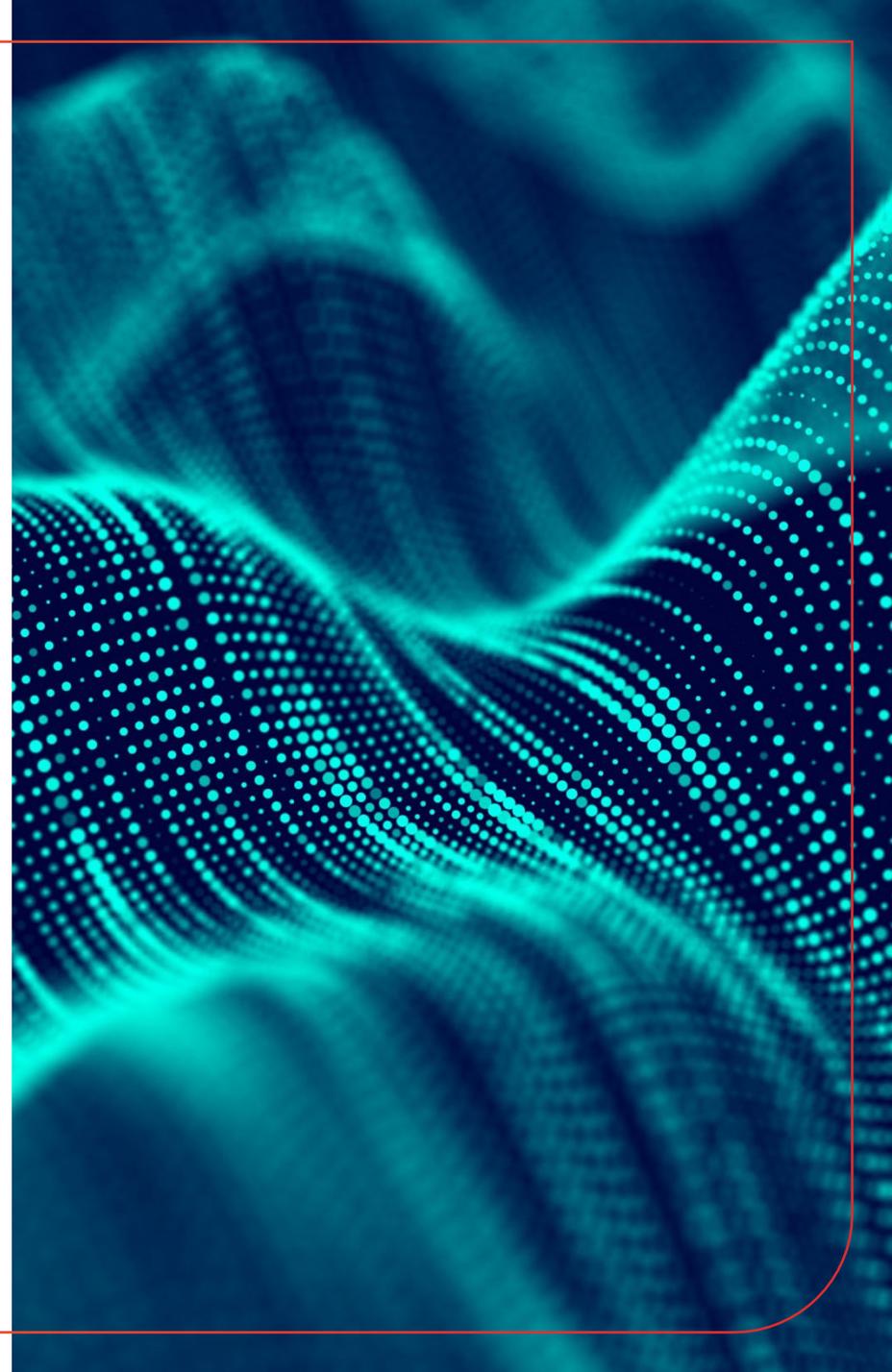


# NYISO 2025-2029 ICAP Demand Curve Reset (DCR)



ICAP Working Group Meeting

March 25, 2024



# Agenda



## Gross CONE Analysis

Technologies Evaluated

Preliminary Results

## Basis of Estimates

Market Drivers

Environmental Review

Scope Assumptions

Cost Estimate Methodology

## Appendix - Detailed Preliminary Results

# Gross CONE Analysis

# Technologies Evaluated



- H/J-class Simple Cycle Gas Turbine (“SCGT”)
  - Represented by GE 7HA.03
- 200 MW Battery Energy Storage System (“BESS”)
  - 4-hour Lithium-Ion BESS
  - 6-hour Lithium-Ion BESS
  - 8-hour Lithium-Ion BESS

# Preliminary Results: Overview

# Preliminary SCGT Results: Overview

## Capital Expenses

	Zone C	Zone J
EPC Cost	\$449.5 mil	\$550.9 mil
Owner's Cost	\$147.7 mil	\$170.7 mil
Financing Costs *	\$38.5 mil	\$46.7 mil
<b>Total Cost</b>	<b>\$635.7 mil</b>	<b>\$768.1 mil</b>
EPC Cost (\$/kW)	\$1,093/kW	\$1,288/kW
Total Cost (\$/kW)	\$1,545/kW	\$1,796/kW

