

NYISO 2025-2029 ICAP Demand Curve Reset (DCR)



ICAP Working Group Meeting

May 20, 2024





**Update:
Battery Energy Storage System
(BESS) Preliminary Estimates**

Preliminary BESS Results: Update

Preliminary Original (4-Hour)	Load Zone C	Load Zone F	Load Zone G-D	Load Zone G-R	Load Zone J	Load Zone K
EPC Project Cost (\$MM)	\$314	\$315	\$314	\$320	\$361	\$324
Owner's Costs (\$MM)	\$70	\$70	\$70	\$70	\$112	\$62
AFUDC (\$MM)	\$23	\$23	\$23	\$23	\$28	\$23
Total Cost (\$MM)	\$407	\$408	\$407	\$413	\$501	\$408

Preliminary Updated (4-Hour)	Load Zone C	Load Zone F	Load Zone G-D	Load Zone G-R	Load Zone J	Load Zone K
EPC Project Cost (\$MM)	\$289	\$291	\$289	\$298	\$361	\$304
Owner's Costs (\$MM)	\$68	\$69	\$68	\$69	\$112	\$61
AFUDC (\$MM)	\$28	\$28	\$28	\$29	\$37	\$29
Total Cost (\$MM)	\$385	\$388	\$386	\$395	\$510	\$394

<i>Percent Difference</i>	<i>-5.3%</i>	<i>-5.1%</i>	<i>-5.3%</i>	<i>-4.4%</i>	<i>1.8%</i>	<i>-3.6%</i>
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- Comparison for 4-hour BESS shown in table above.
- Please refer to Appendices for all updated information.
- Project capital cost updated for all locations except Load Zone J.
- AFUDC updated to reflect preliminary ATWACC and project schedule assumptions.
- Owner's cost and operations and maintenance (O&M) cost updates for percentage-based items reflecting capital cost adjustments.
- 1898 & Co. plans to present detailed cost and performance information for 2-hour BESS at the June 13, 2024, ICAPWG meeting

The background of the slide features a city skyline at night, with various skyscrapers and buildings illuminated. The image is overlaid with a gradient that transitions from a dark blue on the left to a deep purple on the right. The text is centered in a large, white, sans-serif font.

Stakeholder Feedback Considerations

Response to Stakeholder Feedback



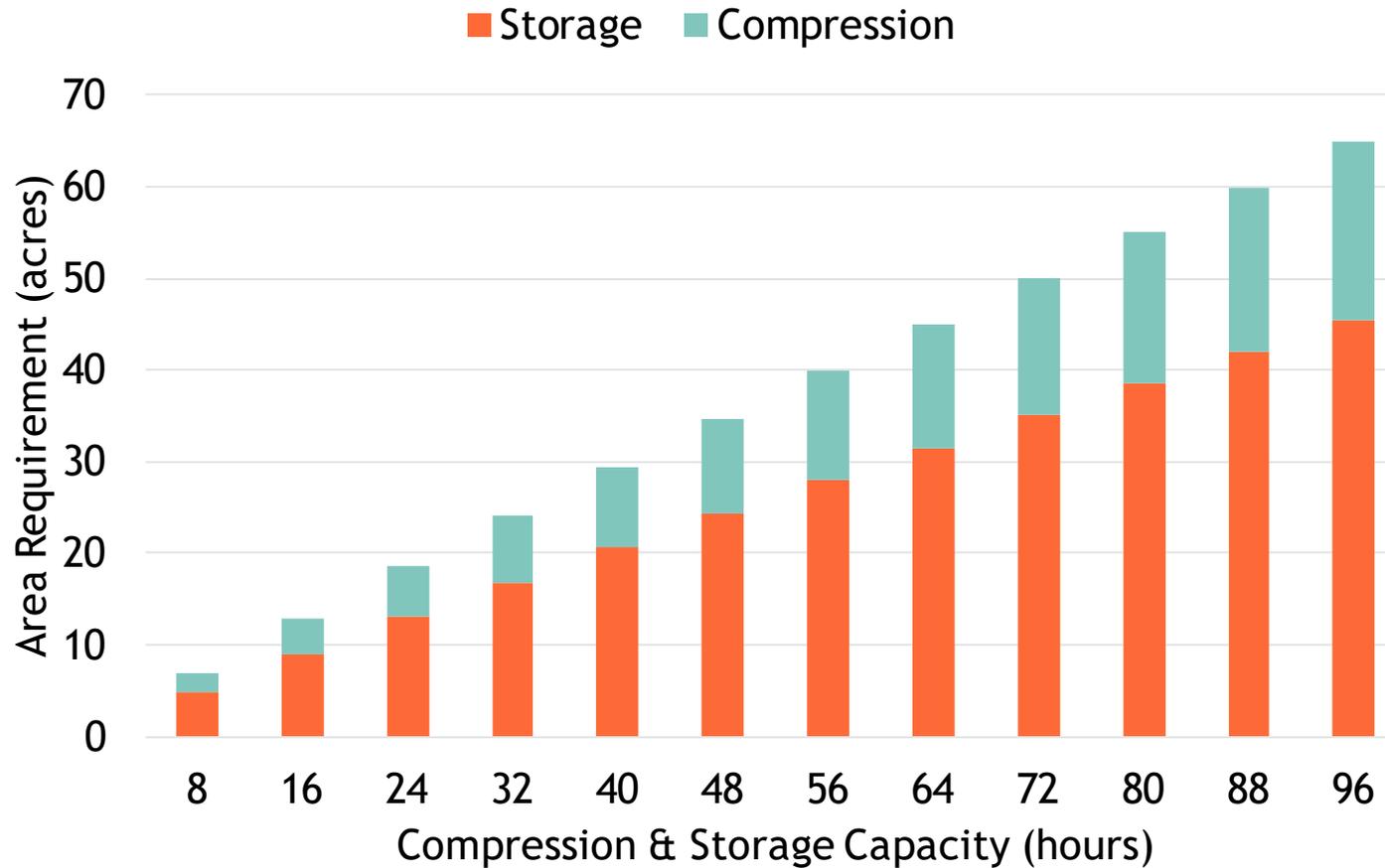
- 1898 & Co. presented the preliminary capital cost, O&M cost, and performance estimates for the Gross CONE Analysis at the 3/25/2024 ICAPWG meeting.
- Purpose of this presentation is to address stakeholder feedback from that meeting.

Stakeholder Feedback:

Provide information on footprint requirements for hydrogen compression and storage for informational “zero-emission” turbine design

PROJECT ACREAGE ASSUMPTIONS

Hydrogen Storage Footprint



Stakeholder Feedback:

Consider impacts of the recently finalized U.S. Environmental Protection Agency (EPA) New Source Performance Standards (NSPS) for Greenhouse Gas (GHG) Emissions from New Fossil Fuel-Fired Electric Generating Units

EPA New Source Performance Standards

40 CFR part 60, subpart TTTTa

- Low load turbines are limited to fuel that emit 120 lb CO₂/MMBtu to 160 lb CO₂/MMBtu¹
- Intermediate load turbines limited to 1170 lb CO₂/MWh (gross)
 - 7HA.03 ≈ 1050 lb CO₂/MWh
- Low-GHG hydrogen co-firing is NOT required as the second component of the Best System of Emissions Reduction (BSER)³

Subcategory	12-operating Month Electric Sales Threshold (Percent of potential electric sales) ²
Low Load	≤ 20 percent
Intermediate Load	> 20 percent and ≤ 40 percent
Base Load	> 40 percent

- A 40% capacity factor (CF) limit will be included in the Energy and Ancillary Services (EAS) revenue model for the simple cycle gas turbine (SCGT) options. Based on the analysis to date, this is not expected to impact the results.

Megawatt-hours (MWh)
Pounds of carbon dioxide (lb CO₂)
Metric million British thermal units (MMBtu)

https://www.epa.gov/system/files/documents/2024-04/eo-12866_111egu_2060-av09_nfrm_20240424_final.pdf

1. Pg 395-396 2. Pg 429-430 3. Pg 443

https://www.eia.gov/environment/emissions/co2_vol_mass.php

Stakeholder Request:

Consider implications of the North American Electric Reliability Corporation (NERC) freeze protection requirements

FREEZE PROTECTION

NERC Reliability Standard Emergency Operations Plan (EOP)-012-2 requires the following:

- **Freeze Protection Measures** - implement measures to allow for 12 continuous hours of operation with a 20-mph wind at the “Extreme Cold Weather Temperature” for the unit
- **Enhanced Cold Weather Preparedness Plans** - identify critical components susceptible to freezing and create a plan to protect these components
- **Corrective Actions** - create an action plan should any critical components freeze
- **Training** - annual training for generator maintenance and extreme cold operations
- **Continuous Improvements** - continuous improvement of the above four requirements

Capital cost and O&M cost estimates already comply with requirements

- Gas turbine package includes inlet bleed heat and pulse filter
- Building enclosure for turbine included primarily for noise mitigation but also benefits freeze protection

Miles per hour (mph)

Stakeholder Feedback:

Provide additional information regarding sales tax assumptions

SALES TAX

Assumption from Final 2021-2025 DCR

“The project owner would receive a tax exemption certificate for capital purchases. Construction supplies and consumables would be taxable. As applicable, consumable material unit costs in the Engineering, Procurement, and Construction (EPC) estimates account for sales tax.”

Sales Tax of capital costs within the Owner’s Cost section was excluded from consideration.

Sales Tax Assumptions

- Consistent with the 2021-2025 DCR
- Sales tax included on construction materials

Sales Tax by Location

	Zone C	Zone F	Zone G-R	Zone G-D	Zone J	Zone K
County	Chemung	Albany	Putnam	Putnam	NYC	NYC
Tax Reporting Code	0711	0181	3731	3731	8081	8081
	8.000%	8.000%	8.375%	8.375%	8.875%	8.875%

Source: <https://www.tax.ny.gov/pdf/publications/sales/pub718.pdf>

Stakeholder Feedback:

Provide further information regarding property insurance assumptions

PROPERTY INSURANCE



- Updated preliminary estimates presented at the 3/25/2024 ICAPWG to include property insurance within the O&M costs
- Insurance costs estimated as a percentage of EPC project component costs.
- Current Assumption for 2025-2029 DCR
 - Property insurance cost assumed at 0.6% of the EPC project capital cost
 - Consistent with 2021-2025 DCR
- 1898 & Co. did not find significant evidence that warranted changes to the property insurance cost assumption used in the last DCR.

