded	Geographic distance from Project • Non-overlapping major road network • Project distance greater than thresholds for air and noise
11	Asphalt Plant Natural Gas Burner	Operation	Excluded	Geographic distance from Project • Project distance greater than threshold for air • No overlapping operational impacts
12	East River ESS Battery Storage	Construction & Operation	Included	N/A

As shown in **Table 3.5-4**, four projects were identified for inclusion in the cumulative impact analysis with the Proposed Action. **Figure 3.5-2** illustrates the locations of the four projects.

The four projects that were screened for inclusion are the following:

NRG Astoria Storage LLC Battery Energy Storage System

NRG Astoria Storage LLC, a subsidiary of NRG Energy, Inc, proposes to develop, construct and operate a 79.9 MW / 319.6 MWh Lithium-Ion Battery Energy Storage System ("BESS") on an approximately 2.2-acre undeveloped portion of the Site and tie into the Astoria West 138kV substation. Due to economic considerations, the BESS project will require a ratepayer guaranteed support contract and is not anticipated to begin onsite construction, which is expected to take approximately one year, until late 2023 at the earliest.

given the current status of the Astoria Cove Rezoning development project and the Project's projected construction timeline. During operations, assuming that the Astoria Cove Rezoning project-moves forward, generated traffic is slightly overlapped with the roadway network for the Project near I-278. However, given the minimal vehicle trips to and from the Project, there would not be any significant cumulative traffic impact nor would there be any significant cumulative off-site mobile source air or noise impacts.

DSNY Queens District 1 Garage & Salt Shed

The DSNY Queens District 1 Garage and Salt Shed would be located at 31-11 20th Avenue next to Luyster Creek, also known as "Steinway Creek", within the Astoria Industrial Business Zone (IBZ). The new one-story 93,775 GSF garage would be used to store large weather-sensitive vehicles (mechanical brooms, salt spreaders, etc.) as well as other vehicles, repair bays, and a wash bay. A three-story, 31,500 SF portion of the building would house the personnel section with locker rooms, lavatories, and offices for DSNY staff use. Collection trucks, service/sedans/SUVs, and salt plow attachments will be stored outdoors along with accessory parking for employees. There would be a total of 103 vehicles and 145 personnel located on the new site. The garage would operate 24/7 with reduced operations on Sundays.

The second proposed structure on the site would be an enclosed 20,000 SF salt shed with capacity to store 10,000 tons of road salt for winter use. A fueling station would be located near the proposed garage building and salt shed. The fueling station with an overhead canopy would provide diesel and unleaded gas for DSNY vehicles. DSNY has also committed to exclusive use of 19th Avenue as the access for entry and exiting the facility.

LaGuardia Airport Central Terminal Building Redevelopment Program

The comprehensive redevelopment of LaGuardia Airport involves transforming LaGuardia into a unified airport with new terminals, better transportation access with a future AirTrain, additional taxi-lanes and best-in-class passenger amenities. Construction of the new unified airport includes new terminals for the existing terminals B, C and D, an improved roadway system, new parking infrastructure and other associated projects.

The Port Authority of New York and New Jersey proposed redevelopment of the original Central Terminal Building (known as Terminal B) at LaGuardia Airport, which included improvements to the airside aprons, landside roadways, and parking within the Airport's central terminal area. The FAA issued its Finding of No Significant Impact/Record of Decision in December 2014 for the design and replacement of terminal B. Simultaneous to the Terminal B replacement, Delta Airlines undertook redevelopment of Terminals C and D, which compliments the redevelopment of the Central Terminal Building, creating seamless passenger and aircraft movement.

Phased construction commenced in 2016 and is 80% complete. Construction of a parking garage was completed in February 2018. Improvements made to Terminal C opened to the public in 2019. The Terminal B Arrivals and Departure Hall was opened in June 2020. Work is ongoing to connect Terminal B to Terminal C, which includes demolition of existing buildings and construction of pedestrian bridges, central hall, and concourses. Construction of the Terminal B project is expected to reach substantial completion in 2022, with the Delta Airlines redevelopment of Terminal C and D to be completed by 2026.

East River ESS Battery Storage Facility

East River ESS, LLC, an indirect wholly owned subsidiary of Hanwha Energy USA Holdings Corporation, a Delaware corporation that does business as 174 Power Global ("174 PG"), is planning to construct an approximately 100 MWe battery storage system (consisting of 400 megawatt hours of storage capacity) on a 4.4 acre parcel of land at 31-03 20th Avenue in Astoria, Queens leased from NYPA within the Astoria ConEd Complex (site of the former Poletti Power Plant)[100]. The battery storage system will be enclosed in multiple containers totaling approximately 130,680 square feet. The facility will serve as a battery storage system capable of charging from, and discharging into, the New York power grid. Construction is expected to begin in December of 2021 and take approximately 9 months. The facility is planned to be operational in December 2022.

[100] https://edc.nyc/sites/default/files/2020-07/NYCIDA-East-River-ESS-Public-Hearing-Package.pdf

These projects were assessed to determine the potential cumulative impacts with the Proposed Action for both construction and operational activities as appropriate. Given the distance between each project and the Proposed Action, potential cumulative effects could occur from:

- Onsite activity impacts from the proposed DSNY garage project, BESS Project and East River ESS battery storage project.
- Off site traffic-related cumulative impacts from identified slightly overlapping roadway network during:
  - Construction period: the proposed DSNY garage, LaGuardia redevelopment and East River ESS projects.
  - Operational period: the proposed DSNY garage project, BESS project, and East River ESS battery storage project.

Figure 3.5-2 Location of Background Projects Included in Cumulative Impact Analysis

3.5.3 Potential Cumulative Impacts by Resource Area

Based on the assessment summary presented in **Tables 3.5-3** and **3.5-4**, potential cumulative impacts between the Proposed Action and the three included projects are summarized in **Table 3.5-5**.

3.5.4 Conclusion

Construction

None of the evaluated projects are expected to be a significant source of traffic and further construction is expected to be short term. Because construction activities for the Proposed Action would last approximately 25 months (20 months of which involve actual construction activities, not all of which would overlap completely with any of the evaluated projects) and are considered temporary and do not warrant an impact assessment per the *CEQR Technical Manual*, the potential cumulative construction period traffic impacts within the affected roadway network would be temporary and minor. Similarly, for on-road traffic, off-site mobile source cumulative impacts from all projects would also be temporary over a slightly overlapping roadway network resulting in short-term minor cumulative impacts on air quality and noise.

Operation

The incremental traffic from potential additional worker's commuting vehicles or fuel delivery trucks under the Proposed Action is anticipated to be minimal. As such the overall cumulative impacts on transportation would be minor and it is anticipated that cumulatively, there would not be significant adverse impact on traffic as a result of the slightly overlapping roadway network.

With respect to air quality, the only potential cumulative impact is with the DSNY Project. Adding the Proposed Action's maximum modeled concentrations to those for the DSNY building project plus a regional background concentration (see Section 3.5.1) results in cumulative concentration levels that are all well below the NAAQS. Therefore, there would be no significantly adverse cumulative operational air quality impacts. The screening analysis for mobile-source emissions performed for the two considered projects with potential cumulative impacts indicate that traffic levels generated by these projects would not exceed the CO and PM screening thresholds. Therefore, a detailed mobile source air quality analysis is not warranted, and no significant impacts would be anticipated from mobile-source emissions. Given the minimal new trips to be generated under the Proposed Action during the operational period, the off-site cumulative mobile source impacts would not be significant over a slightly overlapping roadway network.

Concerning noise, only the BESS, East River ESS and DSNY projects are geographically close enough for potentially overlapping impacts. Operational noise impacts from the East River ESS and BESS projects are expected to be minimal and on-road mobile source noise will be minimal. The onsite operational noise from the DSNY garage facility has been considered minimal and is not addressed in the respective CEQR document. Therefore, based on the predicted noise levels from the Proposed Action, the cumulative noise impacts from onsite source operations from these closely located projects would not be significantly adverse. The DSNY predicted the maximum incremental off-site on-road mobile source noise at late night hours would be 2.7 dBA along Steinway Street between 19th and 20th Avenue with 52 dBA contributed by the DSNY project. This traffic route would unlikely be used for the Proposed Action and this analyzed location is approximately 4,000 feet from the Proposed Action site. Based on the worst-case noise level of 48 dBA from onsite source operation under the Proposed Action predicted at the closest sensitive receptor located near the intersection of 20th Avenue and 23rd Street approximately 2,300 feet from the Proposed Action site, the adverse cumulative noise impact in the affected neighborhood immediately adjacent to each project site would not be significant.

Table 3.5-4 Summary of Potential Cumulative Impacts between the Proposed Action and Other Projects

Resource	Potential Adverse Impacts Associated with the Project	Potential Adverse Cumulative Impacts: DSNY Project[101]	Potential Adverse Cumulative Impacts: LGA Central Terminal	Potential Adverse Cumulative Impacts: NRG Astoria Storage BESS Project	Potential Adverse Cumulative Impacts: East River ESS Battery Storage Project
Transportation	No significant adverse impact - the Project would result in negligible vehicle trips to and from the site associated with an operational staff of less than 15 personnel and less than 10 truck trips per day for deliveries. Existing roadways are anticipated to be sufficient to handle temporary increase in traffic during construction.	No significant adverse cumulative impact – DSNY project-generated traffic is overlapped with the roadway network for the Project. However, given the minimal vehicle trips to and from the Project, no significant cumulative traffic impact would occur.	No significant adverse cumulative impact – LGA project-generated traffic is far enough away that overlapping traffic is expected to be minimal and within existing roadway capacity.	No significant adverse cumulative impact –BESS project not anticipated to generate significant traffic; any additional traffic will be within existing roadway capacity.	No significant adverse cumulative impact – East River ESS project not anticipated to generate significant traffic; any additional traffic will be temporary and minor.
Air Quality	Dispersion modeling results show emissions from the Proposed Action are below all NAAQS SILs, and therefore are de minimis. Operation of the Proposed Action will occur in accordance with the Facility's air permits (Title V and Prevention of Significant Deterioration), as modified for the Proposed Action.	No significantly adverse cumulative impact - DSNY-predicted concentrations including background source contributions using USEPA's AERMOD dispersion model are well below the applicable NAAQS and/or the NYC de minimis criteria.[102] Off-site mobile source cumulative impacts during construction would be temporary over a slightly overlapping roadway network resulting in short-term minor cumulative impacts on air quality. The screening analysis performed for mobile-source emissions	No significant adverse cumulative impact – LGA project not a significant source of air emissions associated with operations. Off-site mobile source cumulative impacts during construction would be temporary over a slightly overlapping roadway network resulting in short-term minor cumulative impacts on air quality.	No significant adverse cumulative impact – BESS project not a source of local air emissions associated with operations.	No significant adverse cumulative impact – East River ESS project not a source of local air emissions associated with operations.

[101] Information regarding potential impacts of DSNY project obtained from the project's Environmental Assessment Form, dated December 4, 2019 (CEQR No. 18DOS008Q).

[102] Only small natural gas-fired combustion units are included in the DSNY garage project. *See Supplement to the Environmental Assessment Statement Form* (DSNY, December 4, 2019),

Resource	Potential Adverse Impacts Associated with the Project	Potential Adverse Cumulative Impacts: DSNY Project[101]	Potential Adverse Cumulative Impacts: LGA Central Terminal	Potential Adverse Cumulative Impacts: NRG Astoria Storage BESS Project	Potential Adverse Cumulative Impacts: East River ESS Battery Storage Project
		during construction indicate that traffic levels would not exceed the CO and PM screening thresholds.			
Noise	No significant adverse impact – the Project would result in a maximum of 48.2 dBA and an increase of less than 2dBA compared to existing conditions at the nearest sensitive receptor.	No significant adverse cumulative impact – onsite operational noise from the DSNY garage facility has been considered minimal. Off-site on-road mobile source noise unlikely to overlap given anticipated traffic routes.	No significant adverse cumulative impact – LGA project stationary and mobile source noise is far enough away resulting in no significant cumulative adverse impact.	No significant adverse cumulative impact – BESS project is not a significant source of noise as the storage systems will be enclosed, which will attenuate noise.	No significant adverse cumulative impact – East River ESS project is not a significant source of noise as the storage systems will be enclosed, which will attenuate noise.
Construction	Temporary (25 months, with only 20 months of physical construction) and not warranted for a detailed analysis. No significant adverse impact on transportation, air quality and noise.	No significant adverse cumulative impact on transportation, air quality and noise since construction activities would be temporary and are not warranted for a detail analysis. During its construction period, the DSNY project would use similar traffic routes as compared to the Proposed Action. However, given the minimal vehicle trips to and from the Project, no significant cumulative traffic impact would occur.	No significant adverse cumulative impact on transportation, air quality and noise since construction mobile source impacts were predicted to be minimal within the roadway network slightly overlapped. The roadways affected by the LaGuardia Airport project would extend to 19th and 20th Avenue, close to Steinway Street that may slightly overlap a small portion of the Proposed Action's truck routes. However, given the current status of the LaGuardia Airport project, any overlap is expected to be short in duration.	N/A	No significant adverse cumulative impact on transportation, air quality or noise since construction activities would be temporary and do not trigger a detailed analysis. During its construction period, the East River project would use similar traffic routes as compared to the Proposed Action. However, given the minimal vehicle trips anticipated for the East River project and the fact that construction schedules would not completely overlap, no significant cumulative traffic impact would occur.
Land Use, Zoning, and Community Character	Proposed Action is consistent with and will not impact current land use, zoning, and	No significant adverse cumulative impact – both projects are permitted as of right and conform	No significant adverse cumulative impact – no potential for overlapping	No significant adverse cumulative impact – BESS project is consistent with	No significant adverse cumulative impact – East River ESS project is

Resource	Potential Adverse Impacts Associated with the Project	Potential Adverse Cumulative Impacts: DSNY Project[101]	Potential Adverse Cumulative Impacts: LGA Central Terminal	Potential Adverse Cumulative Impacts: NRG Astoria Storage BESS Project	Potential Adverse Cumulative Impacts: East River ESS Battery Storage Project
	community character. Therefore, there is no potential for significant adverse cumulative impacts with this resource type.	to existing land use and community character.	impacts due to geographic distance between projects.	and will not impact current land use, zoning, and community character.	consistent with and will not impact current land use, zoning, and community character.
Community Facilities and Utilities	Proposed Action will not result in any permanent increase in local population and therefore, no impacts to school or other community facilities are likely to occur. Therefore, there is no potential for significant adverse cumulative impacts with this resource type.	No significant adverse cumulative impact – DSNY project will not eliminate, displace or alter community facilities.	No significant adverse cumulative impact – no potential for overlapping impacts due to geographic distance between projects.	No significant adverse cumulative impact – BESS project will not result in any permanent increase in local population and therefore, no impacts to school or other community facilities are likely to occur.	No significant adverse cumulative impact – East River ESS project will not result in any permanent increase in local population and therefore, no impacts to school or other community facilities are likely to occur.
Open Space	Proposed Action is a replacement project sited on a long-standing industrial site. It will not change or eliminate open space. Therefore, there is no potential for significant adverse cumulative impacts with this resource type.	No significant adverse cumulative impact – DSNY project will not change or eliminate open space.	No significant adverse cumulative impact – both projects concern existing sites and are geographically distant.	No significant adverse cumulative impact – BESS project will be sited on the same Site as Proposed Action which is a long-standing industrial site that has restricted access. BESS project will not change or eliminate open space.	No significant adverse cumulative impact –East River ESS project is located at the site of the former Poletti Power Plant within the Astoria ConEd Complex and will not change or eliminate open space.
Historic and Cultural Resources	No impact. The NYSHPO provided a letter reconfirming that the Proposed Action will have no adverse impact upon cultural resources in or eligible for inclusion in that State and National Register of Historic Places (see **Appendix B**).	No significant adverse cumulative impact – no historic or cultural resources on DSNY project site.	No significant adverse cumulative impact – no potential for overlapping impacts due to geographic distance between projects. In addition, both projects are replacement projects located on previously disturbed sites.	No significant adverse cumulative impact – BESS project on the same Site as Proposed Action; NYSHPO has provided a letter reconfirming that the Proposed Action will have no adverse impact upon cultural resources in or	No significant adverse cumulative impact – no potential for overlapping impacts due to geographic distance between projects. East River ESS project is located in or adjacent to an area designated as sensitive for archeological

Resource	Potential Adverse Impacts Associated with the Project	Potential Adverse Cumulative Impacts: DSNY Project[101]	Potential Adverse Cumulative Impacts: LGA Central Terminal	Potential Adverse Cumulative Impacts: NRG Astoria Storage BESS Project	Potential Adverse Cumulative Impacts: East River ESS Battery Storage Project
				eligible for inclusion in that State and National Register of Historic Places (see **Appendix B**).	site per NYSHPO. However, NYSHPO has reconfirmed that the Proposed Action will have no adverse impact upon cultural resources.
Visual Resources	No significant adverse impact – Proposed Action will be located on the Astoria ConEd Complex. There are several existing stacks used by other power stations located in the Astoria ConEd Complex that are in the same viewshed as the proposed stack for the Project.	No significant adverse cumulative impact – DSNY project will be located in an existing industrial area, zoned M3-1 (heavy manufacturing), adjacent to the Astoria ConEd Complex. The largest structure expected to be three stories, with a height of 90 ft.	No significant adverse cumulative impact – airport project replacing existing infrastructure and not expected to significantly change any visual or aesthetic resources; project also almost 2 miles from Project.	No significant adverse cumulative impact – BESS project is not expected to be visible from off-site. Regardless, BESS Project will be located on the Astoria ConEd Complex where there are several existing stacks used by other power stations that are in the same viewshed.	No significant adverse cumulative impact – East River ESS project is not expected to be visible from off-site as it will be located within an existing industrial area on the Astoria ConEd Complex where there are several existing tall structures in the same viewshed.

Resource	Potential Adverse Impacts Associated with the Project	Potential Adverse Cumulative Impacts: DSNY Project[101]	Potential Adverse Cumulative Impacts: LGA Central Terminal	Potential Adverse Cumulative Impacts: NRG Astoria Storage BESS Project	Potential Adverse Cumulative Impacts: East River ESS Battery Storage Project
Hazardous Materials	Although there is the potential that hazardous and contaminated material may be encountered during construction of the Proposed Action, any hazardous materials encountered during construction will be appropriately handled and disposed. The Proposed Action would not involve the use of hazardous materials during operations.	No significant adverse cumulative impact – Although there is the potential that hazardous and contaminated material may be encountered during construction of the DSNY project, any hazardous materials encountered during construction will be appropriately handled and disposed. Material handling during operations will be in accordance with applicable federal, state and local requirements and fueling dispensers outdoors would be sheltered from precipitation and an oil/water separator would treat runoff from this area prior to discharge from the site.	No significant adverse cumulative impact – no potential for overlapping impacts due to geographic distance between projects.	No significant adverse cumulative impact – Although there is the potential that hazardous and contaminated material may be encountered during construction of the BESS project, any hazardous materials encountered during construction will be appropriately handled and disposed. The BESS project would not involve the use of hazardous materials during operations.	No significant adverse cumulative impact – although there is the potential that hazardous and contaminated material may be encountered during construction of the East River ESS project, any hazardous materials encountered during construction will be appropriately handled and disposed. The East River project would not involve the use of hazardous materials during operations.
Wildlife	No impact.	No significant adverse cumulative impact.	No significant adverse cumulative impact – no potential for overlapping impacts due to geographic distance between projects. In addition, both projects are replacement projects located on previously disturbed sites.	No impact.	No impact.
Wetlands and Water Resources	The Site does not contain any wetlands of waterbodies and all wastewater discharges will occur in accordance with the Facility's SPDES permit, as	No significant adverse cumulative impact — no wastewater discharges to same surface waterbody as Proposed Action.	No significant adverse cumulative impact — no potential for overlapping impacts due to geographic distance between projects.	No significant adverse cumulative impacts. The BESS project will be on the same Site as the Proposed Action, which does not contain any wetlands or	No significant adverse cumulative impacts – the project will be on an existing industrial site which does not contain any wetlands or waterbodies.

Resource	Potential Adverse Impacts Associated with the Project	Potential Adverse Cumulative Impacts: DSNY Project[101]	Potential Adverse Cumulative Impacts: LGA Central Terminal	Potential Adverse Cumulative Impacts: NRG Astoria Storage BESS Project	Potential Adverse Cumulative Impacts: East River ESS Battery Storage Project
	modified for the Proposed Action.			waterbodies. Stormwater will be managed consistent with the *New York State Stormwater Design Manual* and other applicable guidance and requirements.	Stormwater is also not expected to discharge onto adjacent parcels. It will be collected in a subsurface collection system that will utilize existing infrastructure within the proposed area of development to the extent practicable and which connects to an existing outfall that discharges to the East River.
Climate Change	No significant adverse cumulative impact – the Project will cause a reduction in GHG emissions from the electric system. With respect to sea level rise, the potential for cumulative impacts, if any, is limited only to potential increases in GHG emissions. Further, the Project has been designed at a sufficient elevation to eliminate any potential flooding impact associated with sea level rise.	No significant adverse cumulative impact – not a significant source of GHG emissions.	No significant adverse cumulative impact – not a significant source of GHG emissions.	No significant adverse cumulative impact – BESS project is not a significant source of GHG emissions; it also furthers New York State's and New York City's climate limits, targets, and goals.	No significant adverse cumulative impact – East River ESS project is not a significant source of GHG emissions; it also furthers New York State's and New York City's climate limits, targets, and goals.

3.6 Unavoidable Adverse Environmental Impacts

3.6.1 Introduction

This section identifies the unavoidable adverse environmental impacts that may occur as a result of constructing and operating the Project. According to the SEQR Handbook (NYSDEC, 2020b), the SEQRA process requires the Lead Agency (NYSDEC) and other Involved Agencies to determine if the Project will result in any significant unavoidable or unmitigated adverse environmental impacts.

Unavoidable adverse environmental impacts associated with the proposed Project are the long-term effects that remain after mitigation efforts have occurred. These generally are impacts for which there is no additional feasible method for mitigation. Impacts can be temporary, due to construction activities, or long-term, due to physical alteration of the landscape and environmental conditions. This section summarizes those adverse impacts that cannot be avoided (6NYCRR 617.9 (b)(5)(iii)(b)).

3.6.2 Prior Consideration of Unavoidable Adverse Impacts

As part of the 2010 EIS, unavoidable adverse impacts were evaluated. In particular, the 2010 EIS determined that "the most significant impact identified is air quality." It then compared the Project with the available alternatives (no-action and a Phase 1 only alternative which would have only replaced the Westinghouse units at the Site) and found that the Project, as configured at that time, provided "dramatic benefits … in significant impact categories, air quality and energy." Based on this analysis. NYSDEC concluded in its Findings Statement that "[c]onsistent with social, economic and other essential considerations from among the reasonable alternatives available, the action is the one that avoids or minimizes adverse environmental impacts to the maximum extent practicable, and that adverse impacts will be avoided or minimized to the maximum extent practicable by incorporating as conditions to the decision those mitigative measures that were identified as practicable."

As detailed in Section 1.1.3, the Project has been modified from its previously permitted configuration such that it would be smaller in scale, which means fewer structures and stacks, will incorporate new state-of-the-art and more efficient equipment, and as a peaking facility will operate considerably less often. Due to these modifications, the Project as considered in this Draft SEIS further reduces the potential for adverse impacts. Potential environmental impacts that have been reduced and, thus, not considered in this Draft SEIS include the following (refer to Final Scoping Document, **Appendix D**):[103]

Water Resources and Stormwater Management

The 2010 Findings Statement concluded that "no significant impacts to surface water quality are expected." Water use and wastewater discharge to Outfall 001 for the Project as modified are considerably lower than the Project as previously approved. As in 2010, water will be sourced from New York City water supply with no water withdrawn from the East River.

Noise

The 2010 Findings Statement determined that the predicted increase in noise from the Project was "less than the significance criterion established by CEQR and DEC noise guidance" and further "in compliance with the NYC Noise Code and NYC Zoning

[103] The Final Scoping Document further summarizes those impacts for which there was no change since 2010 when it was determined that there would not be any adverse impact from the Project. These impact categories include: geology, soils and topographic; biological, terrestrial, and aquatic ecology; historic, cultural and archeological resources; public safety; community facilities and services; communication facilities; land use and zoning; use and conservation of energy resources; socioeconomics, and growth inducing impacts.

Resolution criteria." Predicted noise from the Project will be less than the levels previously approved in 2010.

Aesthetic and Visual Resources

In 2010, NYSDEC concluded that the Project "is visually consistent in character with the area, conforms with the look of the existing neighborhood/study area, and does not change the character of the urban design of the area, does not affect any historic or cultural resources, and would be visible to existing residential and commercial areas only in very limited locations." It, therefore determined in its Findings Statement that "[t]he project would not significantly and adversely affect inventoried visual resources, nor affect the public's ability to view and enjoy those resources' such that it "would not result in adverse visual or aesthetic impacts." The Project, as modified, will be smaller in scale compared to the previously approved Project configuration; it will have fewer structures and stacks. As such, the visual impact of the Proposed Action will be less than that evaluated in the 2010 FEIS.

Traffic and Transportation

In 2010, NYSDEC determined that the Project would not have an adverse impact on traffic or transportation. The Project as modified is anticipated to have less operational traffic. Specifically, there will be fewer full-time personnel and, thus, the commuter expectation will be less than both the current number and the number projected for the previously approved Project configuration. Typical truck trips will also remain below 10 per day. Truck trips associated with fuel deliveries will be less than what was anticipated with the previously approved Project configuration due to both its smaller size (437 MWe vs 1040 MWe) and because, as a peaking facility, the plant will operate considerably less often.

Geology, Soils and Topographic

Per the 2010 Findings Statement, "[p]otential impacts to geology, soils, and topography will be insignificant since the project is proposed to be developed on an existing industrially zoned site. As all of the NRG Facility is now utilized, no significant impacts will occur with respect to soils and subsurface conditions." The Project, as modified, will be on the same Site located within the Astoria ConEd Complex, which has been fully developed for over a century.

Biological, Terrestrial, and Aquatic Ecology

The 2010 Findings Statement concluded that there would be "no impacts" to biological, terrestrial and aquatic ecology for the Project based on the Site's more than 100 year history as a fully developed site for electric generating and utility services, the absence of any significant biological, terrestrial, or aquatic ecological resources on the Site and the lack of any proposal to include cooling water intake structures (CWIS) as part of the Project. There have been no changes since 2010 that alter this conclusion. The Project, as modified, still lacks any proposal to include a CWIS.

Effects on Use and Conservation of Energy Resources

The 2010 Findings Statement concluded that, because the Project would "use far less fuel than the existing NRG Astoria facility to produce the equivalent amount of electricity "….equating "to lower incremental energy costs and emissions", there would not be an adverse impact on effects on use and conservation of energy resources. There is no change in the potential effect on use and conservation of energy since 2010. The Project as modified will use even less fuel than the previously approved Project configuration. This equates to even lower incremental energy costs and emissions.

3.6.3 Determinations by Assessment Categories

As described in Section 3.0 of this Draft SEIS, most of the potential significant adverse impacts of the Project will be avoided or mitigated by Project design and implementation of mitigation measures. However, in a few instances, no practicable mitigation was identified to fully mitigate adverse impacts, and, as detailed in Section 4.0, there are no reasonable alternatives to the Project that would meet its purpose and need, eliminate its impacts, and not cause other or similar significant adverse impacts.

The following is a summary of the potential for those "Unavoidable Adverse Impacts."

3.6.3.1 Air Quality

Certain impacts associated with construction activities (such as fugitive dust emissions and construction worker vehicle exhaust emissions) would be unavoidable, even with the proposed mitigation measures described in Section 3.1.9. The impact on air quality, however, would be slight, of limited duration, and would be minimized to the extent practicable through standard construction practices.

The current Project's design includes a state-of-the-science air pollution control system that minimizes air emissions to the maximum extent practicable during operation (refer to Section 3.1.9 of this Draft SEIS). The air quality impact analyses that have been conducted (as described in Section 3.1.7) demonstrate that operation of the Project as modified would result in ambient concentrations of criteria and non-criteria compounds well below health-based and welfare-based ambient air quality standards and guidelines.

In addition, as discussed in Section 3.2, the Project will displace emissions from less-efficient, uncontrolled fossil-fueled electric generating units. This will result in a significant net air quality benefit. Further, there are no reasonable alternatives to the Project that would meet its purpose and need, eliminate its impacts, and not cause other or similar significant adverse impacts (refer to Section 4.0).

Based on the above, as in 2010, the Project would not result in any unavoidable unmitigated adverse air quality impacts.

3.6.3.2 Climate Change and Greenhouse Gas Emissions

Section 3.2 discusses how the Project is consistent with the CLCPA and New York City climate-related Executive Orders, local laws and policies.

The analysis includes GHG emissions from operation of the proposed Project (see **Table 3.2-7**) and upstream GHG emissions, and demonstrates that the proposed Project:

- is consistent with the CLCPA's and local New York City limits, targets and goals;
- will not interfere with the attainment of the ECL Article 75 GHG reduction standards established by the CLCPA; and
- will assist in the attainment of the CLCPA renewable resource targets and GHG emission reductions as well as New York City's climate-related Executive Orders, local laws and policies.

The proposed Project will add an efficient, low-emitting resource to the New York City electrical system, resulting in a reduction of direct, indirect, and upstream GHG emissions. In the mid to longer term (2030-2040), as other renewable resources are added to the system, maintaining efficient low capacity factor dual fuel generation in New York City is important to minimize system cost as technology develops

to reach the ultimate CLCPA limits and to allow for renewables to be added to the system in a cost effective manner. The Project is suited to fill this role and its implementation is forecasted to result in a combined direct, upstream and indirect reduction in GHG emissions through 2035 of over 5,000,000 tons (as shown in **Table 3.2-1** and **Figure 3.2-1**). In the longer term, the proposed Project will be capable of converting to the use of GHG-free hydrogen as fuel, if available[104].

The Project also proposes a smaller plant size (437 MWe vs 1040 MWe) as compared to the Project as previously approved. Because the Project in its current configuration proposes a peaking facility, projected operations will represent a considerably smaller portion of the year, resulting in less GHG emissions. In addition, since the Project does not result in additional employees, there are no additional emissions associated with commuting employees.

The Project will avoid and minimize GHG emissions by implementing BACT for GHGs. As discussed in more detail in Section 4 (BACT analysis) of the 2020 Air Permit Modification Application and in Sections 3.1 and 3.2 herein, GHG emissions will be mitigated though the use of: (1) high-efficiency generating technology; and, (2) low-carbon fuels. It will also operate as a peaking facility with a permitted annual capacity factor of up to approximately 30%, and an expected capacity factor of approximately 4.4% over the 2023-2035 period, which will result in substantially lower GHG emissions compared to the previously approved Project with its four CCCTs and a permitted annual capacity factor in excess of 85%.

Furthermore, as mitigation for direct GHG emission impacts at the Project location, Astoria will upgrade the starting system for the two P&W combustion turbines being retained for black start service. As described further in Section 3.2.4, substantial GHG emissions savings can be achieved by converting the start system for the black start P&W Twin Pac from natural gas to compressed air. The use of compressed air in the start system avoids 1.07 tons of methane emissions on each Twin-Pac start up. As the two P&W black start combustion turbines are expected to start up at least once per month for testing in accordance with Con Edison's system restoration program requirements, the total savings of methane emissions will be 12.83 tons per year, or an annual savings of 1,077 tons of CO_2e.

Further, the Project's future physical climate risk will be minimized as it has been designed to be consistent with the relevant sea-level rise projections, and to mitigate the risks of sea-level rise, storm surges and flooding. The sea level rise projections included in Part 490 of Title 6 of the New York Code of Rules and Regulations and the 2018 Draft New York State Flood Risk Management Guidance for the Implementation of the Community Risk and Resiliency Act ("2018 Guidance") were used to determine the elevation of critical Project components. Additional freeboard per the 2018 Guidance was included in elevation calculations.

For the reasons noted above and as documented in Section 3.2, implementation of the Project would result in an overall reduction in annual GHG emissions from the electric system. Future climate risk has also been reduced thorough Project design elevations that minimizes the risk of flooding, due to sea-level rise and storm surges. Further, there are no reasonable alternatives to the Project that would meet its purpose and need, eliminate its impacts, and not cause other or similar significant adverse impacts (refer to Section 4.0). Therefore, as in 2010, the Project would not result in any unavoidable, unmitigated adverse impacts due to future physical climate risks or GHG emissions.

[104] It should be noted the Project is not seeking to permit operation on hydrogen fuel at this time. Such operation will require a future amended permitting process.

3.6.4 Conclusion

Certain adverse environmental impacts associated with the Project are unavoidable. Potential unavoidable adverse impacts related to the Project have been reduced as much as practical through Project design and appropriate mitigation measures. As documented in the 2010 EIS, 2020 Final Scoping Document and Sections 3.1 through 3.5, potential adverse impacts have been avoided or mitigated through Project design, which minimizes Project impacts to the maximum extent practicable. There also are no reasonable alternatives to the Proposed Project that would meet its purpose and need, eliminate its impacts, and not cause other or similar significant adverse impacts (refer to Section 4.0). Therefore, the project will not result in any unavoidable adverse environmental impacts.