Stakeholder Feedback:

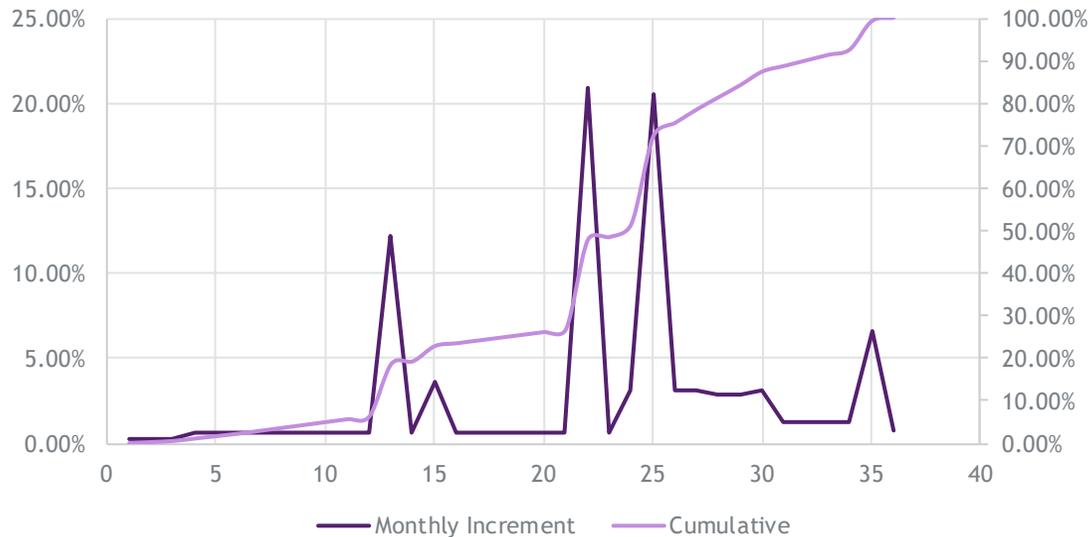
Provide information regarding the assumed Allowance for Funds Used During Construction (AFUDC) costs

AFUDC COSTS

AFUDC costs estimated based on assumed project cashflows

	4-hr BESS	6-hr BESS	8-hr BESS	SCGT
AFUDC (% of CAPEX)	7.8%	9.2%	11.4%	9.0%

BESS Cashflow



SCGT Cashflow



Stakeholder Feedback:

Consider the NYISO site control requirements for the assumed land requirements for the BESS technology.

PROJECT ACREAGE ASSUMPTIONS

NYISO Site Control Requirements



1898 & Co. RESEARCH SUGGESTIONS

The NYISO Interconnection Issues Task Force (IITF) released preliminary technology-specific acreage requirements for proof of Site Control on Interconnection Requests.

Battery Energy Storage:
0.01 acre/MWh_{ac}

The minimum acreage requirements are preliminary and not yet finalized by the NYISO.

Exceptions to this draft requirement exist if a developer submits:

- “a detailed narrative that explains why the site can accommodate the Generating Facility on land that is below the minimum acreage”
- “a Site plan and equipment layout (including any limitations on the site - wetlands, unusable land, spacing, setbacks, etc.) signed and stamped by a licensed Professional Engineer (PE)”

PROJECT ACREAGE ASSUMPTIONS

NYISO Site Control Requirements



2025-2029 DCR BESS - Total Acres

	4 Hour	6 Hour	8 Hour
Zone C	14	18	22
Zone F	14	18	22
Zone G-D	14	18	22
Zone G-R	14	18	22
Zone J	9	12	15
Zone K	12	16	20

Removing
Switchyard
Acreage



2025-2029 DCR BESS - BESS Acres Only

	4 Hour	6 Hour	8 Hour
Zone C	11	15	19
Zone F	11	15	19
Zone G-D	11	15	19
Zone G-R	11	15	19
Zone J	8	11	14
Zone K	10	14	18

PROJECT ACREAGE ASSUMPTIONS

NYISO Site Control Requirements

NYISO Preliminary Minimum Acreage Requirements

	4 Hour	6 Hour	8 Hour
MWh _{ac} at POI	800	1200	1600
Required Acres	8	12	16

2025-2029 DCR BESS - Acres without Switchyard

	4 Hour	6 Hour	8 Hour
Zone C	11	15	19
Zone F	11	15	19
Zone G-D	11	15	19
Zone G-R	11	15	19
Zone J	8	11	14
Zone K	10	14	18

Load Zone J is the only zone that falls below NYISO Preliminary Minimum Acreage Requirements

PROJECT ACREAGE ASSUMPTIONS

NYISO Site Control Requirements



It is reasonable to assume that **Load Zone J** would be the zone most likely to be space-constrained and, therefore, require developers to submit exception documentation, as discussed on Slide 19.

Because of varying energy density values among current vendor products, the energy density reduction trends of developing technologies, the current status of the potential site control requirement, and the layout exceptions available to developers, 1898 & Co. does not propose any changes to its acreage assumptions for all locations.

Stakeholder Feedback:

Provide additional information regarding SCGT performance estimates

GAS TURBINE PERFORMANCE BASIS

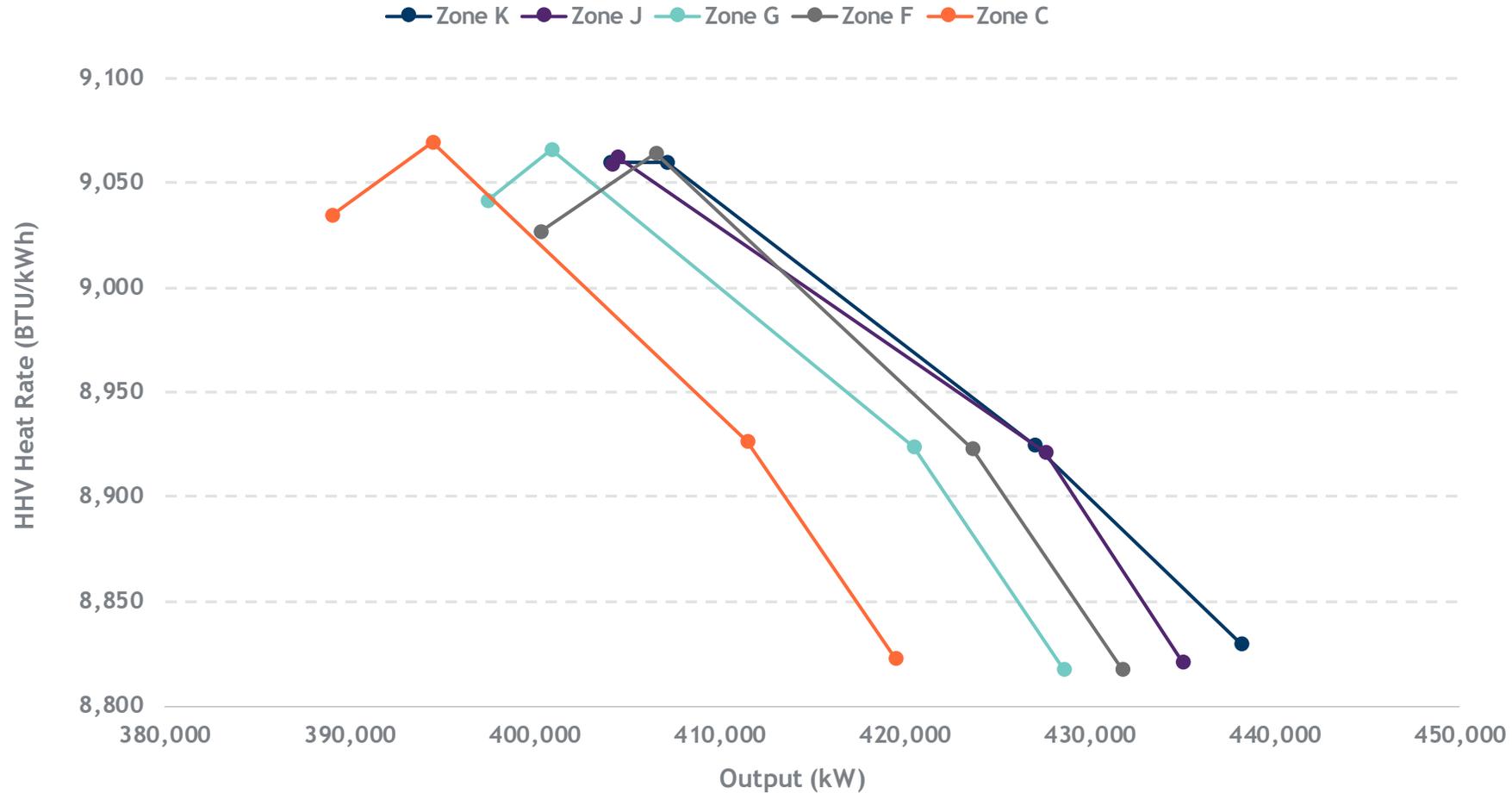
- Gas turbine performances were estimated based on the following site conditions using General Electric’s Gas Turbine Performance (GTP) online estimator with the addition of appropriate plant auxiliary loads.

	Zone C	Zone F	Zone G-R	Zone G-D	Zone J	Zone K
Site Elevation	1099 FT	279 FT	492 FT	492 FT	10 FT	85 FT
ISO Conditions	59° F 60% RH					
ICAP Conditions	90° F 70% RH					
DMNC Summer Conditions	88.9° F 57.7% RH	89.4° F 54.7% RH	92.9° F 51.5% RH	92.9° F 51.5% RH	93.3° F 58.8% RH	88.8° F 59.0% RH
DMNC Winter Conditions	10.8° F 55.7% RH	13.2° F 59.1% RH	12.5° F 57.6% RH	12.5° F 57.6% RH	21.1° F 46.4% RH	16.5° F 50.2% RH

International Standards Organization (ISO) | Dependable Maximum Net Capability (DMNC) | Degrees Fahrenheit (°F) | Relative Humidity (RH)

GAS TURBINE PERFORMANCE RESULTS

7HA.03 With SCR Emissions Controls Performances



Stakeholder Feedback:

Provide additional information for comparative analysis of the 7HA.03 with Selective Catalytic Reduction (SCR) emissions controls vs. 7HA.02 without SCR emissions controls

Capital Cost Comparison

7HA.03 | With SCR Emissions Controls

	Zone C	Zone J
EPC Cost	\$423M	\$551M
Dual Fuel Cost	\$27M	Included
Owner's Cost	\$148M	\$171M
Financing Fees	\$54M	\$65M
Total Cost	\$651M	\$787M
EPC Cost (\$/kW)	\$1,030	\$1,290
Total Cost (\$/kW)	\$1,580	\$1,840

Million (M) | United States Dollars (\$) | \$ Per kW metric based on performance at ISO conditions

7HA.02 | Without SCR Emissions Controls

	Zone C	Zone J
EPC Cost	\$347M	N/A
Dual Fuel Cost	\$27M	N/A
Owner's Cost	\$144M	N/A
Financing Fees	\$47M	N/A
Total Cost	\$564M	N/A
EPC Cost (\$/kW)	\$960	N/A
Total Cost (\$/kW)	\$1,560	N/A

Not Applicable (N/A)

More detailed cost and performance information is provided in the Appendix.

O&M Cost Comparison



7HA.03 | With SCR Emissions Controls

	Zone C	Zone J
Fixed O&M	\$5.80 mil/yr	\$10.61 mil/yr
Major Maintenance	\$1.57/MWh	\$1.49/MWh
Variable O&M	\$1.45/MWh	\$1.54/MWh

7HA.02 | Without SCR Emissions Controls

	Zone C	Zone J
Fixed O&M	\$5.78 mil/yr	N/A
Major Maintenance	\$1.72/MWh	N/A
Variable O&M	\$0.90/MWh	N/A

Million (mil) | O&M based on gas operation only | \$/MWh @ ISO Conditions | Values shown in 2024 dollars

More detailed cost and performance information is provided in the Appendix.

Stakeholder Feedback:

Consider potential need for assuming some form of hedge related to the cost of lithium for BESS options

BESS CAPITAL COST

Hedge on Lithium Carbonate Raw Material Price



- Certain stakeholders recommended consideration of including **the** cost for a potential hedge to limit exposure to BESS raw material fluctuation.
- 1898 & Co. considered feedback from its project experience, as well as procurement professionals, and developers.
- Based on the factors below, 1898 & Co. is not recommending the inclusion of a hedge in the project costs or Owner's Costs.
 - Hedging the raw material cost is not a consistent practice within specific project budgets. Based on correspondence, Owner's that do hedge generally base their decisions on more holistic corporate risks and exposures considering multiple factors and/or multiple projects.
 - Owners may have multiple supply agreements and/or may time procurements to manage prices, which can limit exposure without additional cost line items.
 - The cost of hedging would be based on Owner's risk appetite and opinions on the future pricing and does not appear to be a standard/typical cost that warrants inclusion in the cost estimates for the 2025-2029 DCR.

Stakeholder Feedback:

Provide further information regarding assumed right-of-way costs for underground transmission in Load Zone J

LOAD ZONE J UNDERGROUND 345kV TRANSMISSION LINE

- The Load Zone J underground 345kV transmission line estimate includes a one-time allowance of \$1 million for right-of-way (ROW) payment for the assumed 1-mile line.
 - The \$1 million per mile allowance is the same for all transmission options in the 2025-2029 DCR, both above ground and underground.
 - Prior experience with transmission projects in New York State indicates that the assumed right-of-way payment cost is reasonable.
 - The ROW payment for an underground line in Load Zone J may vary from this allowance in either direction, and it may be divided into annual payments in practice. Because of the nature of this allowance, an annual payment would be calculated to match the net present value of the \$1 million allowance. Therefore, distributing the ROW allowance over time would not materially impact the estimates developed for the DCR.
- 1898 & Co. does not propose any changes to the current assumption of a one-time allowance of \$1 million per mile for ROW for all locations.

Stakeholder Feedback:

Consider potential implications of the draft requirements of 6 NYCRR Part 495, Sulfur Hexafluoride Standards and Reporting

LOAD ZONE J Ground Insulated Switch (GIS) SWITCHYARD

6 New York Codes, Rules, and Regulations (NYCRR) Part 495, Sulfur Hexafluoride (SF₆) Standards and Reporting

- The Department of Environmental Conservation (DEC) filed Draft Regulations to reduce SF₆ emissions on 12/28/23.
- Includes proposed phase out dates
- Exception provided for “equipment containing SF₆ for use as an arc quenching medium” such as circuit breakers.

Due to draft status of regulation and exemption of circuit breakers, 1898 & Co. has not included SF₆ free equipment in the Load Zone J GIS Switchyard.

Phase-out Dates for SF₆ GIE with Voltage Capacity > 38 kV

Voltage Capacity (kV)	Short-Circuit Current Rating (kA)	Phase-Out Date
38 < kV ≤ 145	< 63	January 1, 2026
	>63	January 1, 2028
38 < kV ≤ 145	<63	January 1, 2027
	>63	January 1, 2031
> 245	All	January 1, 2033

Kilovolt (kV) | Kiloamp (kA) Source: <https://dec.ny.gov/sites/default/files/2023-12/part495expresstermspub.pdf>

Stakeholder Feedback:

Provide additional information on the BESS variable O&M methodology

BESS VARIABLE O&M METHODOLOGY

- BESS degradation is impacted by time (calendar degradation) and dispatch behavior (cycle degradation).
- Augmentation-related O&M costs are modeled with fixed and variable levelized components to accommodate cycling variations in net energy and ancillary services (EAS) revenue modeling.

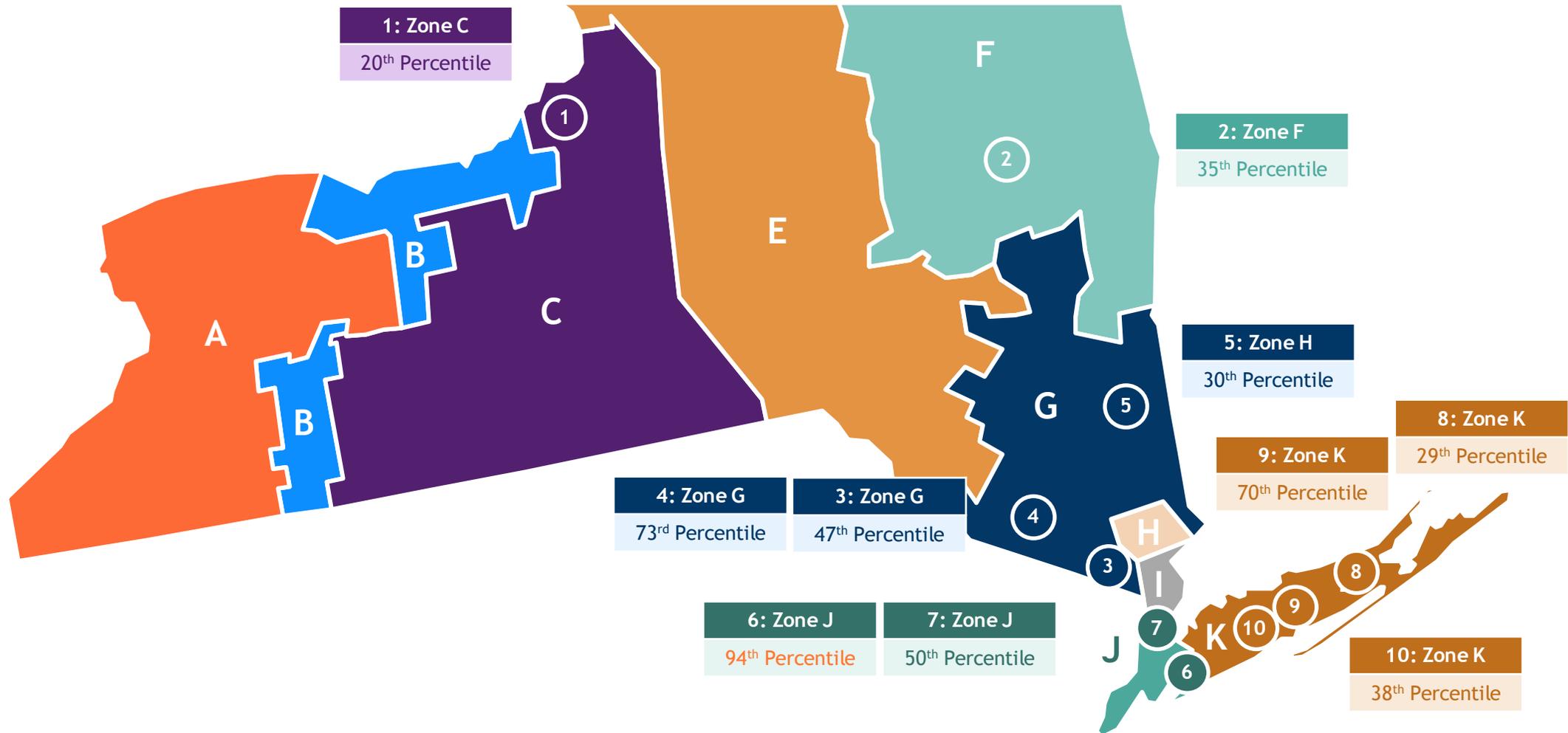
$$\text{Augmentation FOM} \left(\frac{\$}{\text{yr}} \right) + \text{Annual Throughput (MWh)} * \text{Augmentation VOM} \left(\frac{\$}{\text{MWh}} \right) = \text{Total Augmentation O\&M} \left(\frac{\$}{\text{yr}} \right)$$

- Estimated levelized annual augmentation costs for 180 cycle and 365 cycle scenarios with 20-year life.
- Less degradation for 180 cycle use case reduces augmentation requirements/costs.
- Algebraically solved for the variable O&M

Stakeholder Feedback:

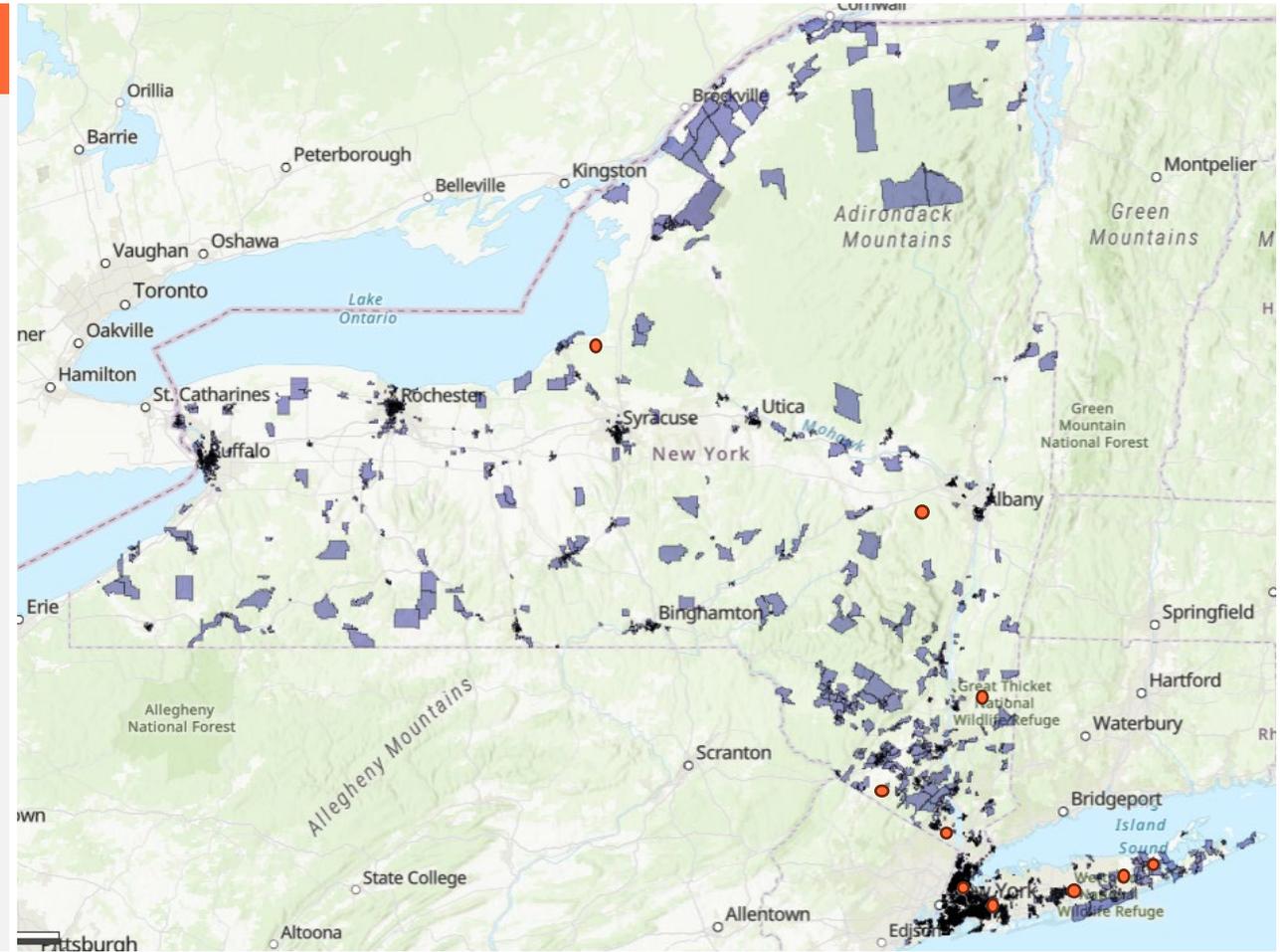
Consider implications of Environmental Justice/Disadvantaged Communities requirements

Environmental Justice (EJ) | EPA EJScreen



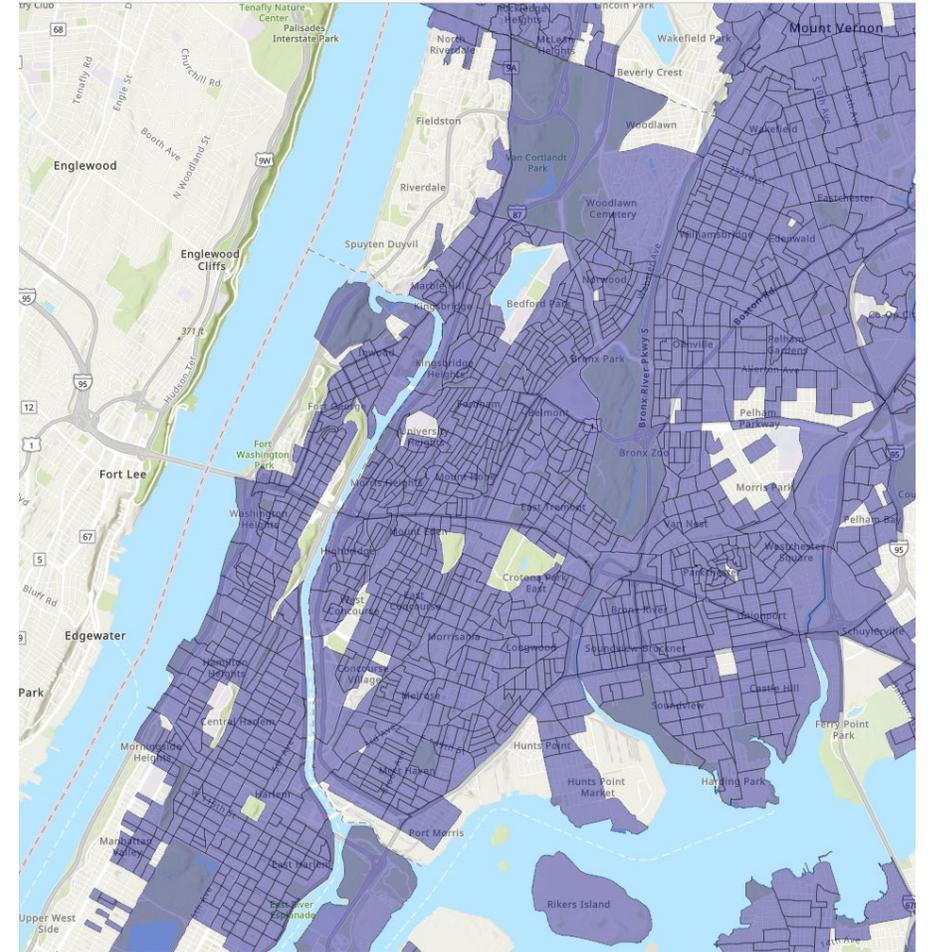
Environmental Justice | NY DEC PEJA

- New York Department of Environmental Conservation (“DEC”) Defines Potential Environmental Justice Areas (PEJA)
 - 52.42% of population minority groups (urban)
 - 26.28% of population minority groups (rural)
 - 22.82% of population below poverty level
 - Updated based on 2020 census data
- NY DEC permitting would require an Enhanced Public Participation Plan



Environmental Justices | Load Zone J

- Load Zone J siting in the Bronx poses higher risk for EJ Concerns.
- Locations within a 3-mile radius of the desired point of interconnection have a high likelihood of being in a PEJA.
- Most effective solution would be to work with the local community and find an equitable solution.
- Community engagement funds have been included to address local engagement and permitting.



Stakeholder Feedback:

Provide additional information regarding the Load Zone J land lease cost data

SITE LEASING ALLOWANCE

- Site Leasing Allowance

- Escalated lease cost assumptions from the 2021-2025 DCR
- Load Zone C, F, G: \$26,000 / acre-year
- Load Zone J: \$313,000 / acre-year
- Load Zone K: \$30,000 / acre-year

- Load Zone J Supplemental Assessment

- Compared escalated value to publicly available transaction data
- Landsearch.com
- 71 entries in Load Zone J
- Escalated value determined to be reasonable considering the range of market data

BESS Site Acre Assumptions			
	4 Hour	6 Hour	8 Hour
Load Zone C	14	18	22
Load Zone F	14	18	22
Load Zone G-D	14	18	22
Load Zone G-R	14	18	22
Load Zone J	9	12	15
Load Zone K	12	16	20

Load Zone J Site Leasing Cost Comparison	
GDP IPD Inflated Lease Rate (\$/acre-year)	313,000
Public Data Transactions 1 st Quartile Lease Rate (\$/acre-yr)	163,000
Public Data Transactions Median Lease Rate (\$/acre-yr)	450,000
Public Data Transactions 3 rd Quartile Lease Rate (\$/acre-yr)	1,018,000

Implicit Price Deflator (IPD) | Year (yr)

SCGT Site Acre Assumptions	
	7HA.03
Load Zone C	15
Load Zone F	15
Load Zone G-D	15
Load Zone G-R	15
Load Zone J	12
Load Zone K	15

Note: Orange text represents an assumption change from the 2021-2025 DCR; however, these assumptions are unchanged from the preliminary assumptions presented at the 3/25/2024 ICAPWG for the 2025-2029 DCR

LAND LEASE | Load Zone J Publicly Available Data

71 Sites Analyzed

20 Brooklyn

- 18 Active Listings
- 2 Under Contract

13 Bronx

- 10 Active Listings
- 3 Under Contract

1 Manhattan

- 1 Active Listing

27 Queens

- 24 Active Listings
- 3 Under Contract

10 Staten Island

- 10 Active Listings

Characteristics:

Industrial
Zoning

0.02-4 Acres
in Size

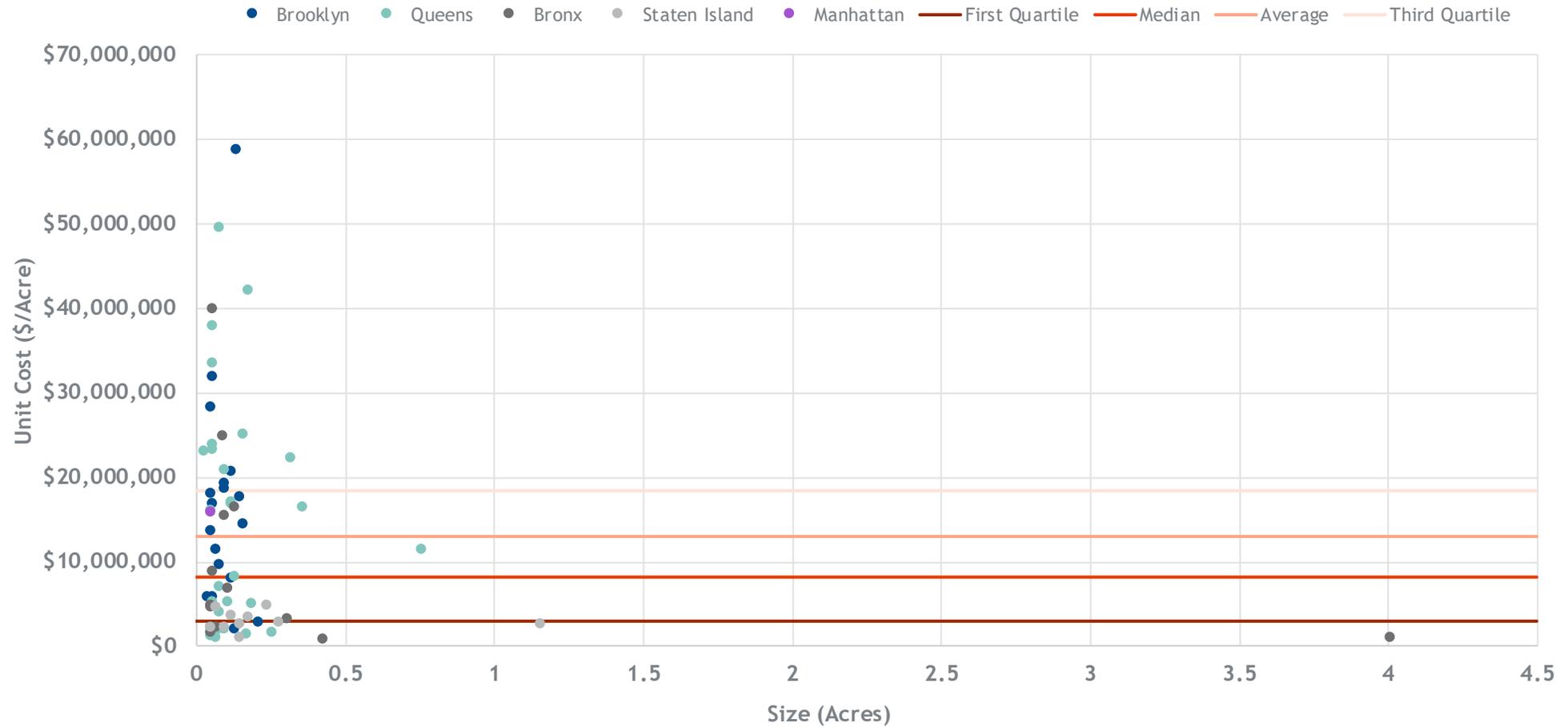
All listings under
365 days old

*Annual Lease \approx Net Income
= Purchase Price \times Capitalization (CAP) Rate*