4.0 Alternatives

4.1 Background

NYSDEC recently adopted 6 NYCRR 227-3 (commonly referred to as the Peaker Rule) that is applicable to the Facility's existing P&W SCCTs. Section 227-3.4 limits NOx emissions for the existing units during the ozone season (May 1 – September 30) except for black start resources. The following NOx emission limits must be met as a facility-level weighted average of all P&W units at the Facility:

- by May 1, 2023 – 100 ppmdvc (all SCCTs); and
- by May 1, 2025 – 25 ppmdvc (gaseous fuels) and 42 ppmdvc (distillate or other liquid fuel).

Alternatively, an owner or operator may opt to comply with Subpart 227-3 by:

- agreeing to a permit condition to not operate the SCCTs during the ozone season (May 1 – September 30); or
- by meeting a 24-hour weighted average output-based emission limit that includes the electric output from electric storage or renewable energy resources.

The Peaker Rule (6 NYCRR 227-3.6) permits the NYISO or the local transmission/distribution owner to designate a SCCT as a reliability source to temporarily resolve a reliability need. A designated reliability source may continue to operate without complying with the applicable emissions limits of Subpart 227-3 until either a permanent solution is placed online or two years after the designated compliance date of Subpart 227-3 has lapsed. The Peaker Rule allows a designated reliability source to operate an additional two years (four years in total) without complying with the applicable emissions limits if the reliability need still exists and a permanent solution has been selected, and that solution is in the process of permitting or construction but not yet online.

Since the existing units do not meet either the 2023 or the 2025 Peaker Rule emission rates, the Applicant was required to file a compliance plan with NYSDEC by March 2020. On February 28, 2020, The Applicant submitted its compliance plan specifying the existing turbines would retire by May 2023 and be replaced by the Project.[105]

4.2 Alternative 1: No Action Alternative

This section evaluates the potential impacts under a scenario where the Applicant does not proceed with the Project but rather implements one of the No Action options discussed below. If the Project is not implemented, then the Applicant has three[106] options to comply with the Peaker Rule:

[105] Astoria submitted a revised compliance plan on May 1, 2020 specifying one existing P&W Twin Pac (consisting of two combustion turbines and a single electric generator) would be retained beyond May 2023 as black start resources pursuant to subdivision 227-3.2(b)(1).

[106] Complying with the hybrid daily effective emission rate listed in 227-3.5(b) in conjunction with nearby commonly owned renewable energy or energy storage resources is also an available option. However, the potential electrical output from electric storage or renewable energy resources is not sufficient for the Facility to comply with the effective emission rate and as such this option is not evaluated further.

A. Cease operating the P&W units at the Facility; or

B. Install controls to meet the NOx limits listed above; or

C. Agree to a permit condition prohibiting operation of the P&W turbines during the ozone season.

4.2.1 Option A – Cease Operating the P&W Turbines at the Facility

Under this option, in order to comply with the Peaker Rule, the Applicant would agree to shut down the Facility's existing 24 P&W SCCTs in May 2023 (cease providing power to the transmission or distribution system). This option assumes that the Site is not redeveloped with other air emission sources.

Shutting down the existing P&W SCCTs in 2023, without replacing them, would eliminate air emissions associated with the Facility. Visual impacts would remain the same. Traffic and noise impacts and other operational impacts would be reduced although negative socioeconomic impacts would occur through the loss of high value jobs, associated indirect jobs and local purchases and services.

Option A would also result in the loss of 502 MWe of generation capacity in NYC, as well as the loss of a critical black start capable resource that would no longer be available in the event of a city-wide power outage. Recent events in California highlight the risks involved in retiring natural gas fired capacity prematurely. In an evaluation of the conditions leading to rotating blackouts this past summer, former FERC Chairperson Cheryl LaFleur identified a "[l]ack of resources to balance wind and solar power."[107] Elaborating further, she states "These blackouts were not an accident—they were intentionally scheduled by the grid operator, the California Independent System Operator ("CAISO"), due to a shortage of resources available to keep the lights on."

In part to avoid the kind of rotating blackouts experienced in California and due to bulk power system limitations on importing power into Zone J[108], the NYSRC[109] establishes rules requiring a minimum amount of In-City generation (the Locational Minimum Installed Capacity Requirement or "LCR").[110] The LCR for New York City has been steadily increasing over the past several years, in part as a result of Indian Point Nuclear Station's retirement. Consequently, the loss of 502 MWe of generating capacity (without replacement) would have a material impact on Zone J reliability standards. In addition, based on the demand curve for New York City's Installed Capacity market, a shortage of In-City generation would also result in an increase in capacity prices paid for by New York City electricity customers.

Furthermore, following the adoption of the Peaker Rule, the New York Independent System Operator ("NYISO") with assistance from Con Edison completed a Short Term Assessment of Reliability: 2020 Q3 ("STAR Report")[111] and Reliability Needs Assessment ("RNA")[112] to determine potential impacts from the new regulations. The STAR Report addresses issues between 2021 and 2025, while the

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[107] "What's ailing California's Electric System" September 2, 2020; https://blogs.ei.columbia.edu/2020/09/02/whats-ailing-californias-electric-system/

[108] Zone J refers to the NYISO capacity zone comprising New York City.

[109] The New York State Reliability Council is a not-for-profit corporation responsible for promoting and preserving the reliability of the New York State power system by developing, maintaining and, from time to time, updating the Reliability Rules which must be complied with by the New York Independent System Operator and all entities engaging in electric power transactions on the New York State power system.

[110] See (NYSRC 2018) Rule A.2

[111] https://www.nyiso.com/documents/20142/16004172/2020-Q3-STAR-Report-vFinal.pdf/f836a71a-8fb7-dd24-2b6a-bfd0e739e2ec

[112] https://www.nyiso.com/documents/20142/2248793/2020-RNAReport-Nov2020.pdf/64053a7b-194e-17b0-20fb-f2489dec330d

RNA looks ahead from 2024 to 2030. Collectively, the STAR Report and RNA detail the following deficiencies[113]:

- On Con Edison jurisdictional facilities ("non-BPTF") in the Astoria East/Corona 138kV Transmission Load Area ("TLA"), thermal overloads of 110 MW starting in 2023 growing to 180 MW by 2030; the duration of the deficiency ranges from 10 hours in 2023 to 13 hours in 2030.

- On NYISO jurisdictional Bulk Power Transmission Facilities ("BPTF") in the New York City 345kV TLA, a 340 MVA dynamic instability issue starting in 2023 and growing from 1,020 MVA in 2025 to 1,390 MVA in 2030; the duration of the deficiency ranges from 9 hours in 2023 to 12 hours in 2030.

- Transmission loading issues in the New York City 345kV TLA starting at 700 MW in 2025 growing to 1,075 MW with the same duration as above.

To address the non-BPTF local transmission security violations in the Astoria East 138kV load pocket, Con Edison has proposed the installation of a "6-mile-long, 345/138kV Phase Angle Regulator (PAR) controlled feeder" from the 345kV Rainey substation to the 138kV Corona substation (the "TRACE Project").[114] To address the near term BPTF issues, the NYISO selected an alternative Con Edison operating procedure for summer 2023.[115] In a report dated February 23, 2021, the NYISO confirmed the Con Edison TRACE Project and alternative operating procedure "have reduced, but not eliminated, the dynamic instability issues. Transient voltage response violations are still observed on Con Edison's non-BPTF system from 2025 through 2030."[116]

Based on the NYISO's conclusions, it is reasonable to expect the capacity provided by the existing P&W units could still be needed post-2023 in order to meet critical deficiencies in New York City's power supply. Should the Facility be designated as a reliability source pursuant to 6 NYCRR 227-3.6, then it will continue operating with the same higher air emission rates and lower efficiency (compared to the proposed Project) until a permanent solution is implemented (up to four additional years). At a minimum, during this time the significant GHG reductions discussed in Section 3.2 would be lost. The results of that analysis are summarized in **Figure 4.2-1**[117] and shows a reduction of close to 255,000 tons of CO_2 emissions from the Project displacing less efficient, higher emission electric generating units between May 2023 and April 2027.

Given the foregoing, Alternative 1/Option A, Cease Operating the Facility in 2023 is not preferred as it:

- would not address known reliability shortfalls in NYC;

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[113] Deficiencies in the STAR Report and RNA are represented in terms of generic compensatory resources, in megawatts (MW) or megavolt-amperes (MVA). Compensatory MW and MVA amounts are determined by adding generic "perfect capacity" resources to effectively satisfy the needs. "Perfect capacity" is a term used to describe resources that are always able to produce energy on demand, without any limitations due to factors such as equipment failures or lack of fuel, without energy duration limitations, and without consideration of transmission security or interface impacts. Actual resources would need to be larger in order to achieve the same impact as perfect-capacity resources. RNA, p. 2.

[114] Utility Report Case 20-E-0197 Utility Transmission & Distribution Investment Working Group Report at pg 109.

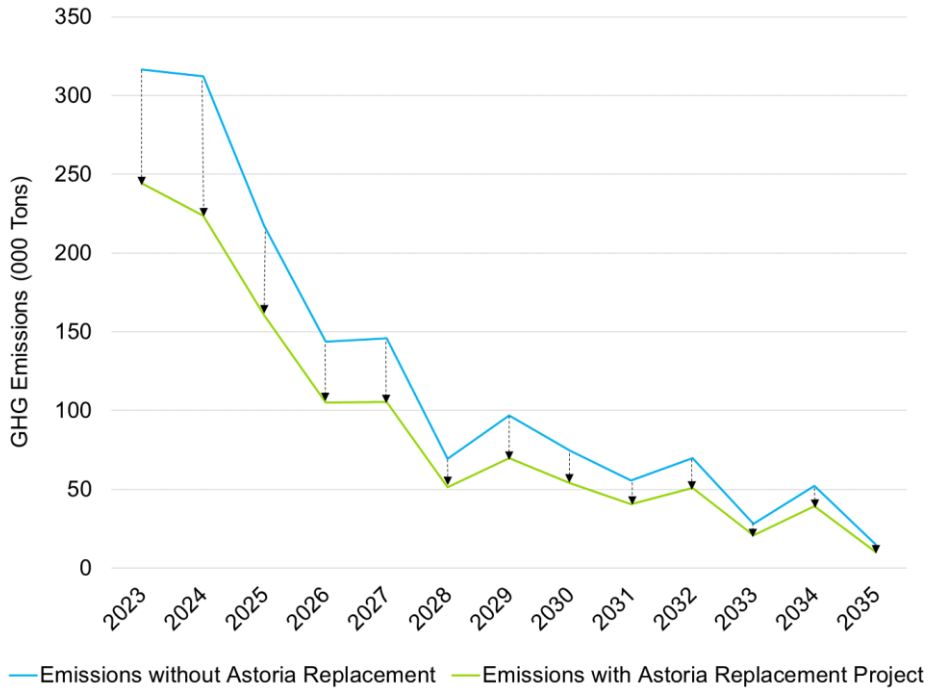
[115] Short-Term Reliability Process Report: 2023 Near-Term Reliability Need – Solution Selection February 22, 2021 at pg 7 https://www.nyiso.com/documents/20142/15930753/2020-Quarter-3%20Short-Term-Reliability-Process-Report-vFinal3.pdf/df5f4ead-0bea-3b31-710b-5fdbe4649a57

[116] 2020-2021 Reliability Planning Process: Post RNA Base Case Updates, February 23, 2021 Slide 19; https://www.nyiso.com/documents/20142/19415353/07%202020-2021RPP_PostRNABaseCaseUpdates.pdf/b81547bc-0411-7958-de0c-7b74244904a5

[117] See also Figure 9 of the Navigant/Guidehouse GHG Report in **Appendix E**.

- would not reduce costs for electricity customers in New York City by providing economic capacity (without a ratepayer guaranteed support contract);
- would not help New York State and New York City achieve their climate limits, targets and goals in that it would not:
  - reduce direct GHG emissions due to displacement of less efficient generating units nor indirect GHG emissions due to accelerated procurement of renewable resources due to capacity market savings;
  - facilitate the integration of renewable energy resources as it would not provide long-term, long duration backup power;
  - result in battery energy storage as proposed for the Project;
  - ensure the Site is preserved for the development of additional stand alone energy storage;
- could result in the Facility being designated as a reliability resource pursuant to 6 NYCRR 227-3.6 for up to four more years in which case significant reductions in air emission would be lost;
- would result in the loss of black start capability that the Site currently can provide jeopardizing the ability of New York City to recover from a major outage; and
- would not provide positive socioeconomic benefits from construction labor and materials, and from the retention of the operations labor force and secondary support services.

Figure 4.2-1 Comparison of Regional GHG Emissions with and without the Project as Currently Configured



Source: Navigant/Guidehouse Analysis; Arrows show reduction in GHG emissions with addition of Astoria Replacement Project. Note: 2023 includes June – December 2023 only.

4.2.2 Option B – Installing Controls on the Existing Units to Meet the Peaker Rule NOx Emission Limits under 227-3.4

Under this option, the Applicant would install air pollution control ("APC") systems and supporting equipment on the existing P&W units to meet the requirements of the Peaker Rule. The major APC system equipment would include twenty-four water injection skids (for use during ULSK firing), SCR and CO catalysts, catalyst frames, catalyst housing, ammonia storage tank, ammonia vaporizer, injection grids, controls and twenty-four exhaust stacks. The SCR and CO catalyst systems and water injection skids would be built on top of the existing P&W buildings. Emissions would be discharged from new rectangular exhaust stacks that would be built above the SCR and CO catalyst housing. The CO catalysts are necessary to reduce the increase in CO emissions resulting from use of water injection to initially control NOx emissions during ULSK firing. These systems are expected to produce exhaust gas emissions of not more than 10 ppmvdc NOx while firing natural gas and 16 ppmvdc NOx while firing ULSK. The total estimated cost for the design and installation of the APC systems and supporting equipment is approximately $339 million. The retrofit project would be accomplished in staggered unit outages over the next two years and could be completed in time for the Peaker Rule deadline of May 2023.

Visual, traffic and noise impacts would initially remain the same although there would be some short-term impacts from installation.

While installing the APC systems would enable the existing P&W SCCTs to comply with the Peaker Rule, they would also result in lower combustion efficiency for these turbines due to the effects of water injection and increased backpressure. As a consequence, contrary to the requirements of the CLCPA, the turbines would use more fuel to generate the same amount of energy resulting in even higher direct and upstream GHG emissions. The addition of the APC systems would also increase the Facility's auxiliary load (i.e., the electricity needed to operate the Facility), resulting in lower net power supplied to the electrical system. Even with the installation of the APC systems, the resultant NOx and CO emission concentrations would still be substantially higher than the Project.[118] Moreover, as discussed under Option A, the significant GHG reductions discussed in Section 3.2 and shown on **Figure 4.2-1** would be lost.

Further, as the capital cost of Option B approaches that of the Project, it is not cost-effective. For the purpose of determining whether the installation of the APC systems described in the previous paragraph are cost-effective, it was conservatively assumed that the 24 P&W turbines would operate at a 3% capacity factor (both currently and after the installation of the APC systems).[119] Based on these assumptions and the current actual and future expected emission rates, the decrease in annual NOx emissions associated installation of the APC systems was calculated to be 355.6 tpy. The total installed cost was then divided by the total reduction in emissions, resulting in an estimated cost of approximately $938,800 per ton of NOx controlled, a value that is clearly not cost-effective when compared to the cost threshold that NYSDEC has determined to be economically feasible under NOx RACT ($3,000/ton)[120].

[118] The existing turbines with new APC equipment would have between 3x and 18x greater NOx and CO emission rates than the Project.

[119] The cost-effectiveness of a particular pollution control is determined by dividing the total cost of the APC system by the reduction in annual emissions (in tons) achieved by the APC system. As such, it is necessary that emissions with and without the APC system be based on the same annual hours of operation.

[120] NYSDEC guidance document DAR-20 Economic and Technical Analysis for Reasonably Available Control Technology (RACT) (effective October 18, 2013).

Given the foregoing technical, environmental and economic factors, Alternative 1/Option B (Installing APC Systems on the Existing Turbines) is not preferred as it:

- is not a long-term solution given the age of the existing P&W units (50+ years);
- does not meet the NYSDEC's determination of economic feasibility because it exceeds the published $/ton threshold;
- would not reduce air emission rates for all pollutants;
- would not help New York State and New York City achieve their climate limits, targets and goals in that it would not:
  - reduce direct GHG emissions due to displacement of less efficient generating units;
  - facilitate the integration of renewable energy resources as it would not provide long-term, long duration backup power;
  - result in battery energy storage as proposed for the Project; and,
  - provide long-term economic capacity to NYC (without a ratepayer guaranteed support contract).