- Applied a 5.5% cap rate to estimated land value to determine lease rate.
 - Same rate applied in 2020 DCR
 - Current cap rate is 5.7% according to JPMorgan
 - Expected to decrease as interest rates decrease due to land value growth exceeding lease revenue growth

LAND LEASE | Load Zone J Publicly Available Data

Load Zone J Land Unit Cost Based On Plot Size



LAND LEASE | Case Analysis for Large Plots

IKEA Brooklyn

22.5 Acres

- Waterfront, Formerly an industrial manufacturing zone

\$31.25 million land cost in 2005

- Inflation adjusted to \$50.18 million (2024)
 - \$2.23M/acre (\$122,700/acre-yr); 20th Percentile
- Adjusted against NYC Case-Shiller Index to \$46.40 million (2024)
 - \$2.06M/acre (\$113,300/acre-yr); 19th Percentile
- Adjusted against Green Street Commercial Property Price Index, Core Sector to \$49.91 million (2024)
 - \$2.22M/acre (\$122,100/acre-yr); 20th Percentile

Sources:

New York Post, "IKEA Lands Deal to Setup Up Brooklyn Shop", 2005. <https://nypost.com/2005/06/14/ikea-lands-deal-to-set-up-brooklyn-shop/>
Case-Shiller Index for New York, New York. <https://fred.stlouisfed.org/series/NYXRSA>
Consumer Price Index Calculator. <https://data.bls.gov/cgi-bin/cpicalc.pl>
Green Street Commercial Property Price Index. <https://www.greenstreet.com/insights/CPPI#different>

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Appendix A: Preliminary 7HA.03 Capital Costs

	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED CAPITAL AND O&M COSTS (Note 1)						
EPC Project Capital Costs, 2024 MM\$ (w/o Owner's Costs)	\$423	\$432	\$435	\$495	\$551	\$537
Dual Fuel Breakout Costs, 2024 MM\$ (w/o Owner's Costs)	\$26.9	\$26.9	\$26.9	Included	Included	Included
Owner's Costs, 2024 MM\$						
Owner's Project Development	\$1.2	\$1.2	\$1.2	\$1.2	\$1.6	\$1.2
Owner's Operational Personnel Prior to COD	\$0.3	\$0.3	\$0.3	\$0.3	\$0.4	\$0.3
Owner's Engineer	\$1.6	\$1.6	\$1.6	\$1.6	\$2.0	\$1.6
Owner's Project Management	\$1.6	\$1.6	\$1.6	\$1.6	\$2.0	\$1.6
Owner's Legal Costs	\$0.7	\$0.7	\$0.7	\$0.7	\$0.8	\$0.7
Owner's Start-up Engineering and Commissioning	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1
Land	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Construction Power and Water	\$0.5	\$0.5	\$0.5	\$0.5	\$0.7	\$0.5
Permitting Support	\$0.7	\$0.7	\$0.7	\$0.7	\$1.0	\$0.7
Switchyard	\$18.2	\$18.2	\$18.2	\$18.2	\$51.0	\$13.0
Transmission Line and Electrical Interconnection	\$26.0	\$26.0	\$26.0	\$26.0	\$29.3	\$23.0
Gas Interconnection and Reinforcement	\$35.4	\$35.4	\$35.4	\$35.4	\$15.5	\$36.6
System Deliverability Upgrade Costs	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Water Supply Infrastructure	\$9.6	\$9.6	\$3.2	\$3.2	\$6.8	\$1.6
Emission Reduction Credits	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Public Outreach and Area Development	\$0.6	\$0.6	\$0.6	\$0.6	\$0.8	\$0.6
Startup/Testing (Fuel & Consumables)	\$3.2	\$3.2	\$3.2	\$3.2	\$4.1	\$3.2
Initial Fuel Inventory	\$6.9	\$6.9	\$6.9	\$6.9	\$6.9	\$6.9
Site Security	\$0.7	\$0.7	\$0.7	\$0.7	\$0.9	\$0.7
Operating Spare Parts	\$10.0	\$10.0	\$10.0	\$10.0	\$10.0	\$10.0
Builders Risk Insurance (0.45% of Construction Costs)	\$2.0	\$2.1	\$2.1	\$2.2	\$2.5	\$2.4
Owner's Contingency (5% for Screening Purposes)	\$28.4	\$28.9	\$28.7	\$30.4	\$34.4	\$32.1
Owner's Cost Allowance Subtotal, 2024\$	\$148	\$148	\$142	\$143	\$171	\$137
	8.92%	8.92%	8.92%	8.92%	8.67%	8.92%
Financing Fees, 2024 MM\$						
EPC Portion	\$40.5	\$41.3	\$41.5	\$44.5	\$49.6	\$48.4
Non-EPC Portion	\$13.3	\$13.3	\$12.7	\$12.9	\$15.4	\$12.3
AFUDC Subtotal, 2024\$	\$54	\$55	\$54	\$57	\$65	\$61
Total Project Costs, 2024\$	\$651	\$661	\$658	\$695	\$787	\$735

Appendix A: Preliminary 7HA.02 Capital Costs

	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED CAPITAL AND O&M COSTS (Note 1)						
EPC Project Capital Costs, 2024 MM\$ (w/o Owner's Costs)	\$346.85	\$355.06	\$356.54	\$385.68		
Dual Fuel Breakout Costs, 2024 MM\$ (w/o Owner's Costs)	\$26.9	\$26.9	\$26.9	\$26.9		
Owner's Costs, 2024 MM\$						
Owner's Project Development	\$1.2	\$1.2	\$1.2	\$1.2		
Owner's Operational Personnel Prior to COD	\$0.3	\$0.3	\$0.3	\$0.3		
Owner's Engineer	\$1.6	\$1.6	\$1.6	\$1.6		
Owner's Project Management	\$1.6	\$1.6	\$1.6	\$1.6		
Owner's Legal Costs	\$0.7	\$0.7	\$0.7	\$0.7		
Owner's Start-up Engineering and Commissioning	\$0.1	\$0.1	\$0.1	\$0.1		
Land	\$0.0	\$0.0	\$0.0	\$0.0		
Construction Power and Water	\$0.5	\$0.5	\$0.5	\$0.5		
Permitting Support	\$0.7	\$0.7	\$0.7	\$0.7		
Switchyard	\$18.2	\$18.2	\$18.2	\$18.2		
Transmission Line and Electrical Interconnection	\$26.0	\$26.0	\$26.0	\$26.0		
Gas Interconnection and Reinforcement	\$35.4	\$35.4	\$35.4	\$35.4		
System Deliverability Upgrade Costs	\$0.0	\$0.0	\$0.0	\$0.0		
Water Supply Infrastructure	\$9.6	\$9.6	\$3.2	\$3.2		
Emission Reduction Credits	\$0.0	\$0.0	\$0.0	\$0.0		
Public Outreach and Area Development	\$0.6	\$0.6	\$0.6	\$0.6		
Startup/Testing (Fuel & Consumables)	\$3.2	\$3.2	\$3.2	\$3.2		
Initial Fuel Inventory	\$6.9	\$6.9	\$6.9	\$6.9		
Site Security	\$0.7	\$0.7	\$0.7	\$0.7		
Operating Spare Parts	\$10.0	\$10.0	\$10.0	\$10.0		
Builders Risk Insurance (0.45% of Construction Costs)	\$1.7	\$1.7	\$1.7	\$1.9		
Owner's Contingency (5% for Screening Purposes)	\$24.6	\$25.0	\$24.8	\$26.3		
Owner's Cost Allowance Subtotal, 2024\$	\$144	\$144	\$137	\$139		
Financing Fees, 2024 MM\$						
EPC Portion	\$33.6	\$34.4	\$34.5	\$37.1		
Non-EPC Portion	\$12.9	\$13.0	\$12.4	\$12.5		
AFUDC Subtotal, 2024\$	\$47	\$47	\$47	\$50		
Total Project Costs, 2024\$	\$564	\$573	\$568	\$601		

Notes:

[1] Capital and fixed O&M costs are presented in 2024 USD \$MM. Estimated costs exclude decommissioning costs and salvage values.

[2] Total compounded cost of capital based on estimated permitting, engineering, and construction scheduling over a 4-year period.