4.2.3 Option C – Prohibit Operation of P&W Turbines During the Ozone Season

A review of Facility operations during the past five full years (2015-2019) shows that approximately 59% of the P&W turbines annual generation occurred during the ozone season, which is historically when the demand for electricity is typically the greatest. Accepting a permit condition prohibiting operation during the ozone season would therefore result in the loss of an important generation resource. Based on the NYISO's recent STAR Report and Reliability Needs Assessment discussed under Option A, it is expected the capacity provided by the existing P&W units could be needed post-2023 during the ozone season in order to meet critical deficiencies in New York City's power supply. Should the Facility be designated as a reliability source pursuant to 6 NYCRR 227-3.6, then it will continue operating with the same higher air emission rates and lower efficiency until a permanent solution is implemented (up to four additional years). As a minimum, during this time the significant GHG reductions discussed in Section 3.2 would be lost.

Given the foregoing, Alternative 1/Option C (Prohibit Operation of P&W Turbines During the Ozone Season) is not preferred as it:

- would not address known reliability shortfalls in New York City;
- would not reduce costs for electricity customers in New York City by providing economic capacity(without a ratepayer guaranteed support contract);
- would not help New York State and New York City achieve their climate limits, targets and goals in that it would not:
  - reduce direct GHG emissions due to displacement of less efficient generating units;
  - facilitate the integration of renewable energy resources as it would not provide long-term, long duration backup power;
  - result in battery energy storage as proposed for the Project;
- could result in the Facility being designated as a reliability resource during the ozone season pursuant to 6 NYCRR 227-3.6 for up to four more years in which case significant reductions in air emission would be lost;
- would not reduce air emission rates during the non-ozone season (October 1 – April 30);
- would result in the loss of black start capability during the ozone season that the Site currently can provide, jeopardizing the ability of New York City to recover from a major outage; and,

- would not provide positive socioeconomic benefits from construction labor and materials, and would not ensure retention of a year-round operations labor force and secondary support services.

4.3 Alternative 2: The Project as Configured in 2010

This section evaluates the impact of proceeding with the Project in its previously permitted configuration, instead of the Project as currently configured.

4.3.1 Alternative 2 Description

The 2010 Alternative configuration included four GE 7FA CC-FAST CCCTs intended to be used for intermediate duty with a total gross electrical output of 1,040 MWe and a permitted annual capacity factor in excess of 85%[121]; ULSD firing in all four units was limited to a total of 400 hours/year ("Alternative 2"). Alternative 2 was to be constructed in two phases, with two CCCTs per phase, over a five-year period. The Alternative 2 turbines would be equipped with evaporative coolers and would primarily fire natural gas with ULSD as the back-up fuel. NOx emissions would be controlled with a SCR system using aqueous ammonia, and water injection (ULSD only). CO, VOC, and organic HAP emissions would be controlled with oxidation catalysts. These are the same control systems that are proposed for the Project as modified.

Table 1.1-2 provides a summary comparison of Alternative 2 and the Project as modified designs.

4.3.2 Comparison of Potential Environmental Impacts from Alternative 2 to the Project

As discussed below, the environmental impacts of Alternative 2 are greater than the Project as modified.

Table 3.1-7 shows that maximum annual emissions for Alternative 2 are 2.4x to 5.4x greater than annual emissions for the Project as currently configured (with the exception of VOC emissions which are similar). The differences are primarily the result of a larger facility size (1,040 MW vs 437 MW) and annual capacity factor (>85% vs 30%). With respect to water resources, as discussed in Section 3.3.7.2, water use and wastewater discharge for Alternative 2 are considerably higher than corresponding data for the Project as currently configured. As shown in **Table 3.3-4**[122], Alternative 2 would have greater noise impacts at receptors N1, N2, and N3 (by 3.3, 5.5, and 6.0 dBA respectively) than the Project as currently configured. Visual impacts of Alternative 2 also will be greater than the Project as modified. **Figures 3.3-7 and 3.3-8** demonstrate the Project uses less than one half the site with a single 250-foot exhaust stack, whereas Alternative 2 would have taken up the entire site and included four 250-foot exhaust stacks. Finally, as discussed in Section 4.1.6 of the Final Scoping Document, traffic impacts would be greater under Alternative 2 as there would be more full-time personnel as well as more truck trips associated since Alternative 2 is larger in size (1040 MWe vs. 437 MWe), has a longer construction schedule and was permitted with a larger annual capacity factor than being sought for the Project.

4.3.3 Limitations of Alternative 2

A primary purpose of the Project is to provide backup/stand by service for intermittent renewable resources by participating in the Ten Minute Non-Synchronous Reserves ("TMNSR") market. This market requires a facility to be able to start up and reach full load within 10 minutes, operate for no more than one hour, shut back down and immediately be prepared to start up again within 10 minutes.

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[121] The 2010 configuration of the Project was permitted based on annual operation of each of the four CCCTs limited to 8460 hrs/yr on natural gas and 100 hrs/yr on ULSD. This is equivalent to an annual capacity factor of 98%.

[122] The three residential noise receptors evaluated are the same as in 2010 (see **Appendix I** for details).

Alternative 2 was not designed to provide TMNSR service. In addition, the construction schedule for a four-unit combined cycle project is approximately 60 months as opposed to 25 months for a single unit simple cycle project. Even if construction were started now (April 2021), the facility could not be ready for operation by May 2023.

4.3.4 Conclusion

Alternative 2 (Previously Permitted 2010 Configuration) is not preferred as it:

- requires a longer construction schedule and cannot be completed in time to ensure uninterrupted service from the Site; thus, creating short-term reliability concerns;
- results in greater direct air emissions, including GHG emissions;
- results in greater impacts to water resource, noise, traffic, and aesthetic/visual resources;
- would provide less help to New York State and New York City in achieving their climate limits, targets and goals in that it would:
  - not qualify for TMNSR, an essential NYISO reliability service for backup/standby generators supporting the integration of additional renewable resources;
  - not result in battery energy storage as proposed for the Project;
  - limit future stand alone energy storage installations due to its larger project footprint;
- would not reduce costs for electricity customers in New York City by providing economic capacity as it would require a ratepayer guaranteed support contract to move forward; and,
- would result in the loss of black start capability that the Site currently can provide, thus, jeopardizing the ability of New York City to recover from a major outage.

4.4 Alternative 3: The Project as defined by the Siting Board's 2019 Declaratory Ruling

4.4.1 Alternative 3 Description

In 2017, the Applicant presented a modification of the previously approved Project to the Siting Board as part of its Petition for Declaratory Ruling (refer to Section 1.1.2). This iteration of the Project consisted of three turbines, rather than four, and the units were to be operated in simple cycle mode rather than combined cycle mode. The replacement turbines for Alternative 3 were to be the same GE 7F.04, dual-fuel models as previously permitted in 2010 and discussed in Alternative 2. The design output of this alternative was 579 MWe (total for three units), compared to Alternative 2's 1,040 MWe for the four combined cycle units. Alternative 3 would ensure continuous service from the site while replacing the existing P&W turbines.

The Alternative 3 turbines would be equipped with evaporative coolers and would primarily fire natural gas with ULSD as the back-up fuel. NOx emissions would be controlled with a SCR system using aqueous ammonia, and water injection (ULSD only). CO, VOC, and organic HAP emissions would be controlled with oxidation catalysts. These are the same control systems that are proposed for the Project as modified.

Table 1.1-2 provides a summary comparison of Alternative 3 and the Project as modified designs.

While the annual capacity factor for Alternative 3 was not specified in either the July 2017 Petition or the June 2019 declaratory ruling, it has been assumed to be the same as for the Project as modified (i.e., 30%); ULSD firing in all three units was to be limited to 720 hours/year per unit, consistent with the Project as modified.

4.4.2 Comparison of Potential Environmental Impacts from Alternative 3 to Project

As discussed below, the environmental impacts of Alternative 3 are greater.

The expected hourly and annual air emissions for Alternative 3 are greater than air emissions for the Project as currently configured because of the greater electrical output and the lower efficiency associated with Alternative 3 although both project configurations would use the same state-of-the-art air pollution control system and would have roughly the same annual capacity factor. Water use and wastewater discharge and noise impacts for Alternative 3 are higher compared to the Project because of the greater electrical output associated with Alternative 3. Alterative 3's impact on aesthetic and visual resources would also be greater. Alternative 3 would occupy a greater footprint on the Site than the Project as currently configured and Alternative 3 also would consist of three CTGs, each with a stack height of 250 feet, while the Project as currently configured has only one CTG with a stack height of 250 feet. Finally, Alternative 3's traffic impacts would be slightly higher. Operational commuter traffic for Alternative 3 would be similar to the Project as currently configured based on a similar expectation of personnel and the expected number of commuting workers. As with the Project as currently configured, expected typical truck trips for Alternative 3 would be below 10 per day. However, due to the larger size (579 MWe vs 437 MWe) of Alternative 3, estimated truck trips associated with fuel deliveries would be slightly greater for Alternative 3.

4.4.3 Limitations of Alternative 3

The construction schedule for a three-unit simple cycle project is longer than the schedule for a single unit simple cycle project. Based on the Project's expected start date, Alternative 3 would not be ready for operation by May 2023.

4.4.4 Conclusion

Alternative 3 (as Presented in Siting Board 2019 Declaratory Ruling) is not preferred as it:

- proposes a larger size project with less efficient technology resulting in greater direct air emissions, including GHG emissions;
- results in greater impacts to water resources, noise, and aesthetic/visual resources;
- requires a longer construction schedule with attendant impacts; and,
- would not result in battery energy storage as proposed for the Project.

4.5 Alternative 4: Stand Alone Battery Energy Storage

Under the Alternative 4, the existing turbines would be replaced by a stand-alone Lithium Ion Battery Energy Storage System ("BESS").

4.5.1 Alternative 4 Description

NRG Energy, Inc. ("NRG"), the parent of Astoria Gas Turbine Power LLC, has been evaluating battery energy storage projects on the Site for several years. In fact, a 1.5 MW mobile battery storage project is already under construction on the Site. Known as Storage on Demand, this project is being completed in partnership with Con Edison under the state's Reforming the Energy Vision ("REV") program.[123] Storage on Demand consists of three 500 kW battery storage systems on mobile trailers, which will be deployed throughout Con Edison's service territory as needed. When not deployed, the

[123] PSC Case 14-M-0101 - Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision. Order Adopting Regulatory Policy Framework and Implementation Plan (Issued February 27, 2015).

battery storage systems will participate in New York's wholesale energy markets from the Site. Commercial operation is expected by summer 2021.

In addition, due to the ability of battery energy storage systems to provide short-term balancing services (e.g., shifting renewable energy from off-peak to on-peak periods), NRG has initiated early development efforts for an onsite 79.9 MW stand alone battery storage system.[124] Ultimately, NRG believes the best long-term use of the Site would include fast start dispatchable generation for long duration backup/standby service followed by future development of stand alone battery energy storage.

However, battery energy storage is not currently preferred as a stand-alone project at the Site. The existing P&W turbines are expected to operate at the Site until May 2023 due to known reliability issues identified by the NYISO and Con Edison (See Section 4.2.1). As a result, retirement of the existing turbines is contingent on the proposed Project maintaining continuous service from the Site.[125] As noted above in Section 4.1, if a replacement project is not ready by May 2023, the Facility could be deemed a designated reliability source which may require it to operate for up to an additional four years (May 2027). As a result, the entire Site is not currently available for the development of energy storage.[126]

Given the foregoing, the battery energy storage system evaluated under this alternative is limited to approximately 7.3 acres of the Site's 15 acres to ensure continuous service from the existing turbines to address local reliability issues. As such, this alternative considers a BESS with a capacity of 293 MWe (alternating current or "AC") with a 4-hour duration as shown on **Figure 4.5-1**.

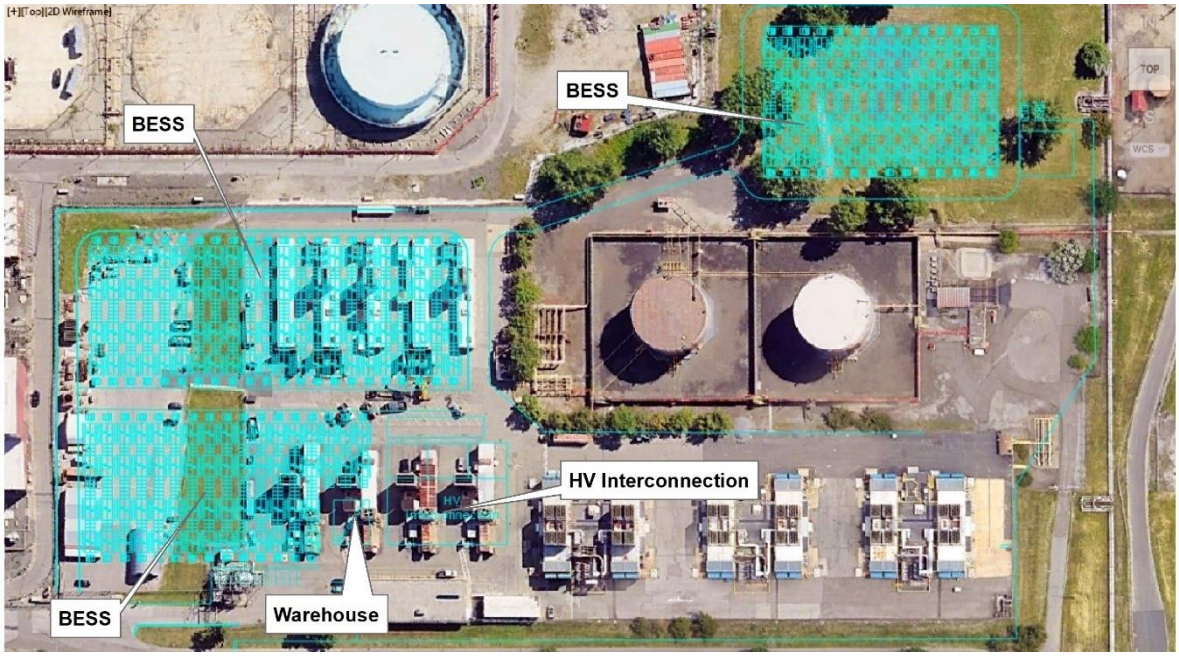
The battery energy storage system would consist of modular enclosures housing direct current "DC" batteries, bi-directional inverters, cooling systems, AC circuit breakers, and an integrated computerized battery management system. Each enclosure would be rated at 2,958 kWh AC and 910kVa (at 480V). There would be four enclosures behind a single transformer. Space would be included to augment the system as needed to continually provide output at rated capacity for 20 years. Augmentation would be accomplished by installing additional enclosures and inverters as older batteries degrade.

[124] See Q830 in the NYISO's electric interconnection queue.

[125] The Applicant further notes the retirement of the existing Facility is also subject to prior approval by the NYISO pursuant to Section 38 (Generator Deactivation Process) of its Open Access Transmission Tariff.

[126] Once the P&W units cease operating, they could be demolished to allow for additional space at the Site for battery energy storage. This, however, could not be accomplished until the existing units are approved for retirement by the NYISO and are removed from the Site; a process that could take several years to complete. The Applicant notes the potential development of additional stand alone battery energy storage after the existing turbines retire is already part of the long-term plan for the Site.

Figure 4.5-1 Alternative 4 BESS Layout



4.5.2 Comparison of Potential Environmental Impacts from Alternative 4 to Project

Visual impacts from Alternative 4 would be relatively unchanged from existing conditions. Traffic and noise impacts would likely be reduced but not eliminated. Given the minimal impact on those resources from the proposed Project, the difference is anticipated to be negligible. Impacts to water resources would likely be less under Alternative 4. However, there would be short-term traffic and noise impacts during an expected 16-month construction schedule.

While the battery storage system itself operates without meaningful air emissions, it does increase total energy consumption on the electrical system when it recharges. Based on a round trip efficiency of 85 percent and, assuming the system cycles 350 days per year, Alternative 4 would require more than 480 GWh of incremental energy production annually from other NYISO generating resources. Assuming all of the charging requirements are met off peak, the total annual air emissions attributable to the energy storage system are summarized in **Table 4.5-1.**

In addition, due to fire and personnel safety concerns, any BESS project would need to obtain a Letter of No Objection from the New York City Fire Department ("FDNY").

Table 4.5-1 Estimated Air Emissions Attributable to the Alternative 4: Battery Energy Storage System

Pollutant	Emissions (tpy) (1)
NO_X	2.6
VOC	0.5
CO	2.0
PM_{10}/ $PM_{2.5}$	2.3
SO_2	0.4
GHG as CO_2e – 20 yr GWP	50,183
(1) Assumptions: 293 MWe storage capacity, 4-hour duration, 350 cycles/yr, 85% efficiency, and emissions based on marginal off-peak generating resources. Indirect/upstream emissions are not included.	