Appendix A: Preliminary BESS 4-Hour Capital Costs

	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED CAPITAL COSTS						
EPC Project Capital Costs, 2024 MM\$ (w/o Owner's Costs)	\$289	\$291	\$289	\$298	\$361	\$304
Owner's Costs, 2024 MM\$						
Owner's Project Development	\$0.7	\$0.7	\$0.7	\$0.7	\$0.9	\$0.7
Owner's Operational Personnel Prior to COD	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1
Owner's Engineer	\$0.6	\$0.6	\$0.6	\$0.6	\$0.8	\$0.6
Owner's Project Management	\$0.9	\$0.9	\$0.9	\$0.9	\$1.2	\$0.9
Owner's Legal Costs	\$0.7	\$0.7	\$0.7	\$0.7	\$0.9	\$0.7
Owner's Start-up Engineering and Commissioning	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1
Sales Tax	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Construction Power and Water	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2
Permitting Support	\$1.0	\$1.0	\$1.0	\$1.0	\$1.3	\$1.0
Switchyard	\$18.2	\$18.2	\$18.2	\$18.2	\$51.0	\$13.0
Transmission Line and Electrical Interconnection	\$26.1	\$26.1	\$26.1	\$26.1	\$29.3	\$23.0
Gas Interconnection & Reinforcement	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
System Deliverability Upgrade Costs	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Water Supply Infrastructure	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Emission Reduction Credits	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Public Outreach and Area Development	\$0.3	\$0.3	\$0.3	\$0.3	\$0.4	\$0.3
Startup/Testing (Fuel & Consumables)	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1
Initial Fuel Inventory	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Site Security	\$0.4	\$0.4	\$0.4	\$0.4	\$0.6	\$0.4
Operating Spare Parts	\$1.0	\$1.0	\$1.0	\$1.0	\$1.0	\$1.0
Builders Risk Insurance (0.45% of Construction Costs)	\$1.3	\$1.3	\$1.3	\$1.3	\$1.6	\$1.4
Owner's Contingency (5% for Screening Purposes)	\$17.0	\$17.1	\$17.0	\$17.5	\$22.5	\$17.4
Owner's Cost Allowance Subtotal, 2024 MM\$	\$68	\$69	\$68	\$69	\$112	\$61
AFUDC as a Percentage of Capital Costs (%)	7.85%	7.85%	7.85%	7.85%	7.85%	7.85%
AFUDC, 2024 MM\$						
EPC Portion	\$22.7	\$22.8	\$22.7	\$23.4	\$28.3	\$23.9
Non-EPC Portion	\$5.4	\$5.4	\$5.4	\$5.4	\$8.8	\$4.8
AFUDC Subtotal, 2024 MM\$	\$28	\$28	\$28	\$29	\$37	\$29
Total Project Costs, 2024 MM\$	\$385	\$388	\$386	\$395	\$510	\$394

Notes:

[1] EPC electrical scope ends at the high side of the MPT. Includes engineering, procurement, construction (EPC) contracting methodology.

[2] EPC cost accounts for BESS sizing that accommodates system losses, equipment efficiencies, minimum state of charge, aux load, degradation during shipping/construct

[3] Estimated Costs exclude decommissioning costs and salvage values.

Appendix A: Preliminary BESS 6-Hour Capital Costs

	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED CAPITAL COSTS						
EPC Project Capital Costs, 2024 MM\$ (w/o Owner's Costs)	\$418	\$421	\$418	\$430	\$512	\$440
Owner's Costs, 2024 MM\$						
Owner's Project Development	\$0.7	\$0.7	\$0.7	\$0.7	\$0.9	\$0.7
Owner's Operational Personnel Prior to COD	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1
Owner's Engineer	\$0.6	\$0.6	\$0.6	\$0.6	\$0.8	\$0.6
Owner's Project Management	\$0.9	\$0.9	\$0.9	\$0.9	\$1.2	\$0.9
Owner's Legal Costs	\$0.7	\$0.7	\$0.7	\$0.7	\$0.9	\$0.7
Owner's Start-up Engineering and Commissioning	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1
Sales Tax	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Construction Power and Water	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2
Permitting Support	\$1.1	\$1.1	\$1.1	\$1.1	\$1.4	\$1.1
Switchyard	\$18.2	\$18.2	\$18.2	\$18.2	\$51.0	\$13.0
Transmission Line and Electrical Interconnection	\$26.1	\$26.1	\$26.1	\$26.1	\$29.3	\$23.0
Gas Interconnection & Reinforcement	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
System Deliverability Upgrade Costs	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Water Supply Infrastructure	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Emission Reduction Credits	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Public Outreach and Area Development	\$0.3	\$0.3	\$0.3	\$0.3	\$0.4	\$0.3
Startup/Testing (Fuel & Consumables)	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2
Initial Fuel Inventory	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Site Security	\$0.6	\$0.6	\$0.6	\$0.6	\$0.7	\$0.6
Operating Spare Parts	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5
Builders Risk Insurance (0.45% of Construction Costs)	\$1.9	\$1.9	\$1.9	\$1.9	\$2.3	\$2.0
Owner's Contingency (5% for Screening Purposes)	\$23.6	\$23.7	\$23.6	\$24.2	\$30.2	\$24.3
Owner's Cost Allowance Subtotal, 2024 MM\$	\$76	\$77	\$77	\$77	\$121	\$69
AFUDC as a Percentage of Capital Costs (%)	9.24%	9.24%	9.24%	9.24%	9.24%	9.24%
AFUDC, 2024 MM\$						
EPC Portion	\$38.6	\$38.9	\$38.7	\$39.7	\$47.3	\$40.7
Non-EPC Portion	\$7.1	\$7.1	\$7.1	\$7.1	\$11.2	\$6.4
AFUDC Subtotal, 2024 MM\$	\$46	\$46	\$46	\$47	\$59	\$47
Total Project Costs, 2024 MM\$	\$540	\$543	\$540	\$554	\$692	\$557

Notes:

[1] EPC electrical scope ends at the high side of the MPT. Includes engineering, procurement, construction (EPC) contracting methodology.

[2] EPC cost accounts for BESS sizing that accommodates system losses, equipment efficiencies, minimum state of charge, aux load, degradation during shipping/construction.

[3] Estimated Costs exclude decommissioning costs and salvage values.

Appendix A: Preliminary BESS 8-Hour Capital Costs

	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED CAPITAL COSTS						
EPC Project Capital Costs, 2024 MM\$ (w/o Owner's Costs)	\$540	\$543	\$540	\$555	\$664	\$569
Owner's Costs, 2024 MM\$						
Owner's Project Development	\$0.7	\$0.7	\$0.7	\$0.7	\$1.0	\$0.7
Owner's Operational Personnel Prior to COD	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1
Owner's Engineer	\$0.7	\$0.7	\$0.7	\$0.7	\$0.9	\$0.7
Owner's Project Management	\$1.0	\$1.0	\$1.0	\$1.0	\$1.3	\$1.0
Owner's Legal Costs	\$0.7	\$0.7	\$0.7	\$0.7	\$0.9	\$0.7
Owner's Start-up Engineering and Commissioning	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1
Sales Tax	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Construction Power and Water	\$0.2	\$0.2	\$0.2	\$0.2	\$0.3	\$0.2
Permitting Support	\$1.1	\$1.1	\$1.1	\$1.1	\$1.5	\$1.1
Switchyard	\$18.2	\$18.2	\$18.2	\$18.2	\$51.0	\$13.0
Transmission Line and Electrical Interconnection	\$26.1	\$26.1	\$26.1	\$26.1	\$29.3	\$23.0
Gas Interconnection & Reinforcement	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
System Deliverability Upgrade Costs	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Water Supply Infrastructure	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Emission Reduction Credits	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Public Outreach and Area Development	\$0.3	\$0.3	\$0.3	\$0.3	\$0.4	\$0.3
Startup/Testing (Fuel & Consumables)	\$0.2	\$0.2	\$0.2	\$0.2	\$0.3	\$0.2
Initial Fuel Inventory	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Site Security	\$0.7	\$0.7	\$0.7	\$0.7	\$0.9	\$0.7
Operating Spare Parts	\$2.0	\$2.0	\$2.0	\$2.0	\$2.0	\$2.0
Builders Risk Insurance (0.45% of Construction Costs)	\$2.4	\$2.4	\$2.4	\$2.5	\$3.0	\$2.6
Owner's Contingency (5% for Screening Purposes)	\$29.7	\$29.9	\$29.7	\$30.5	\$37.8	\$30.8
Owner's Cost Allowance Subtotal, 2024 MM\$	\$84	\$84	\$84	\$85	\$131	\$77
AFUDC as a Percentage of Capital Costs (%)	11.48%	11.48%	11.48%	11.48%	11.48%	11.48%
AFUDC, 2024 MM\$						
EPC Portion	\$61.9	\$62.3	\$62.0	\$63.7	\$76.2	\$65.3
Non-EPC Portion	\$9.7	\$9.7	\$9.7	\$9.8	\$15.0	\$8.9
AFUDC Subtotal, 2024 MM\$	\$72	\$72	\$72	\$73	\$91	\$74
Total Project Costs, 2024 MM\$	\$695	\$699	\$696	\$713	\$886	\$720

Notes:

[1] EPC electrical scope ends at the high side of the MPT. Includes engineering, procurement, construction (EPC) contracting methodology.

[2] EPC cost accounts for BESS sizing that accommodates system losses, equipment efficiencies, minimum state of charge, aux load, degradation during shipping/construction.

[3] Estimated Costs exclude decommissioning costs and salvage values.

Appendix B: Preliminary 7HA.03 O&M Costs



	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED O&M COSTS (Note 1)						
FIXED O&M COSTS (Note 1)						
Fixed O&M Cost - LABOR, 2024\$MM/Yr	\$1.11	\$1.22	\$1.44	\$1.80	\$1.93	\$1.93
Fixed O&M Cost - OTHER, 2024\$MM/Yr	\$1.61	\$1.61	\$1.61	\$1.61	\$1.61	\$1.61
Property Insurance Allowance	\$2.70	\$2.75	\$2.77	\$2.97	\$3.31	\$3.22
Site Leasing Allowance, 2024\$/MM/Yr	\$0.38	\$0.38	\$0.38	\$0.38	\$3.76	\$0.45
LEVELIZED CAPITAL MAINTENANCE COSTS (Note 2)						
Major Maintenance Cost, 2024\$/GT-hr or \$/engine-hr	\$650	\$650	\$650	\$650	\$650	\$650
Major Maintenance Cost, 2024\$/GT-start	\$23,100	\$23,100	\$23,100	\$23,100	\$23,100	\$23,100
Major Maintenance Cost, 2024\$/MWh	\$1.57	\$1.51	\$1.52	\$1.52	\$1.49	\$1.53
NON-FUEL VARIABLE O&M COSTS (EXCLUDES MAJOR MAINTENANCE) - GAS OPERATION, 2024\$/MWh (Note 3)						
Water Related O&M, \$/MWh	\$0.00	\$0.00	\$0.00	\$0.00	\$0.04	\$0.00
SCR Reagent, \$/MWh	\$0.55	\$0.55	\$0.55	\$0.55	\$0.60	\$0.60
Other Consumables and Variable O&M, \$/MWh	\$0.90	\$0.90	\$0.90	\$0.90	\$0.90	\$0.90
Total Variable O&M - Gas Operation, 2024\$/MWh	\$1.45	\$1.45	\$1.45	\$1.45	\$1.54	\$1.50
NON-FUEL VARIABLE O&M COSTS (EXCLUDES MAJOR MAINTENANCE) - FUEL OIL OPERATION, 2024\$/MWh (Note 3)						
Water Related O&M, \$/MWh	\$6.98	\$6.77	\$6.82	\$6.82	\$6.99	\$6.72
SCR Reagent, \$/MWh	\$0.87	\$0.88	\$0.87	\$0.87	\$0.84	\$0.87
Other Consumables and Variable O&M, \$/MWh	\$0.90	\$0.90	\$0.90	\$0.90	\$0.90	\$0.90
Total Variable O&M - Fuel Oil Operation, 2024\$/MWh	\$8.75	\$8.55	\$8.59	\$8.59	\$8.73	\$8.49

Notes

[1] All gas turbine FOM costs assume 7 full time personnel for first unit; Performances based on ISO conditions.

[2] Major maintenance \$/hr and \$/start are NOT additive. The maintenance will be either starts or hours based depending on operating profile. If average hours/start > 35.6, then maintenance will be hours based.

[3] VOM assumes the use of temporary trailers for demineralized water treatment, where applicable.

Appendix B: Preliminary 7HA.02 O&M Costs



	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED O&M COSTS (Note 1)						
FIXED O&M COSTS (Note 1)						
Fixed O&M Cost - LABOR, 2024\$/MM/Yr	\$1.10	\$1.20	\$1.20	\$1.40		
Fixed O&M Cost - OTHER, 2024\$/MM/Yr	\$1.60	\$1.60	\$1.60	\$1.60		
Property Insurance Allowance	\$2.70	\$2.75	\$2.77	\$2.97		
Site Leasing Allowance, 2024\$/MM/Yr	\$0.38	\$0.38	\$0.38	\$0.38		
LEVELIZED CAPITAL MAINTENANCE COSTS (Note 2)						
Major Maintenance Cost, 2024\$/GT-hr or \$/engine-hr	\$620	\$620	\$620	\$620		
Major Maintenance Cost, 2024\$/GT-start	\$23,000	\$23,000	\$23,000	\$23,000		
Major Maintenance Cost, 2024\$/MWh	\$1.72	\$1.70	\$1.70	\$1.70		
NON-FUEL VARIABLE O&M COSTS (EXCLUDES MAJOR MAINTENANCE) - GAS OPERATION, 2024\$/MWh (Note 3)						
Water Related O&M, \$/MWh	\$0.00	\$0.00	\$0.00	\$0.00		
SCR Reagent, \$/MWh	NA	NA	NA	NA		
Other Consumables and Variable O&M, \$/MWh	\$0.90	\$0.90	\$0.90	\$0.90		
Total Variable O&M - Gas Operation, 2024\$/MWh	\$0.90	\$0.90	\$0.90	\$0.90		
NON-FUEL VARIABLE O&M COSTS (EXCLUDES MAJOR MAINTENANCE) - FUEL OIL OPERATION, 2024\$/MWh (Note 3)						
Water Related O&M, \$/MWh	\$6.98	\$6.77	\$6.82	\$6.82		
SCR Reagent, \$/MWh	\$0.87	\$0.88	\$0.87	\$0.87		
Other Consumables and Variable O&M, \$/MWh	\$0.90	\$0.90	\$0.90	\$0.90		
Total Variable O&M - Fuel Oil Operation, 2024\$/MWh	\$8.75	\$8.55	\$8.59	\$8.59		

Notes

[1] All gas turbine FOM costs assume 7 full time personnel for first unit; Performances based on ISO conditions.

[2] Major maintenance \$/hr and \$/start are NOT additive. The maintenance will be either starts or hours based depending on operating profile. If average hours/start > 35.6, then maintenance will be hours based.

[3] VOM assumes the use of temporary trailers for demineralized water treatment, where applicable.

Appendix B: Preliminary BESS 4-Hour O&M Costs



	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED O&M COSTS						
FIXED O&M COSTS						
Fixed O&M Cost - Assumes LTSA with Integrator/OEM, 2024\$MM/Yr	\$3.9	\$3.9	\$3.9	\$3.9	\$3.9	\$3.9
Capacity Maintenance Agreement (Fixed Portion Levelized), 2024\$MM/Yr	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5	\$1.5
Site Leasing Allowance, 2024\$MM/Yr	\$0.4	\$0.4	\$0.4	\$0.4	\$2.8	\$0.4
Property Insurance Allowance, 2024\$MM/Yr	\$1.7	\$1.7	\$1.7	\$1.8	\$2.2	\$1.8
Total Fixed O&M Cost 2024\$MM/Yr	\$7.5	\$7.5	\$7.5	\$7.6	\$10.4	\$7.6
VARIABLE O&M COSTS (Augmentation Model)						
Capacity Maintenance Agreement (Variable Portion Levelized), 2024 \$/MWh	\$6.58	\$6.58	\$6.58	\$6.58	\$6.58	\$6.58

Notes:

[1] Battery FOM accounts for routine BESS and PCS maintenance, BOP maintenance, remote monitoring, asset management, performance guarantees, extended warranties, standby/idle aux loads, and an inverter replacement allowance.

[2] Augmentation typically occurs in milestone events, but the total lifetime augmentation estimates are levelized here, intended to account for maintaining rated energy capacity for 20-year life. Augmentation estimates are modeled in fixed and variable components to allow for cycle adjustments in DCR (both components together make up the augmentation estimate).

Appendix B: Preliminary BESS 6-Hour O&M Costs



	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED O&M COSTS						
FIXED O&M COSTS						
Fixed O&M Cost - Assumes LTSA with Integrator/OEM, 2024\$MM/Yr	\$5.4	\$5.4	\$5.4	\$5.4	\$5.4	\$5.4
Capacity Maintenance Agreement (Fixed Portion Levelized), 2024\$MM/Yr	\$2.3	\$2.3	\$2.3	\$2.3	\$2.3	\$2.3
Site Leasing Allowance, 2024\$MM/Yr	\$0.5	\$0.5	\$0.5	\$0.5	\$3.8	\$0.5
Property Insurance Allowance, 2024\$MM/Yr	\$2.5	\$2.5	\$2.5	\$2.6	\$3.1	\$2.6
Total Fixed O&M Cost 2024\$MM/Yr	\$10.6	\$10.6	\$10.6	\$10.7	\$14.5	\$10.8
VARIABLE O&M COSTS (Augmentation Model)						
Capacity Maintenance Agreement (Variable Portion Levelized), 2024 \$/MWh	\$6.40	\$6.40	\$6.40	\$6.40	\$6.40	\$6.40

Notes:

[1] Battery FOM accounts for routine BESS and PCS maintenance, BOP maintenance, remote monitoring, asset management, performance guarantees, extended warranties, standby/idle aux loads, and an inverter replacement allowance.

[2] Augmentation typically occurs in milestone events, but the total lifetime augmentation estimates are levelized here, intended to account for maintaining rated energy capacity for 20-year life. Augmentation estimates are modeled in fixed and variable components to allow for cycle adjustments in DCR (both components together make up the augmentation estimate).

Appendix B: Preliminary BESS 8-Hour O&M Costs



	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED O&M COSTS						
FIXED O&M COSTS						
Fixed O&M Cost - Assumes LTSA with Integrator/OEM, 2024\$MM/Yr	\$6.9	\$6.9	\$6.9	\$6.9	\$6.9	\$6.9
Capacity Maintenance Agreement (Fixed Portion Levelized), 2024\$MM/Yr	\$2.9	\$2.9	\$2.9	\$2.9	\$2.9	\$2.9
Site Leasing Allowance, 2024\$MM/Yr	\$0.6	\$0.6	\$0.6	\$0.6	\$4.7	\$0.6
Property Insurance Allowance, 2024\$MM/Yr	\$3.2	\$3.3	\$3.2	\$3.3	\$4.0	\$3.4
Total Fixed O&M Cost 2024\$MM/Yr	\$13.5	\$13.6	\$13.5	\$13.6	\$18.4	\$13.8
VARIABLE O&M COSTS (Augmentation Model)						
Capacity Maintenance Agreement (Variable Portion Levelized), 2024 \$/MWh	\$6.52	\$6.52	\$6.52	\$6.52	\$6.52	\$6.52

Notes:

[1] Battery FOM accounts for routine BESS and PCS maintenance, BOP maintenance, remote monitoring, asset management, performance guarantees, extended warranties, standby/idle aux loads, and an inverter replacement allowance.

[2] Augmentation typically occurs in milestone events, but the total lifetime augmentation estimates are levelized here, intended to account for maintaining rated energy capacity for 20-year life. Augmentation estimates are modeled in fixed and variable components to allow for cycle adjustments in DCR (both components together make up the augmentation estimate).

Appendix C: 7HA.03 Preliminary Performance



	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
BASE PLANT DESCRIPTION						
Number of Gas Turbines/Engines/Units	1	1	1	1	1	1
Representative Class Gas Turbine	GE HA.03					
Startup Time to Base Load, min (Notes 1)	10	10	10	10	10	10
Startup Time to MECL, min	8	8	8	8	8	8
Cold Startup Time to SCR Compliance, min (Note 2)	45	45	45	45	45	45
Forced Outage Factors (FOF), % (Note 3)	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Assumed Land Use, Acres	15	15	15	15	12	15
Fuel Design	Dual Fuel (Natural Gas and Fuel Oil)					
Inlet Conditioning	Evap Cooling					
Heat Rejection	Fin Fan Heat Exchanger					
NO _x Control	Dry Low NOx on Gas / Water Injection on Fuel Oil SCR Included	Dry Low NOx on Gas / Water Injection on Fuel Oil SCR Included	Dry Low NOx on Gas / Water Injection on Fuel Oil SCR Included	Dry Low NOx on Gas / Water Injection on Fuel Oil SCR Included	Dry Low NOx on Gas / Water Injection on Fuel Oil SCR Included	Dry Low NOx on Gas / Water Injection on Fuel Oil SCR Included
CO Control	CO Catalyst					
Particulate Control	Good Combustion Practice					
Interconnection Voltage, kV	345	345	345	345	345	138
Technology Rating	Mature	Mature	Mature	Mature	Mature	Mature
Permitting & Construction Schedule (Years from FNTF)	3	3	3	3	3	3