4.5.3 Limitations of Alternative 4

On December 2018, the NYSPSC issued an Energy Storage Deployment Order, which included a requirement for the Department of Public Service staff to analyze the operational and emissions data of conventional peaking units to identify potential candidates for repowering or replacement with energy storage and/or clean resources (NYSDPS, 2018). The Department of Public Service retained E3 Consulting to conduct this analysis. In July 2019, E3 issued their final report entitled "The Potential for Energy Storage to Repower or Replace Peaking Units in New York State"[127].

E3's analysis included about 4,500 MW of peaking units across the state (almost entirely concentrated in New York City, Long Island, and the Lower Hudson Valley) and concluded only 83 MW were candidates for replacement with 4-hour battery energy storage systems (or about 2 percent). However, if the study was expanded to include 6 to 8-hour duration systems, then some of NRG's existing turbines could potentially be candidates for replacement.[128] While the Applicant does not agree with this conclusion due to the numerous occasions when the existing Facility has been required to operate longer than 8 continuous hours (see Section 1.4.1), it is further discussed below.

As detailed in Appendix B of the E3 report, replacing the existing Facility turbines would require energy storage resources of 6 to 8 hours duration with sizes ranging from 100 to 150 percent of the existing turbines' capabilities. Based on this information, it can be determined that the amount of currently available 4-hour duration energy storage resources required to replace the existing turbines with the same output rating as the Project (437 MW) would be 1,024 MW. As described above, the

[127] https://www.ethree.com/wp-content/uploads/2019/08/E3_The_Potential_for_Energy_Storage_to_Repower_or_Replace_Peaking_Units_in_New_York_State_July_2019.pdf.

[128] It is important to note the E3 study did not include any analysis of limitations associated with charging constraints in load pockets such as the Astoria East/Corona 138kV Transmission Load Area where the existing turbines are located. Identifying these limitations would require battery energy storage configurations to be submitted into the NYISO's electrical interconnection process.

Site only supports the construction of 293 MW of 4-hour duration battery energy storage resources, which is less than 30 percent of the amount required in the E3 analysis. Even if the Site could accommodate the full 1,024 MW, it is estimated the cost of such a project would exceed $1.5 billion. This capital cost alone[129] is close to 4x the anticipated cost of the Project and would not be economically feasible without a ratepayer guaranteed support contract.

Additionally, an energy storage alternative cannot resolve the reliability issues identified in New York City (see Section 4.1.1) since it cannot be constructed in time to replace the existing turbines. In particular, interconnecting to Con Edison's high voltage electric transmission system involves a process requiring over three years to complete. The typical electrical interconnection process in New York starts with an interconnection request to the NYISO followed by receipt of an approved System Reliability Impact Study ("SRIS") scope from the NYISO Operating Committee ("OC") (6 months). The SRIS must then be completed and the study results approved by the OC (12 months). Next, the project with its approved SRIS must enter the NYISO Class Year process. At the completion of the Class Year process (18-24 months), the project must accept its interconnection costs and post financial security. Finally, the interconnection facilities must be constructed (6 – 24 months), which is estimated to be about a year for Alternative 4. In the best circumstances, a project requires over three years between interconnection request and interconnection facilities availability for use.

Even if the energy storage system could be available in time to meet the identified reliability needs, its limited discharge duration before requiring recharge (4 hours) would not fully address either the Astoria East/Corona 138kV deficiency (9-12 hours in duration) or the Zone J 345kV transmission security violations (10-13 hours in duration).

In addition, energy storage resources have limitations on their ability to serve in the future as detailed by several consultants in recent reports. The Brattle Group produced a report for the NYISO in June 2020 entitled "New York's Evolution to a Zero Emission Power System" which identified the following key issue:

> "**Short duration storage** such as batteries can help provide balancing across hourly and daily time scales". However, "the **future [electric grid**] will require more flexibility across all time scales (hourly, multi-day, seasonal) to balance intermittent renewables and more volatile load." (emphasis in original)[130]

Similarly, in its State of the Grid 2021 Presentation Talking Points, the NYISO states:

> "Battery storage resources help address variability from renewable resources, but based on current technology, periods of reduced renewable generation when the sun doesn't shine or the wind isn't blowing rapidly deplete battery storage resource capabilities".[131]

The Analysis Group prepared the graphic in **Figure 4.5-2** which demonstrates the future need for quick start dispatchable resources to provide long-duration seasonal scale backup service (Analysis Group 2020). In this case, several multi-day lulls in winter wind production create a series of shortfalls

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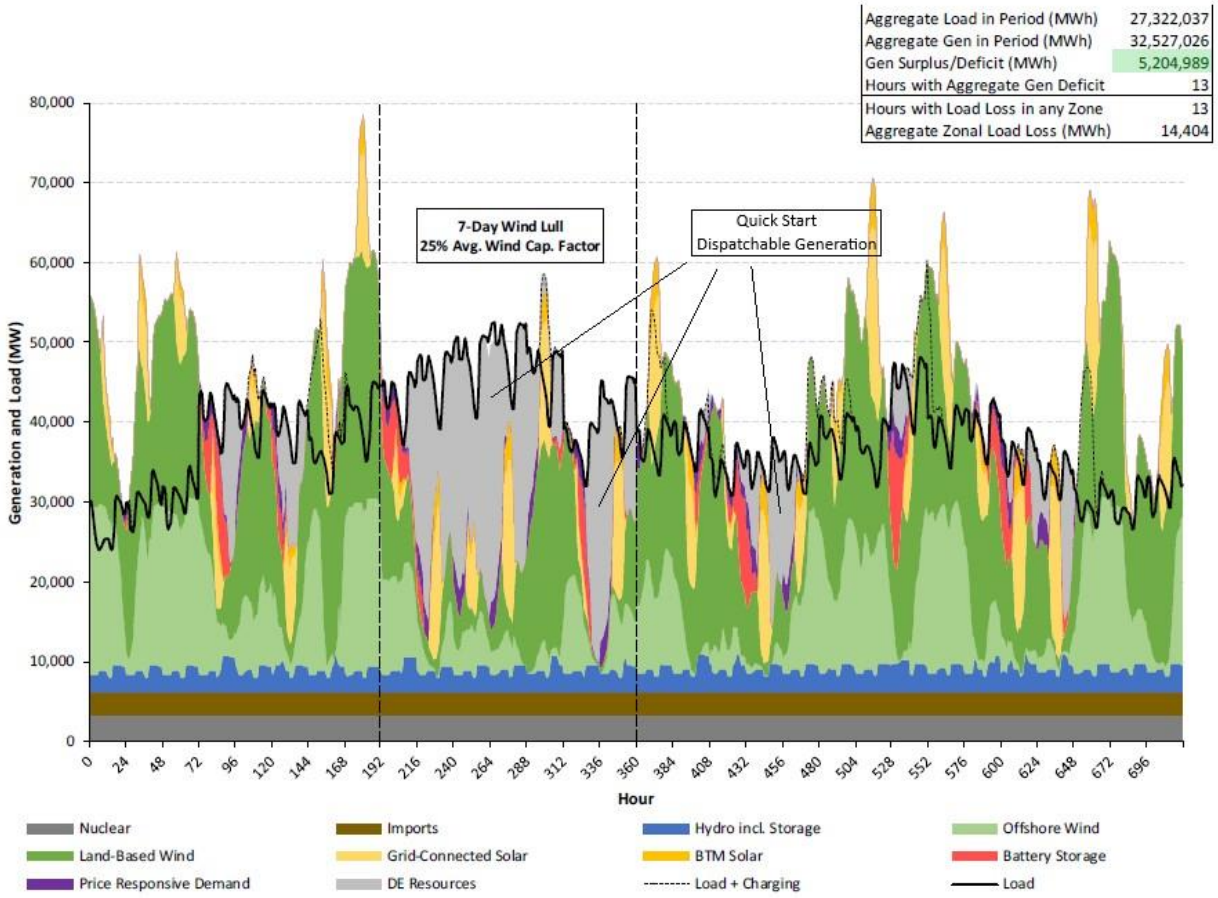
[129] The E3 report specifically did not address capital or life cycle costs of replacing peaking units with energy storage

[130] https://www.nyiso.com/documents/20142/13245925/Brattle%20New%20York%20Electric%20Grid%20Evolution%20Study%20-%20June%202020.pdf/69397029-ffed-6fa9-cff8-c49240eb6f9d

[131] February 25, 2021 https://www.nyiso.com/documents/20142/15736687/State-of-the-Grid-Dewey-Presentation-Talking-Points.pdf/560be98f-1ae9-0e10-ccef-cfcea25fff84

in energy production (gray areas of graph below) following the depletion of battery energy storage resources (red areas of graph below).

Figure 4.5-2 Hourly Load/Generation Balance

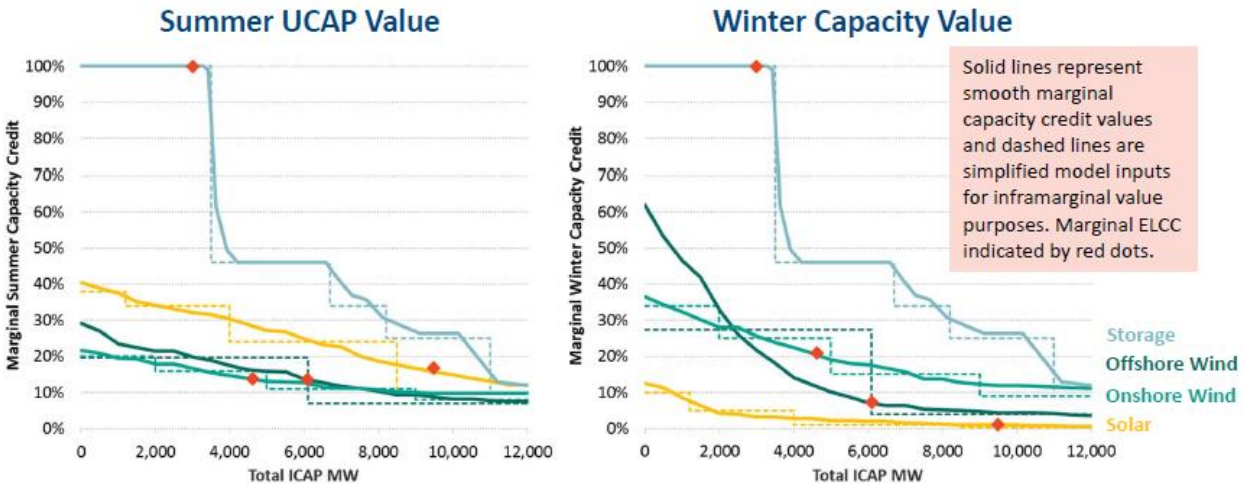


Furthermore, under current NYISO rules, 4-hour duration battery energy storage resources suffer a 10 percent derate in the capacity market (increasing to 25 percent as soon as 1,000 MW of limited duration energy storage resources are added to the system).[132] The rationale for these capacity derates is described in the Brattle Group's May 2020 report to the New York Public Service Commission entitled "Quantitative Analysis of Resource Adequacy Structures":

> "Energy storage can change the "shape" of peak net load periods, flattening and elongating peak periods. As more storage is deployed, longer discharge durations are therefore required to provide the same capacity value."[133]

In the future, the capacity derate for energy storage and intermittent renewable resources (wind and solar) increases even further as shown on the graph in **Figure 4.5-3**.

Figure 4.5-3 Capacity Derate for Energy Storage and Intermittent Renewables



As noted in the graphs provided in **Figure 4.5-3**, assuming New York is successful in adding the necessary energy storage resources to reliably operate a zero carbon electric grid in 2040 (15.6 GW per **Figure 3.2-4** in Section 3.2.1.2), the capacity market derate for each MW will be close to 90%. Wind and solar have even greater discounts.

Relative to the economic feasibility of an energy storage alternative, the capital cost of the system is estimated at $452M or $1,543/kW (a greater than 21% increase in cost over a combustion turbine[134] with only 67% of the output, which is limited to a 4-hour duration). Due to this above market cost, financing an alternative battery energy storage project would require ratepayer support in the form of a long-term Energy Storage Service Agreement ("ESSA"). Moreover, based on the current FERC approved Buyer Side Mitigation rules, such ratepayer support would trigger a mandatory floor price

[132] May 2019 presentation to the NYISO ICAPWG (https://www.nyiso.com/documents/20142/5375692/Expanding Capacity Eligibility 030719.pdf/19c4ea0d-4827-2e7e-3c32-cf7e36e6e34a)

[133] https://brattlefiles.blob.core.windows.net/files/18985_quantitative_analysis_of_resource_adequacy_structures.pdf ; p. 16.

[134] Navigant's estimated cost for a CT in Zone J is $1,274/kW based on U.S. Energy Information Administration data and National Renewable Energy Laboratory's Annual Technology Baseline. See Table 3 in the Navigant/Guidehouse GHG Report (**Appendix E**).

in the NYISO's installed capacity ("ICAP") market further reducing the economic benefits of a battery energy storage project.

Finally, stand alone energy storage resources do not currently qualify for System Restoration Service, which requires resources to be capable of generating power while restarting the electric grid for up to 12 continuous hours. Alternative 4, therefore would jeopardize New York City's ability to recover from a major outage.

4.5.4 Conclusion

Alternative 4 is not preferred as it:

- would not resolve known reliability shortfalls in NYC;
- would not reduce costs for New York City electricity customers by providing economic capacity (without a ratepayer guaranteed support contract);
- would provide less help to New York State and New York City in achieving their climate limits, targets and goals in that it would:
  - be limited in its ability to facilitate the integration of renewable energy resources as it would not provide long-term, long duration backup power;
- would result in the loss of black start capability that the Site currently can provide, thus, jeopardizing the ability of New York City to recover from a major outage; and,
- would not provide nearly the same level of positive socioeconomic benefits from construction labor and materials, and from the retention of operations labor force and secondary support services.

While Alternative 4 is not technically nor economically feasible for replacing the existing turbines and addressing the known reliability shortfalls in Zone J, due to the many benefits of battery energy storage systems, NRG intends to continue pursuing the future development of additional stand alone battery energy storage systems on the Site to complement the Project.

4.6 Alternative 5: A Photovoltaic Solar Energy System

This section evaluates the potential impacts under a scenario where the Project is not implemented and instead the Site is redeveloped with a solar energy system.

4.6.1 Alternative 5 Description

As an alternative to the Project as currently configured, a photovoltaic ("PV") solar energy system could be installed on the Site. As with Alternative 4, due to the need for the existing Facility to continue operating at least until May 2023, only approximately 7.3 acres would be available for Alternative 5. The total capacity of the PV system is estimated to be 2.5 MW alternating current ("AC"). The PV panels are rated at 590 Watts direct current ("DC") per panel, one of the highest power densities on the market as of the time of the analysis. The panels would be mounted on single axis tracking systems to maximize plant output. The layout allows space for a generator step-up transformer ("GSU") and the requisite electrical equipment. The estimated annual PV plant production is 3,487 MWh. **Figure 4.6-1** shows the Site layout for the solar energy system alternative.

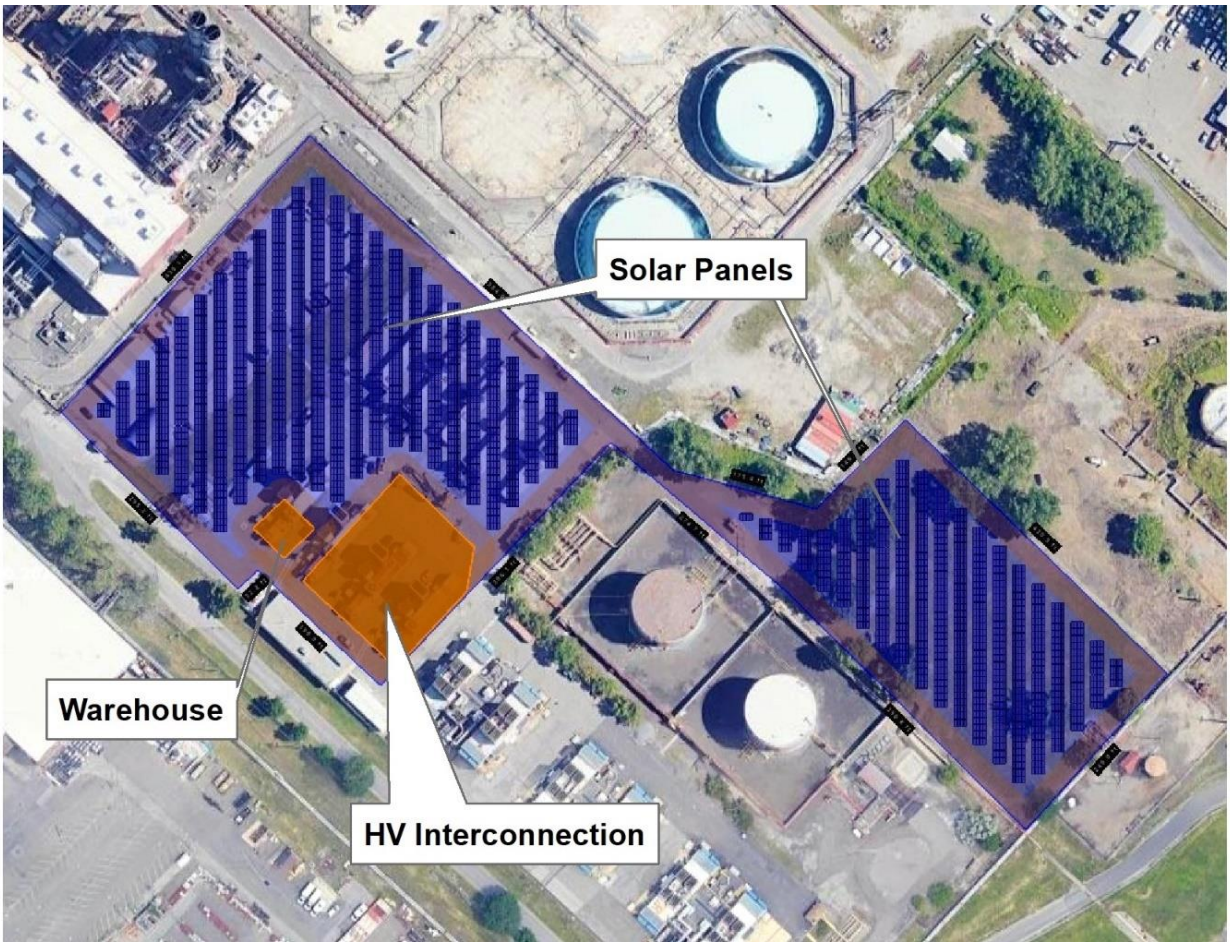
4.6.2 Comparison of Potential Environmental Impacts from Alternative 5 to Project

Visual impact would remain unchanged at the Site from existing conditions. Traffic and noise impacts would likely be reduced but, given the minimal impact on those resources from the proposed Project, the difference is anticipated to be negligible. Impacts to water resources would likely be less under Alternative 5. There would also be some short-term impacts from installation. Impacts to air quality

would also be reduced. However, additional power would have to be generated from other resources to make up the significant difference in generation between Alternative 5 and the Project to provide power during periods when the solar energy system is not generating power. This additional off-site generation would result in emissions and associated air quality impacts.

Additional impacts for Alternative 5 include potential glare with regard to commercial air traffic at LaGuardia airport. The potential impacts of solar glare would need to be studied to determine if mitigation (e.g., use of anti-reflective coatings, adjustment of orientation, etc.) would be required given the close proximity of the airport.

Figure 4.6-1 Site Layout of Solar Energy System Alternative



4.6.3 Limitations of Alternative 5

Although a solar energy system can be constructed on the Site, it would not provide sufficient output to address the known reliability issues in Astoria. Given the limited size of the Site and available space for solar panels, the output of a solar energy system would represent less than 1% of the Project's design capacity. It would take approximately 1,220 acres (over 4 times the area of the entire Astoria ConEd Complex) to produce the same output via the Solar Alternative as the Project (assuming the sun is shining). Land the Applicant does not own nor control.

In addition, solar energy resources are completely dependent on the sun to generate electricity. As a natural consequence, solar facilities only produce energy intermittently. It is estimated a solar resource on the site would only be available about 20% of the year. As a result, solar projects currently receive a significant discount in the NYISO's ICAP market (81%) limiting their ability to economically reduce capacity prices in New York City.

Also, given an important purpose of the Project is to provide reliable backup/stand by service to facilitate the integration of additional renewable resources, an intermittent solar facility could not meet this objective. Moreover, the size of a solar facility (2.5 MW) would not be adequate to address the local reliability issue in Astoria even if it was available around the clock.

Therefore, due to the limited size of the Site, and the intermittent nature of solar power, Alternative 5 does not meet the Project's purpose and need.

4.6.4 Conclusion

Alternative 5 is not preferred as it:

- would not address known reliability shortfalls in NYC;
- would not reduce costs to electricity customers in New York City by providing economic capacity(without a ratepayer guaranteed support contract);
- would provide less help to New York State and New York City in achieving their climate limits, targets and goals in that it would:
  - not facilitate the integration of renewable energy resources as it would not provide long-term, long duration backup power;
  - not result in of battery energy storage as proposed for the Project;
  - prohibit future stand alone energy storage installations on the site due to its footprint;
- would result in the loss of black start capability that the Site currently can provide jeopardizing the ability of New York City to recover from a major outage; and,
- would not provide nearly the same level of positive socioeconomic benefits from construction labor and materials, and from the retention of operations labor force and secondary support services.

4.7 Alternative 6: A Land Based Wind Energy Conversion System

This section evaluates the potential impacts under a scenario where the Project (or "Preferred Alternative") is not implemented and instead the Site is redeveloped with a wind energy conversion system.

4.7.1 Alternative 6 Description

Under the Land Based Wind Energy Conversion Alternative ("Land Based Wind Alternative"), wind

turbines would be constructed at the Site. A wind energy project consists of one or more wind turbines that are used to convert the wind's kinetic energy into electricity which is then delivered to the electrical grid. Horizontal axis wind turbines ("HAWT") are the predominant turbine design in use today. The HAWT rotor comprises blades (usually three) symmetrically mounted to a hub. The rotor is connected via a shaft to a gearbox and generator. The nacelle houses these components atop a tower that sits on a concrete foundation. This alternative, however, is not feasible and cannot meet the identified reliability shortfalls in Zone J. Relevant considerations include:

- the limited size of the Site;
- the size and number of the wind turbines required to generate sufficient power to address the reliability shortfalls in Zone J;
- the proximity of LaGuardia Airport;
- required setback distances; and,
- the wind classification of the Site where the turbines would be installed.

The impact of these constraints on the limitations of implementing Alternative 6 is discussed in Section 4.7.2.

4.7.2 Limitations of Alternative 6

The Project is designed to generate 437 MWe power for distribution into the grid. Current utility scale wind turbine technology for onshore application can produce power generation name plate capacities ranging from 1.5 MWe to as high as 5 MWe. Therefore, there would need to be 88 of the 5 MWe wind turbines or 292 of the 1.5 MWe wind turbines. This requires a minimum of approximately 1600 acres (based on the 5 MWe turbine size); a larger area would be needed for 1.5 MWe turbines. Because the Site, assuming it was fully available for development, is only approximately 15 acres, it cannot accommodate a sufficient number of wind turbines to meet the Project's output. Furthermore, based on the need for the existing Facility to continue operating at least until May 2023, only an area of approximately 7.3 acres is available for installation of a wind energy project.

Not only is the Site too small, but its proximity to LaGuardia Airport is problematic. The range of wind turbine heights (from grade to tip of the turbine blade, referred to as the tip height) for a 1.5 MWe wind turbines operating in New York is approximately 330 – 390 feet while the height for a 5 MWe wind turbine would be approximately 500 feet (U.S. Wind Turbine Database, 2020). The height of both the 1.5 and 5 MWe turbines exceed the current height approved by FAA regulations for this Site (250 feet). Therefore, constructing 1.5 or 5.0 MWe wind turbines at the Site would not be feasible. The largest commercially available utility scale wind turbine that has a maximum tip height of 250 feet is approximately 0.9 MWe[135]. Based on New York City setback requirements for large wind turbines[136], only one wind turbine could be located on the western portion of the Site. Also of concern is potential interference with radar sites used by air traffic control and interference with normal traffic flow patterns at the airport.

Further, putting aside spatial and height concerns, the Site's climate is not conducive to wind. The average wind speed in the vicinity of the Site (based on 2014 – 2018 LaGuardia Airport data) is 6.3

[135] The Enercon E44 model is an example of one wind turbine that has a design output of 0.9 MWe with a tip height of less than 250 feet. The tip height for this wind turbine model is 220 feet based on a hub height of 148 feet and a rotor diameter of 144 feet (https://en.wind-turbine-models.com; accessed October 9, 2020).

[136] NYC Administrative Code Section BC 3114, which is applicable to wind turbines with a rotor diameter of approximately 52 feet.

meters per second ("m/s") at a height of 80 m, which is below the low end of the threshold wind speed necessary to make wind energy commercially viable (6.5 m/s) (University of Michigan, 2020).

In addition, wind energy resources are completely dependent on the wind to generate electricity. As a natural consequence, wind facilities only produce energy intermittently. Given an important purpose of the Project is to provide reliable backup/stand by service to facilitate the integration of additional renewable resources, an intermittent wind facility could not meet this objective. Moreover, the size of a wind facility (0.9 MWe) would not be adequate to address the local reliability issue in Astoria even if it was available around the clock.

Based on the foregoing, installing wind turbines on the Site is not technically feasible. As such, Alternative 6 is not considered further and assessments of potential impacts are not necessary in this DSEIS.

4.7.3 Conclusion

Alternative 6 is not preferred as it is not technically feasible. Even assuming that it was feasible, Alternative 6:

- would not address known reliability shortfalls in NYC;
- would not reduce costs for electricity customers in New York City by providing economic capacity (without a ratepayer guaranteed support contract);
- would provide less help to New York State and New York City in achieving their climate limits, targets and goals in that it would:
  - not facilitate the integration of renewable energy resources as it would not provide long-term, long duration backup power;
  - not result in battery energy storage as proposed for the Project;
  - limit future stand alone energy storage installations due to its footprint;
- would result in the loss of black start capability that the Site can provide jeopardizing the ability of New York City to recover from a major outage; and,
- would not provide nearly the same level of positive socioeconomic benefits from construction labor and materials, and from the retention of operations labor force and secondary support services.

4.8 Alternative 7: Immediate Use of Green Hydrogen or Renewable Natural Gas

This section evaluates the potential impacts under a scenario where the Project is constructed, but immediately commences commercial operation using a renewable fuel such as green hydrogen or RNG.

4.8.1 Alternative 7 Description

This alternative evaluates the immediate use of green hydrogen or RNG for the Project. Green hydrogen or RNG would be procured from a producer of the fuel and delivered to the Site via the existing high pressure natural gas pipeline system. In the case of green hydrogen, the Project's combustion turbine would be modified in accordance with the original equipment manufacturer's

recommendations[137] including the addition of a fuel blending skid enabling operation on up to a 10 percent blend of the fuel. In the case of RNG, no changes would be required to the Project as the fuel is fully interchangeable with natural gas.

4.8.2 Limitations of Alternative 7

Alternative 7 is not technically feasible because currently there are no commercially available sources of either green hydrogen or RNG on the high pressure natural gas pipeline system.

Section 3.2.1.2 discusses the technical and economic feasibility of operating the Project on green hydrogen, which is dependent on three factors; namely: (i) the ability of the power generation equipment to successfully operate on hydrogen fuel, (ii) the ability to deliver hydrogen fuel to the Project site and (iii) the capability of renewable energy resources to economically produce adequate quantities of hydrogen fuel to operate the Project. The same section discusses the possible future operation of the Project using RNG, a pipeline quality gas derived from biomass or other renewable resources that is fully interchangeable with conventional natural gas. While operation on green hydrogen and RNG is expected to be feasible in the future, neither is available for immediate use by the Project.

A number of pilot projects are underway demonstrating the concept of producing both green hydrogen and RNG, as well as injecting them into the existing natural gas pipeline system. Yet none of these efforts has targeted the quantity of fuel required by the Project nor the injection of the fuel into high pressure natural gas pipelines.

In the case of green hydrogen, a commercial offering of the fuel is not expected until large amounts of renewable energy have been added to the electric system providing the necessary energy to operate the required electrolyzers.

Presently, most RNG is produced by anaerobic digestion of organic waste at landfills and used for onsite electric generation or for local use by heating and gas appliances. Until its closure in 2001, the Fresh Kills Landfill on Staten Island was the largest landfill in the world. Landfill gas has been collected, treated and recycled at the facility for almost 40 years. In 2018, the landfill produced on average 62,500 cubic feet of low pressure methane per hour. Today, the City of New York sells the methane to National Grid who distributes the gas locally for cooking and heating fuel.[138] For comparison, the Project's combustion turbine requires 3.9 MM cubic feet of high pressure natural gas per hour to operate at full load. Even if the low pressure Fresh Kills RNG could be diverted to the Site via the high pressure natural gas pipeline system, it would still only account for about 1.6 percent of the necessary fuel.

While the supply of RNG is expected to grow dramatically over the next twenty years,[139] currently there are no commercial supplies of the fuel available for use by the Project.

Based on the foregoing, the immediate use of green hydrogen or RNG is not technically feasible at the Site. As such, Alternative 7 is not considered further and assessments of potential impacts are not necessary in this DSEIS.

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[137] Appendix L – GE Letter dated February 2, 2021.

[138] Collection and Processing - Freshkills Park

[139] The AGF Study estimates worldwide RNG production will grow from 250 tBtu/year in 2025 to as much as 3,750 tBtu/year in 2040. As a point of reference, National Gas Intelligence reports the collective volume of RNG produced in the United States in 2020 was less than 1 tBtu. U.S. RNG Production, Sites Accelerate in 2020 - Natural Gas Intelligence

4.8.3 Conclusion

Alternative 7 is not preferred as it is not technically feasible.

4.9 Alternative 8: Electric Interconnection of Offshore Wind and/or Enhancing New York Port Infrastructure[140]

Other developers have proposed numerous offshore wind projects to connect directly to New York City's electric transmission system. This section evaluates the potential impacts under a scenario where the Project (or "Preferred Alternative") is not implemented and instead the Site is redeveloped in support of new offshore wind projects including as a point of electrical interconnection, equipment manufacturing, component assembly and O&M.

4.9.1 Alternative 8 Description

New York's burgeoning offshore wind industry requires onshore support for manufacturing, component assembly and staging, as well as operations and maintenance facilities. New York State has committed to investing $200M in offshore wind port infrastructure and in October 2019, NYSERDA issued a Request for Qualifications from interested developers.[141] Respondents to the solicitation included Ports and Marine Terminals in the Capital Region and Brooklyn. A key element of each proposed site is direct access to a deep-water dock allowing equipment and personnel to transit to the offshore wind platforms by ship. Most recently, the Port of Albany, Port of Coeymans, the South Brooklyn Marine Terminal, Montauk Harbor, Port Jefferson and East Setauket have all been announced as locations for offshore wind support facilities.[142]

As an alternative to the Project, the three onsite feeders connecting to Con Edison's Astoria East 138kV substation could be considered for interconnection of an offshore wind project. **Figure 4.9-1** shows a conceptual layout for the necessary equipment to interconnect a 1,000 MW project. This equipment would include landing facilities for large overhead or underground high voltage AC or DC cables, electrical transformers to match system voltage and a switchyard to connect the incoming cables to the three existing feeders onsite. If the offshore wind project utilizes high voltage direct current transmission technology ("HVDC"), then a converter station would also be required to convert direct current into alternating current for use on the electric grid.