Appendix C: 7HA.03 Preliminary Performance



	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED PERFORMANCE (BASED ON NATURAL GAS OPERATION) (Note 4)						
ISO Load Performance						
Net Plant Output, kW	411,400	423,600	420,400	420,400	427,600	423,600
Net Plant Heat Rate, Btu/kWh (HHV)	8,930	8,920	8,920	8,920	8,920	8,920
Heat Input, MMBtu/hr	3,670	3,780	3,750	3,750	3,810	3,780
DMNC ICAP Load Performance						
Net Plant Output, kW	389,000	400,300	397,400	397,400	404,100	404,000
Net Plant Heat Rate, Btu/kWh (HHV)	9,070	9,060	9,070	9,070	9,060	9,060
Heat Input, MMBtu/hr	3,530	3,630	3,600	3,600	3,660	3,660
Summer Base Load Performance						
Net Plant Output, kW	400,200	411,800	408,000	408,000	413,900	417,000
Net Plant Heat Rate, Btu/kWh (HHV)	9,000	9,000	9,000	9,000	9,000	9,000
Heat Input, MMBtu/hr	3,600	3,710	3,670	3,670	3,730	3,750
Summer DMNC Base Load Performance						
Net Plant Output, kW	394,500	406,500	400,900	400,900	404,400	407,100
Net Plant Heat Rate, Btu/kWh (HHV)	9,000	9,000	9,040	9,040	9,060	9,060
Heat Input, MMBtu/hr	3,600	3,700	3,620	3,620	3,660	3,690
Winter Base Load Performance						
Net Plant Output, kW	414,300	429,100	426,900	426,900	434,700	438,100
Net Plant Heat Rate, Btu/kWh (HHV)	8,930	8,870	8,850	8,850	8,830	8,830
Heat Input, MMBtu/hr	3,700	3,810	3,780	3,780	3,840	3,870
Winter DMNC Base Load Performance						
Net Plant Output, kW	419,500	431,700	428,500	428,500	435,000	438,100
Net Plant Heat Rate, Btu/kWh (HHV)	8,800	8,800	8,820	8,820	8,820	8,830
Heat Input, MMBtu/hr	3,700	3,800	3,780	3,780	3,840	3,870
Estimated Startup Fuel Usage, MMBtu						
Start to Base Load, MMBtu	300	300	300	300	300	300

Notes:

[1] Simple cycle start times assume purge credits are available.

[2] The SCR compliance start time assumes a cold start, ending at the time when the catalysts are heated and the stack achieves desired NOx levels.

[3] Outage and availability statistics are collected using the NERC Generating Availability Data System. Simple cycle data is based on North American units that came online in 2013 or later. Reporting period is 2013-2022.

[4] New and clean performance assumed for all scenarios. All performance ratings based on NATURAL GAS operation. Minimum loads are based on OEM information at requested elevation and ambient conditions.

Appendix C: 7HA.02 Preliminary Performance



	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
BASE PLANT DESCRIPTION						
Number of Gas Turbines/Engines/Units	1	1	1	1		
Representative Class Gas Turbine	GE HA.02	GE HA.02	GE HA.02	GE HA.02		
Startup Time to Base Load, min (Notes 1)	10	10	10	10		
Startup Time to MECL, min	8	8	8	8		
Cold Startup Time to SCR Compliance, min (Note 2)	45	45	45	45		
Forced Outage Factors (FOF), % (Note 3)	0	0	0	0		
Assumed Land Use, Acres	15	15	15	15		
Fuel Design	Dual Fuel (Natural Gas and Fuel Oil)					
Inlet Conditioning	Evap Cooling	Evap Cooling	Evap Cooling	Evap Cooling		
Heat Rejection	Fin Fan Heat Exchanger					
NO _x Control	Dry Low NO _x on Gas / Water Injection on Fuel Oil	Dry Low NO _x on Gas / Water Injection on Fuel Oil	Dry Low NO _x on Gas / Water Injection on Fuel Oil	Dry Low NO _x on Gas / Water Injection on Fuel Oil		
CO Control	CO Catalyst	CO Catalyst	CO Catalyst	CO Catalyst		
Particulate Control	Good Combustion Practice	Good Combustion Practice	Good Combustion Practice	Good Combustion Practice		
Interconnection Voltage, kV	345	345	345	345		
Technology Rating	Mature	Mature	Mature	Mature		
Permitting & Construction Schedule (Years from FNTF)	0	0	0	0		

Appendix C: 7HA.02 Preliminary Performance

	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
ESTIMATED PERFORMANCE (BASED ON NATURAL GAS OPERATION) (Note 4)						
ISO Load Performance						
Net Plant Output, kW	342,043	352,362	369,400	369,400		
Net Plant Heat Rate, Btu/kWh (HHV)	9,073	9,063	9,070	9,070		
Heat Input, MMBtu/hr	3,105	3,190	3,350	3,350		
DMNC ICAP Load Performance						
Net Plant Output, kW	321,026	330,682	328,126	328,126		
Net Plant Heat Rate, Btu/kWh (HHV)	9,183	9,173	9,173	9,173		
Heat Input, MMBtu/hr	2,944	3,029	3,011	3,011		
Summer Base Load Performance						
Net Plant Output, kW	330,966	340,717	337,404	337,404		
Net Plant Heat Rate, Btu/kWh (HHV)	9,123	9,123	9,123	9,123		
Heat Input, MMBtu/hr	3,020	3,105	3,077	3,077		
Summer DMNC Base Load Performance						
Net Plant Output, kW	325,665	325,665	325,665	325,665		
Net Plant Heat Rate, Btu/kWh (HHV)	9,153	9,153	9,153	9,153		
Heat Input, MMBtu/hr	2,982	3,067	3,029	3,029		
Winter Base Load Performance						
Net Plant Output, kW	357,001	357,001	357,001	357,001		
Net Plant Heat Rate, Btu/kWh (HHV)	8,993	8,993	8,993	8,993		
Heat Input, MMBtu/hr	3,209	3,209	3,209	3,209		
Winter DMNC Base Load Performance						
Net Plant Output, kW	352,172	363,722	331,250	331,250		
Net Plant Heat Rate, Btu/kWh (HHV)	8,963	8,973	9,153	9,153		
Heat Input, MMBtu/hr	3,153	3,257	3,029	3,029		

Notes:

[1] Simple cycle start times assume purge credits are available.

[2] The SCR compliance start time assumes a cold start, ending at the time when the catalysts are heated and the stack achieves desired NOx levels.

[3] Outage and availability statistics are collected using the NERC Generating Availability Data System. Simple cycle data is based on North American units that came online in 2013 or later. Reporting period is 2013-2022.

[4] New and clean performance assumed for all scenarios. All performance ratings based on NATURAL GAS operation. Minimum loads are based on OEM information at requested elevation and ambient conditions.

Appendix C: Preliminary BESS 4-Hour Performance

	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
BASE PLANT DESCRIPTION						
Nominal Output, MW	200	200	200	200	200	200
Nominal Duration, hr	4	4	4	4	4	4
Assumed Useful Life (years)	20	20	20	20	20	20
Equivalent Availability Factor (%)	98%	98%	98%	98%	98%	98%
Assumed Land Use During Operation, Acres (Not Construction Land Use)	14	14	14	14	9	12
Annual System Cycles	365	365	365	365	365	365
Storage System Initial Overbuild (Years)	4	4	4	4	4	4
Storage System AC Roundtrip Efficiency (%)	85%	85%	85%	85%	85%	85%
Interconnection Voltage, kV	345	345	345	345	345	138
Technology Rating	Mature	Mature	Mature	Mature	Mature	Mature
EPC Schedule (Years from NTP)	2.75	2.75	2.75	2.75	2.75	2.75
ESTIMATED PERFORMANCE						
BESS Performance						
Net Plant Output, kW	200,000	200,000	200,000	200,000	200,000	200,000
Discharge Duration,hr	4	4	4	4	4	4
Net Plant Energy Capacity, kWh	800,000	800,000	800,000	800,000	800,000	800,000
Energy Capacity Installed with Overbuild, kWh AC at POI	903,000	903,000	903,000	903,000	903,000	903,000

Notes:

[1] Availability and outage rate assumptions are based on vendor correspondence and industry publications.

Appendix C: Preliminary BESS 6-Hour Performance

	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
BASE PLANT DESCRIPTION						
Nominal Output, MW	200	200	200	200	200	200
Nominal Duration, hr	6	6	6	6	6	6
Assumed Useful Life (years)	20	20	20	20	20	20
Equivalent Availability Factor (%)	98%	98%	98%	98%	98%	98%
Assumed Land Use During Operation, Acres (Not Construction Land Use)	18	18	18	18	12	16
Annual System Cycles	365	365	365	365	365	365
Storage System Initial Overbuild (Years)	4	4	4	4	4	4
Storage System AC Roundtrip Efficiency (%)	85%	85%	85%	85%	85%	85%
Interconnection Voltage, kV	345	345	345	345	345	138
Technology Rating	Mature	Mature	Mature	Mature	Mature	Mature
EPC Schedule (Years from NTP)	3.00	3.00	3.00	3.00	3.00	3.00
ESTIMATED PERFORMANCE						
BESS Performance						
Net Plant Output, kW	200,000	200,000	200,000	200,000	200,000	200,000
Discharge Duration,hr	6	6	6	6	6	6
Net Plant Energy Capacity, kWh	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Energy Capacity Installed with Overbuild, kWh AC at POI	1,354,500	1,354,500	1,354,500	1,354,500	1,354,500	1,354,500

Notes:

[1] Availability and outage rate assumptions are based on vendor correspondence and industry publications.

Appendix C: Preliminary BESS 8-Hour Performance

	Load Zone C: Central	Load Zone F: Capital	Load Zone G: Dutchess	Load Zone G: Rockland	Load Zone J: New York City	Load Zone K: Long Island
BASE PLANT DESCRIPTION						
Nominal Output, MW	200	200	200	200	200	200
Nominal Duration, hr	8	8	8	8	8	8
Assumed Useful Life (years)	20	20	20	20	20	20
Equivalent Availability Factor (%)	98%	98%	98%	98%	98%	98%
Assumed Land Use During Operation, Acres (Not Construction Land Use)	22	22	22	22	15	20
Annual System Cycles	365	365	365	365	365	365
Storage System Initial Overbuild (Years)	4	4	4	4	4	4
Storage System AC Roundtrip Efficiency (%)	85%	85%	85%	85%	85%	85%
Interconnection Voltage, kV	345	345	345	345	345	138
Technology Rating	Mature	Mature	Mature	Mature	Mature	Mature
EPC Schedule (Years from NTP)	3.25	3.25	3.25	3.25	3.25	3.25
ESTIMATED PERFORMANCE						
BESS Performance						
Net Plant Output, kW	200,000	200,000	200,000	200,000	200,000	200,000
Discharge Duration,hr	8	8	8	8	8	8
Net Plant Energy Capacity, kWh	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000
Energy Capacity Installed with Overbuild, kWh AC at POI	1,806,000	1,806,000	1,806,000	1,806,000	1,806,000	1,806,000

Notes:

[1] Availability and outage rate assumptions are based on vendor correspondence and industry publications.