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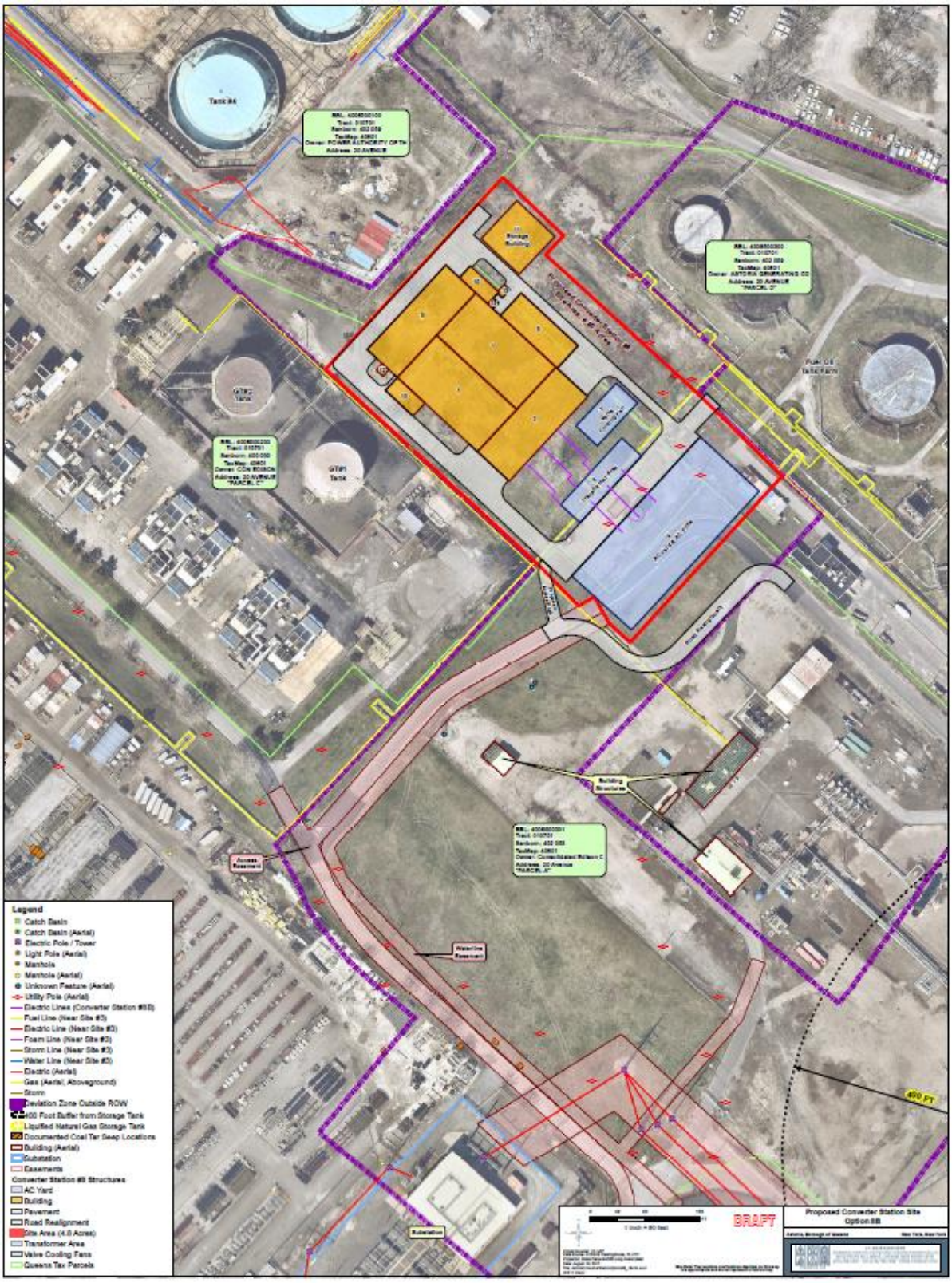
140 *See* SEQR Handbook, pg. 5, 18 (4th ed. 2020) (requiring only that Astoria, as a private applicant, consider alternatives that concern parcels owned by, or under option to, it); *see also In re Long Island Pine Barrens Soc'y Planning Bd. of Brookhaven*, 1990 NYLJ LEXIS 5941, at *16 (N.Y. Sup. Ct. 1990).

141 https://www.nyserda.ny.gov/About/Newsroom/2019-Announcements/2019-10-02-New-York-State-Launches-Process-to-Upgrade-Port-Infrastructure-to-Support-Expanding-Offshore-Wind-Industry.

142 https://rtoinsider.com/rto/new-york-offshore-wind-ports-brooklyn-albany-long-island-191107/

Figure 4.9-1 Conceptual Equipment Layout to Interconnect a 1,000 MW Wind Project



4.9.2 Comparison of Potential Environmental Impacts from Alternative 8 to the Project

Visual impact would remain relatively unchanged at the Site from existing conditions. Traffic and noise impacts would likely be reduced but, given the minimal impact on those resources from the proposed Project, the difference is anticipated to be negligible. Although the Project would use water for NOx control when operating on ULSD, impacts to water resources would likely be greater under Alternative 8 as it would necessitate impacts to the East River for the placement of the required electrical cables. Impacts to air quality from the Facility would also be reduced as would GHG emissions. However, additional power would have to be generated from other resources to make up for the intermittent nature of power generated by Alternative 8 (when the offshore wind energy system is not generating power). This additional off-site generation would result in emissions and associated air quality impacts. Short-term impacts from construction and installation would be similar to the Project. Moreover, the alternative would also contemplate the construction and operation of an offshore wind farm and related high-voltage transmission line necessary to deliver power from the wind farm to the grid. This too would entail environmental impacts such as impacts to migratory birds, marine species and their habitats, and tidal wetlands.

4.9.3 Limitations of Alternative 8

Since the Site has a relatively small footprint and is completely landlocked[143] with no direct access to waterfront dockage space, the Site cannot provide the necessary port infrastructure in support of offshore wind development. Requisite land rights would require the consent of another private entity for which Astoria does not control.

Even assuming port access, none of the proposed offshore wind projects could address the near-term reliability shortfalls projected for New York City (see **Section 1.4.1**), nor do the Project's feeders tying into the Astoria East 138kV substation have sufficient capacity to interconnect these projects. Finally, due to updated interconnection requirements contained in Con Edison's latest Transmission Planning Criteria (TP-7100-18), the existing cables used to interconnect the Project would no longer be allowed to attach to the Astoria East 138kV substation in the current configuration. Instead new bus positions would have to be created to accommodate the interconnection.

To date, the only offshore wind renewable energy certificate (OREC) awards announced connecting to Zone J are:

- Empire Wind 1
  - 816 MW connecting to Gowanus Substation in Brooklyn
  - Located approximately 14 miles from Jones Beach State Park
  - Status – data collection is ongoing and permitting process still in the preliminary phase[144]; permitting process expected to take 4-5 years
  - Projected commercial operation date (as of May 2020): December 2024[145]

- Beacon Wind 1[146]
  - 1230 MW connecting to an Astoria substation
  - Located over 60 miles east of Montauk Point

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143 *See* Figure 1.1-1 – Facility Location

144 https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Focus-Areas/NY-Offshore-Wind-Projects.

145 NYISO Interconnection Q737.

146 On January 13, 2021, NYSERDA announced a provisional contract award to Equinor's 1,230 MW Beacon Wind project. According to the NYISO's public electric interconnection queue, Equinor has requested interconnection at both the Astoria East 138kV and Astoria West 138kV substations (Q1016 and Q1017) with proposed Commercial Operation Dates ("COD") in 2027 and 2028. However, Beacon Wind's System Reliability Interconnection Study, which will ultimately form the basis for determining the feasibility and cost of such an interconnection, has not yet commenced.

- Status – NYSERDA contract announced in January 2021; permitting process expected to take 5-7 years[147]
- Projected commercial operation date (as of May 2020): 2027-28

Resolving Near-Term Reliability Needs

As detailed in **Section 1.4.1**, reliability shortfalls in New York City by 2023 have been identified. However, the intermittent nature of offshore wind generation eliminates the technology from consideration as a reliability solution. Any proposed generation solution would need to be fully dispatchable (available on demand) to resolve the near-term reliability needs of the system.

Even if an offshore wind project could contribute to resolving the near-term reliability issues, none of the OREC awarded projects slated for connection to Zone J could be ready for operation by May 2023. Neither has commenced construction nor been permitted. Indeed, using a best-case scenario based on current status, neither of these projects is expected to achieve commercial operation until the mid- to late-2020s, well after May 2023. This is because the permitting timetable for an offshore wind project is lengthy. Thus, even the targeted commercial operation dates of 2024 and 2028, respectively, are contingent on a multitude of factors, the greatest being the issuance of various permits from the Bureau of Ocean Energy Management ("BOEM") and other related federal agencies. BOEM's process is detailed in **Figure 4.9-2** and includes various phases and milestones, including:

1. planning and analysis;

2. leasing;

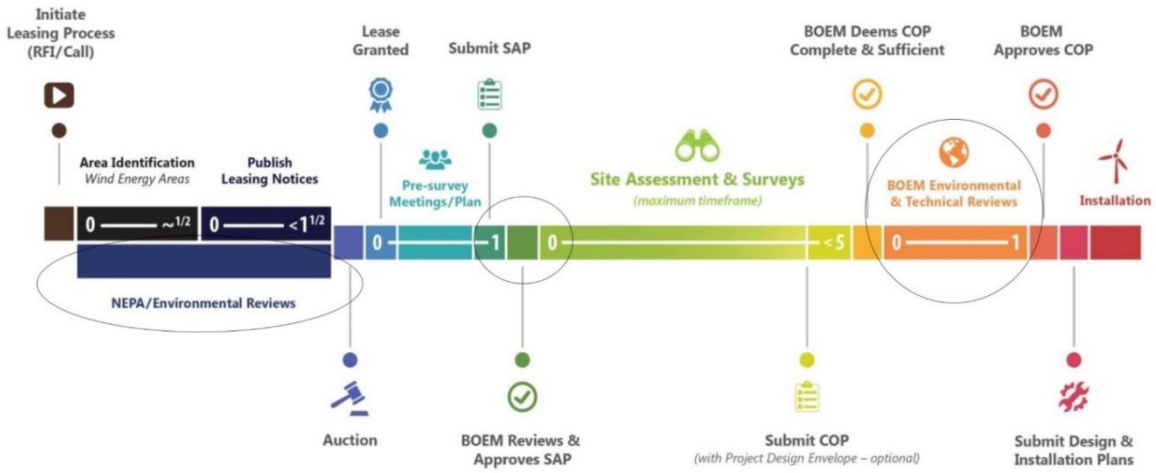
3. site assessment and surveys, which begins with submission of a site assessment plan and concludes with submission of a construction and operation plan and can take up to five (5) years;

4. environmental and technical reviews, including preparation of an Environmental Assessment or Environmental Impact Statement under the National Environmental Policy Act; and,

5. construction and operations.

[147] https://www.equinor.com/en/what-we-do/beaconwind.html.

Figure 4.9-2 BOEM Permitting Process



Source: https://www.boem.gov/sites/default/files

In addition to federal requirements, New York's jurisdiction would apply to the electrical cables running through New York's territorial waters and the point of interconnection where the cables make landfall. The state siting process, governed under Article VII of the Public Service Law, can also take years to complete due to the extensive and detailed application requirements contained therein.

Interconnection Capability

In response to the CLCPA, the Department of Public Service and NYSERDA initiated a set of system studies, collectively referred to as the Power Grid Study ("PGS"), including:

(i) a study conducted by the Joint Utilities on local transmission and distribution (LT&D) needs ("Utility Study");

(ii) a study of offshore and onshore bulk-power transmission infrastructure scenarios … to illustrate possible solutions to integrate the mandated 9,000 MW of offshore wind by 2035 ("OSW Study"); and,

(iii) a state-wide scenario-based study analyzing transmission, generation and storage options for achieving 70% renewable generation by 2030 and a zero-emission grid by 2040 ("Zero Emission Study").

On January 19, 2021, the initial results of these studies were released in an "Initial Report on the New York Power Grid Study" ("Initial PGS Report")[148] The first two studies analyze the feasibility of injecting 9,000 MW of offshore wind resources onto the bulk power grid of New York City and Long Island in a reliable and cost effective manner. The third study discusses reliable and cost-effective outcomes for meeting all the CLCPA targets on a state-wide basis and specifically addresses the level of fast start resources required to support increasing levels of renewable generation.

[148] https://brattlefiles.blob.core.windows.net/files/20842_initial_report_on_the_new_york_power_grid_study.pdf.

In these studies, Con Edison states that offshore wind "resources must connect to New York City and Long Island" in order to meet the CLCPA's target of 9,000 MW of offshore wind. The benefit of connecting to New York City is direct access to the customers there. However, Con Edison also acknowledges that "connecting to either area will pose challenges from both a routing and permitting perspective."

Specifically, in the Utility Study, Con Edison discussed the possibility of using retiring peaking plants as interconnection points ("POI") for new offshore wind projects. In doing so, Con Edison assumed that "none of the POI would be available for any of the assumed renewable additions." It based this assumption on, among other things, the following: [149]

1. "While existing POIs are grandfathered from current compliance obligations, any material change at the POI (*i.e.,* retirement of a fossil facility replaced by an Energy Storage System) must conform with and adhere to the latest applicable NERC, NPCC, and NYSRC Reliability Rules, including NYSRC Local Reliability Rules, ***as well as applicable CECONY specifications, procedures and guidelines, requiring such significant investment to utilize the existing POI that alternative POI options that are physically feasible may be more economical***;" and,

2. "Existing POIs are located in already constrained areas and/or low voltage areas where, for example, ***a typical size of an OSW project would be un-deliverable due to bus equipment and/or outlet capability limitations and where local upgrades would be simply infeasible or cost prohibitive[.]"***

The OSW Study identifies potential POIs for New York City and Long Island through an iterative screening process. It starts with every New York City and Long Island substation above 69 kV and applies a thermal transfer screen analysis to identify 36 substations that could accept at least 300 MW of OSW. For those 36 substations, production cost simulations were conducted to identify 20 substations with the least curtailments. The analysis did not identify the Project's point of interconnection (the 138kV Astoria East substation) on this list. Ultimately, the study concluded "the most promising performance, i.e., fewest adverse system impacts based on reliability security analysis" was at the following combination of 345kV Zone J substations: Farragut (1,400 MW), Rainey (1,250 MW), Mott Haven (1,250 MW) and West 49th St (1,200 MW).[150]

Summarizing the OSW Study, the Initial PGS Report compares the results of six separate sources seeking to identify preferred electrical interconnection solutions for adding large amounts of offshore wind to New York City and Long Island. In doing so, the Initial PGS Report notes:

> Integrating offshore wind will also depend on accessing POIs that are jointly feasible on the transmission system and have sufficient space for the necessary interconnection equipment. The various studies do not all reach the same conclusions on which POIs are feasible, nor are the studied POIs consistent with utilities' study assumptions and the NYISO interconnection queue[.][151]

A summary of these differing conclusions is presented in **Table 4.9-1** below.

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149 Utility Study at pg. 106 (emphasis added).

150 OSW Study at pg. D-23 and D-24.

151 Initial Report at pg. 65.

Table 4.9-1 Points of Interconnection for Potential Projects

Source		Points of Interconnection for Potential Projects	
		Zone J	Zone K
OSW Study	[1]	Farragut (1400 MW) Rainey (1250 MW) Mott Haven (1250 MW) West 49th St. (1200 MW)	New Bridge (600 MW) Shore Rd. (500 MW) Northport (400 MW) Syosset (300 MW) Brookhaven (270 MW)
Zero Emissions Study	[2]	Farragut Rainey West 49th Street Fresh Kills	Ruland Rd. East Garden City River Head
Anbaric Study	[3]	Gowanus (2000 MW) Fresh Kills (1700 MW) Rainey (1200 MW)	Ruland Rd. (1200 MW) East Garden City (1084 MW)
CARIS 70x30	[4]	Farragut (1440 MW) Fresh Kills (1424 MW) Gowanus (816 MW)	Brookhaven (384 MW) Ruland Rd. (384 MW)
Utility Study: ConEd and LIPA	[5]	Two new OSW interconnection hubs with 3000 MW and 2180 MW.	Ruland Rd. (1400 MW) East Garden City (700 MW)
NYISO Interconnection Requests	[6]	Gowanus (2080 MW) Fresh Kills (880 MW)	Ruland Rd. (1816 MW) Brookhaven (880 MW) Barrett (2500 MW)

Notably, while the various sources do reach different conclusions, none identifies the Project's substation (Astoria East 138kV) as a Point of Interconnection for new offshore wind.

In addition, Appendix C (Transmission Policy Working Group Report) of the Initial PGS Report notes that:

> The two projects selected by NYSERDA in its 2019 RFP were both larger than 800 MW, and it is expected that future projects will seek to connect at a similar scale. ***Such interconnections are best made directly onto the 345 kV system*** to make them available to reach all customers in the City and potentially to be exported for use of customers in other regions. However, the transmission system in New York City offers limited available points of interconnection for new generation to connect. Of those interconnection points that are available today, many would require substantial upgrades to make the interconnecting generation deliverable to loads.

Accordingly, as detailed in the Transmission Policy Working Group Report, Con Edison concludes the best solution to adding large amounts of new offshore wind resources in New York City is not to use existing POIs from retiring peaking plants as interconnection points for new offshore wind projects, but rather to build two new Clean Energy Hubs (i.e., 345kV substations):

> [Con Edison] is exploring the opportunity to create Clean Energy Hubs in New York City that would: (1) connect and fully deliver new resources such as offshore wind; (2) solve identified bottlenecks or constraints on the local system to enable loads to be served by renewable energy; and (3) address future load growth from electrification (due to CLCPA), while also improving the resiliency of the company's local system.[152]

[152] Utility Study at pg. 21.

In short, redeveloping the Site as a point of electrical interconnection for new offshore wind projects is not technically feasible. The total capability of the Project's existing interconnecting feeders to the Astoria East 138kV substation is only 585 MW, which is well short of the interconnecting capability required for Empire Wind 1 and equates to less than one half the interconnecting capability required for Beacon Wind 1. It is therefore unlikely the interconnecting capability of the Site would be sufficient for any future offshore wind project given the expectation that future projects would be similar in size and scale given (1) the amount of offshore wind still needed to achieve New York's offshore wind target of 9,000 MW by 2035 and (2) the economies of scale necessary to permit, finance and construct such projects. Moreover, even if the Project does not move forward, there are no open positions at the Astoria East 138kV substation to accommodate new offshore wind projects and, due to space constraints, the ability to expand the substation is uncertain at best.

Long Duration Backup/Standby Service

Alternative 8 does not provide the necessary quick start, fast ramping dispatchable capability to support the addition of large amounts of renewable energy. As detailed in **Section 1.4.1**, the Project's quick start/fast ramping long-duration capability allows it to provide this needed backup balancing service for intermittent renewables. In contrast, Alternative 8 does not. Because offshore wind itself is heavily influenced by weather conditions, it does not provide the needed flexible resources (*i.e.*, fast response rates and the ability to startup and shutdown quickly and frequently) to balance intermittent renewables.

The Zero Emission Study recognizes that renewable energy generation from offshore wind and other sources is intermittent. This intermittency leads to variable power supply requiring large amounts of quick start fast ramping dispatchable resources to maintain grid reliability:

> Dispatchable capacity is needed by the market to maintain locational reserve margin requirements as electricity demand escalates and the effective load carrying capability of renewables declines.[153]

The study further indicates by 2030 between 18 and 24 GW of natural gas units will be required on the system.[154] Furthermore, "in 2040, 12 GW of 'other thermal' generation capacity remains operational for backup power needs".[155]

4.9.4 Conclusion

Alternative 8 is not technically feasible. Even if it were feasible, it would not be preferred as it:

- would not address known reliability shortfalls in NYC;
- will not be completed in time to ensure uninterrupted service from the Site; thus, avoiding short-term reliability concerns and the possibility of the existing P&W units being designated as a reliability resource pursuant to 6 NYCRR 227-3.6 for up to four more years in which case significant reductions in air emission would be lost;
- would not reduce costs to electricity customers in New York City by providing economic capacity (without a ratepayer guaranteed support contract);
- would not provide long-term, long duration backup power supporting intermittent renewable energy; and,
- would result in the loss of black start capability that the Site can provide jeopardizing the ability of New York City to recover from a major outage.

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153 Zero Emission Study at pg. E-24. Also see Figure 4.5-3 for a description of the future decline in "effective load carrying capability" of renewable resources.

154 Initial Report Fig. 21 at pg. 86.

155 *Id.* at pg. 79.

4.10 Demand Management and Energy Efficiency

Demand management is consumer driven use of less energy during peak hours, or moving the time of energy use to off-peak times such as nighttime and weekends. Energy efficiency seeks to reduce consumer energy consumption by using less energy to attain the same amount of useful output. Other than equipment at its own Site, the Applicant does not have control over consumer demand. On that basis, no formal alternative analysis can be completed for Demand Management and Energy Efficiency. However, Demand Management and Energy Efficiency concepts have been incorporated into the Project's design. In particular, the Project employs the most efficient combustion turbine technology available today in its size range, including the use of high efficiency balance of plant motors and fans. The General Electric Frame 7HA.03 machine has an energy efficiency approximately 30% greater than the existing turbines. Accordingly, the new turbine will use approximately 30% less fuel than the Facility's existing turbines to make the same amount of electricity. Furthermore, the Project's operation will displace other older less efficient generating facilities increasing the overall efficiency of New York's electric grid.

In addition, impacts from third party Demand Management and Energy Efficiency programs are already taken into account by the NYISO when considering the future needs of New York's electric system. Every year the NYISO prepares a consolidated report on Load and Capacity Data for the New York Control Area – often referred to as the Gold Book. When forecasting future energy usage and seasonal peak demand, the NYISO includes "the projected impacts of energy efficiency programs, building codes and standards, distributed energy resources, behind-the-meter energy storage, behind-the-meter solar photovoltaic power ("solar PV"), electric vehicle usage, and electrification of heating and other end uses."[156] These are the very same forecasts used in the NYISO's Reliability Needs Assessment which identified capacity shortfalls in Astoria and New York City.

Load and capacity forecasts from the Gold Book are also used to evaluate resource adequacy in the long-term. For instance, the 2020 Gold Book includes the following observation:

> "The energy growth rate over the thirty years in the 2020 baseline forecast is higher than the rate published [last year]. The higher forecasted growth in energy usage can be attributed in part to the increasing impact of electric vehicle usage and other electrification especially in the later years. Significant load-reducing impacts occur due to energy efficiency initiatives and the growth of distributed behind-the-meter energy resources, such as solar PV. Much of these impacts are due to New York State's energy policies and programs, including the Climate Leadership and Community Protection Act ("CLCPA"), Clean Energy Standard ("CES"), the Clean Energy Fund ("CEF"), the NY-SUN initiative, the energy storage initiative, and other programs developed as part of the Reforming the Energy Vision ("REV") proceedings."

Since this very same forecast was used by the third party consultants evaluating New York's transition to a carbon-free electric grid, the need for the Project already incorporates the impacts from aggressive future Demand Management and Energy Efficiency programs.[157]

[156] NYISO, 2020a; page 2

[157] See Section 1.4.1

4.11 Alternatives Conclusion

Taking into account alternatives that are within the Applicant's control and the Project's purpose and need, eight alternatives, including one with multiple options, were considered. As summarized in Table 4.11-1, the Proposed Action is preferred as it:

- will address known reliability shortfalls in New York City by 2023;
- can be completed in time to ensure uninterrupted service from the Site; thus, avoiding short-term reliability concerns and the possibility of the existing P&W units being designated as a reliability resource pursuant to 6 NYCRR 227-3.6 for up to four more years in which case significant reductions in air emission would be lost;
- will reduce costs for electricity customers in New York City by providing economic capacity (without a ratepayer guaranteed support contract);
- results in significantly less environmental impacts (air quality, water resource, noise, traffic and aesthetic/visual resources) than the Project as previously configured;
- displaces higher emitting sources such that it will result in an overall net reduction in air emissions in the New York City area;
- requires a shorter construction schedule with attendant benefits as compared to the Project as previously configured;
- facilitates New York State and New York City in achieving their climate limits, targets and goals in that it will:
    - reduce GHG air emissions;
    - facilitate the integration of renewable energy resources by providing long-term, long duration backup power;
    - result in the addition of proposed battery energy storage;
    - preserve a portion of the Site for future stand alone energy storage installations;
- preserves the Site's black start capability to facilitate electrical system restoration in New York City following major power outages; and,
- provides positive socioeconomic benefits from construction labor and materials, and from the retention of operations labor force and secondary support services.

Table 4.11-1 Comparison of Meeting Project Purpose Criteria between Current Project and Alternatives

Project Purpose Criteria	Current Project Configuration	Alternative 1 – No Action			Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
		Option A Cease Operation	Option B Upgrade Emissions Controls	Option C No Operation During Ozone Season	2010 Project Configuration	2017 Project Configuration	Battery Energy Storage System	Renewables: Solar Energy	Renewables: Wind energy	Immediate use of Green Hydrogen or RNG	Electric Interconnect for Offshore Wind
Addresses known reliability shortfall in NYC	X		X		(1)	(1)				(8)	
Reduces air emission rates including GHGs	X	X	(2)	(4)	X	X(5)	X	(11)	(7)	(8)	(9)
Facilitates the integration of renewable energy resources with long-term, long duration backup power	X		(3)		X	X	(6)			(8)	(10)
Reduces costs for electricity customers in NYC by providing economic capacity without ratepayer support	X					X				(8)	
Contributes to energy storage goals	X						X			(8)	
Capable of year-round system restoration service	X		X			X				(8)	

(1) Project schedule will no longer support uninterrupted service from the Site without extended operation of the existing P&W units.
(2) Upgrading controls on existing P&W turbines (SCR with water injection during oil firing and oxidation catalyst) would decrease NOx, CO, and VOC emission rates, but, due to efficiency drop, results in an increase in GHG emission rates.
(3) Due to the age of the existing P&W units (50+ years), upgrading controls is only considered a short-term solution.
(4) Only during the ozone season (May 1 – September 30); no change in emission rates during non-ozone season (October 1 – April 30)
(5) While the 2017 project configuration reduces air emissions, due to lower efficiency (34% for natural gas compared to 37% for current Project configuration), it results in higher direct GHG emissions compared to the current Project configuration.
(6) Facilitates the integration of renewable energy sources with short duration backup power, but does not address long-term seasonal scale backup requirements.
(7) While a wind turbine alternative on the Site is not technically feasible, if it were possible, then Alternative 6 would reduce air emission rates, but would also require dispatchable generation backup which would contribute to GHG emissions.
(8) While the immediate use of green hydrogen or RNG is not technically feasible, if it were possible, then Alternative 7 would meet the Project Purpose Criteria.
(9) While not feasible, the addition of offshore wind resources would reduce statewide GHG emissions, but also requires dispatchable generation backup which would contribute to GHG emissions.
(10) While not feasible, providing electrical interconnection for offshore wind resources does facilitate its integration to the grid, but does not address the long-term, long duration backup necessary for reliability.
(11) The addition of solar energy resources would reduce statewide GHG emissions, but also requires dispatchable generation backup which would contribute to GHG emissions.

5.0 References

Adhikari, A. and Yin, J., 2020. "Short-Term Effects of Ambient Ozone, PM2.5, and Meteorological Factors on COVID-19 Confirmed Cases and Deaths in Queens, New York." International Journal of Environmental Research and Public Health. 17*(11), 4047.* June.

AECOM, 2020. Air Quality Modeling Protocol, Turbine Replacement Project, February.

Analysis Group, 2019. Fuel and Energy Security In New York State. An Assessment of Winter Operational Risks for a Power System in Transition. Final Report. November. https://www.nyiso.com/documents/20142/9312827/Analysis%20Group%20Fuel%20Security%20Final%20Report%2020191111%20Text.pdf/cbecabaf-806b-d554-ad32-12cfd5a86d9e

Analysis Group, 2020. Climate Change Impact Phase II. An Assessment of Climate Change Impacts on Power System Reliability in New York State. Final Report. September. https://www.nyiso.com/documents/20142/15125528/02%20Climate%20Change%20Impact%20and%20Resilience%20Study%20Phase%202.pdf/89647ae3-6005-70f5-03c0-d4ed33623ce4

Berrians 1 Gas Turbine Power LLC, 2002 ("Berrians"). Berrians Unit 1 Proposed Power Generation Facility Located in Astoria, NY, Environmental Assessment Statement, August.

Cooney, G.; Jamieson, M.; Marriott, J.; Bergerson, J.; Brandt, A.; Skone, T. "Updating the U.S. Life Cycle GHG Petroleum Baseline to 2014 with Projections to 2040 Using Open-Source Engineering-Based Models. Supporting Information. *Environmental Science & Technology* 2017 *51* (2), 977-987
DOI: 10.1021/acs.est.6b02819

Energy and Environmental Economics, Inc. ("E3"), 2020. Pathways to Deep Decarbonization in New York State. San Francisco, CA. June 24.

FLAG, 2010. Federal Land Managers' Air Quality Related Values Work Group (FLAG) Phase 1 Report – Revised (2010). NPS/NRPC/NRR – 2010/232.

Heederik, DJJ; Smit, LAM; Vermeulen, RCH. 2020. "Go slow to go fast: A plea for sustained scientific rigour in air pollution research during the COVID-19 pandemic." Eur. Respir. J. 56 (1) :2001361. doi: 10.1183/13993003.01361-2020.

Littlefield, J., Roman-White, S., Augustine, D., Pegallapati, A., Zaimes, G. G., Rai, S., Cooney, G., & Skone, T. J. 2019. Life Cycle Analysis of Natural Gas Extraction and Power Generation. National Energy Technology Laboratory, Pittsburgh, April 5. DOE/NETL-2019/2039. https://www.netl.doe.gov/energy-analysis/details?id=7c7809c2-49ac-4ce0-ac72-3c8f8a4d87ad

Navigant/Guidehouse, 2020a. GHG Impacts of Astoria Replacement Project. Navigant Consulting. April 2020, supplemented February 2021.

Navigant/Guidehouse, 2020b. Navigant (A Guidehouse Company) Study: Economic Development Benefits of the Proposed Astoria Replacement Project. Navigant Consulting. April 2020, supplemented January 2021.

New York City, New York, Dept. of Health (NYC Health, 2020). New York City Coronavirus Disease 2019 (COVID-19) Data. September 23. Accessed on September 24, 2020 at https://github.com/nychealth/coronavirus-data.

New York City Department of Health and Mental Hygiene ("NYCDHMH"), 2018. Community Health Profiles. Long Island City and Astoria, Queens Community District 1. https://www1.nyc.gov/assets/doh/downloads/pdf/data/2018chp-qn1.pdf

NYISO, 2019. Power Trends 2019. https://www.nyiso.com/documents/20142/6386402/Por-Trends-2019-Media-Briefing-FINAL.pdf/bc903ee2-d571-190e-e2d0-831a16b425a5?t=1556738785048

NYISO, 2020a. 2020 Load and Capacity Data. April. https://www.nyiso.com/documents/20142/2226333/2020-Gold-Book-Final-Public.pdf/

NYISO, 2020b. Power Trends 2020. https://www.nyiso.com/documents/20142/6386402/Power-Trends-2020-Media-PPT.pdf/6c8770c9-7a6f-44fd-1db9-6626ab768e0c?t=1591734914513

NYSDEC, 2001. Assessing and Mitigating Noise Impacts. Issued October 6, 2000. Revised February 2, 2001. https://www.dec.ny.gov/docs/permits_ej_operations_pdf/noise2000.pdf

NYSDEC, 2009. Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements. 15 July 2009.

NYSDEC, 2016. DAR-1: Guidelines for the Evaluation and Control of Ambient Air Contaminants under Part 212. Issued 10 August 2016.

NYSDEC, 2020a. DAR-10: NYSDEC Guidelines on Dispersion Modeling Procedures for Air Quality Impact Analysis. Issued 1 September 2020.

NYSDEC, 2020b. The SEQR Handbook. Fourth Edition – 2020. https://www.dec.ny.gov/docs/permits_ej_operations_pdf/seqrhandbook.pdf

NYSDPS, 2018. Order Establishing Energy Storage Goal and Deployment Policy. Case 18-E-0130. In the Matter of Energy Storage Deployment Program. December.

NYSDOH, 2011. New York State Cancer Registry. Data for 2005-2009. Incidence data are provisional November 2011. https://www.health.ny.gov/statistics/cancer/registry/zipcode/index.htm

NYSDOH, 2017. Updated Guidance for Health Data Review and Analysis Relating to NYSDEC Environmental Justice Requirements for CP-29 and 6 NYCRR 487. Updated October 2014, revised 1-26-15, links updated June 2017. https://www.health.ny.gov/environmental/investigations/environmental_justice/docs/new_guidance_ej_rev2017.pdf

NYSRC, 2018. Reliability Rules & Compliance Manual. For Planning and Operating the New York State Power System. Version 42. February 9. http://www.nysrc.org/pdf/Reliability%20Rules%20Manuals/RRC%20Manual%20V42_Final.pdf

Siting Board, 2019. Case 17-F-0451. Declaratory Ruling on Petition of NRG Astoria Power LLC. Issued 12 June 2019.

University of Michigan. 2020. Wind Energy Factsheet. Pub. No. CSS07-09. Center for Sustainable Systems,

USEPA, 1980. A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils and Animals. EPA 450/2-81-078. 12 December 1980.

USEPA, 1985. Guideline for Determination of Good Engineering Practice Stack height (Technical Support Document for the Stack Height Regulations). EPA-450/4-80-023R. June 1985.

USEPA, 2009. Risk Management Program Guidance for Offsite Consequence Analysis. EPA 550-B-99-0099. March 2009.

USEPA, 2014. Guidance for PM2.5 Permit Modeling. Memorandum. 20 May 2014.

USEPA, 2017. Guideline on Air Quality Models. 40 CFR Part 51, Appendix W. January 2017.

USEPA, 2019. Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program. 20 April 2019.

U.S. Wind Turbine Database, 2020. https://eerscmap.usgs.gov/uswtdb/viewer/#6.37/41.834/-76.856 , Release July; accessed October 9).

Wu, X; Nethery, RC; Sabath, MB; Braun, D; Dominici, F. 2020. "Air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis." Sci. Adv. 6 (45): eaba4049. doi: 10.1126/sciadv.abd4049.