\*Financing Costs are a placeholder assumption, subject to change | Values shown in 2024 dollars

## Operating Expenses

	Zone C	Zone J
Fixed O&M	\$5.80 mil/yr	\$10.61 mil/yr
Major Maintenance	\$1.58/MWh	\$1.52/MWh
Variable O&M	\$1.45/MWh	\$1.54/MWh

Gas Operation Only with LTSA | Values shown in 2024 dollars

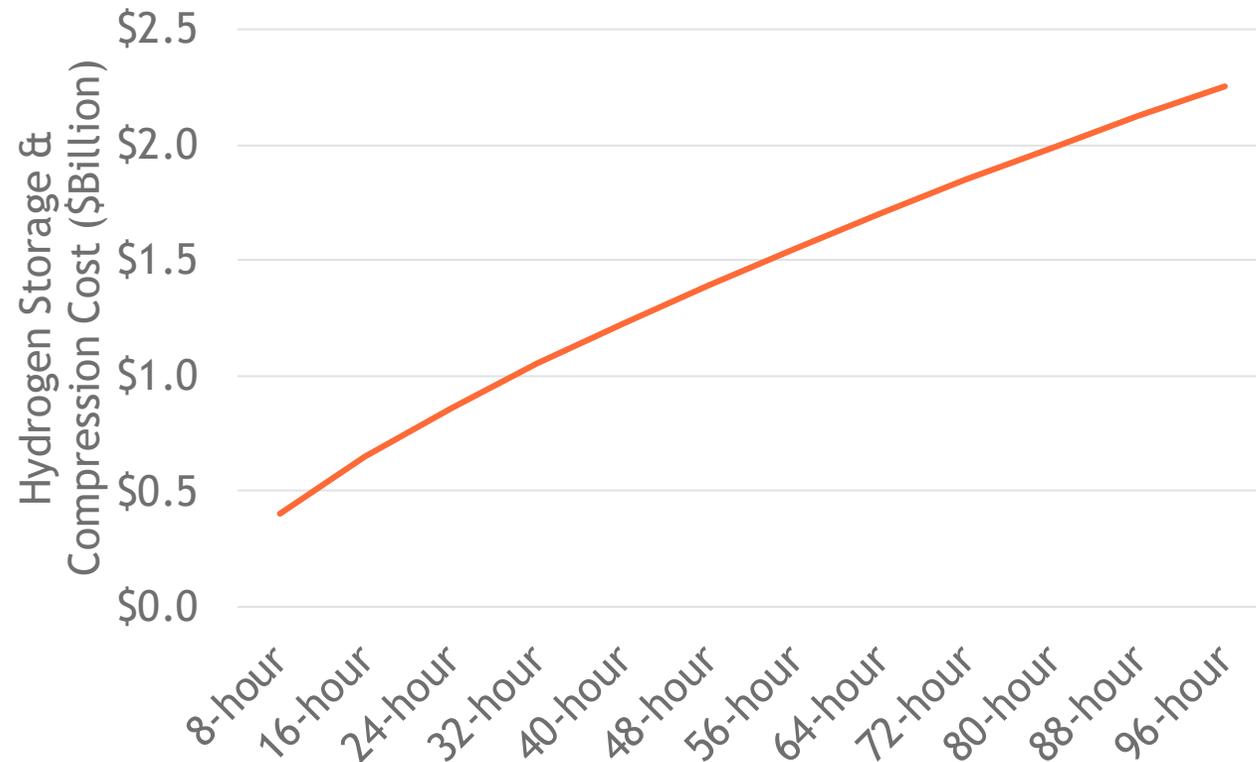
## Performances

	Zone C	Zone J
Net Output	411.4 MW	427.6 MW
Net Heat Rate	8,930 Btu/kWh	8,920 Btu/kWh
Heat Input	3,670 MMBtu/hr	3,810 MMBtu/hr

@ISO Conditions: 59°F, 60% Rel. Humidity

# Preliminary SCGT Results (Future CLCPA Compliance)

- Future Hydrogen Combustion Upgrade
  - Approximately \$35 million in 2024 dollars
- Hydrogen Storage and Compression



# Preliminary BESS Results: Overview (200 MW/4-hour)

## Capital Expenses

	Zone C	Zone J
EPC Cost	\$314 mil	\$361 mil
Owner's Cost	\$70 mil	\$112 mil
Financing Costs *	\$23 mil	\$28 mil
<b>Total</b>	<b>\$407 mil</b>	<b>\$501 mil</b>
EPC (\$/kWh)	\$348	\$400
Total (\$/kWh)	\$450	\$555

\* Financing Costs are a placeholder assumption, subject to change | Values shown in 2024 USD. \$/kWh based on kWh AC at POI, including overbuild

## Operating Expenses

	Zone C	Zone J
Fixed O&M	\$7.7 mil/year	\$10.4 mil/year
Variable O&M	\$6.58/MWh	\$6.58/MWh

Values shown in 2024 USD | FOM includes LTSA, Fixed portion of augmentation estimate, site leasing allowance, and property insurance. VOM includes variable portion of augmentation.

## Performance

	Zone C	Zone J
Rated Power	200 MW	200 MW
Rated Energy	800 MWh	800 MWh
RTE (%)	85%	85%
Response Time	< 10 Seconds	< 10 Seconds

# BESS Unit Cost Discussion

- Table values represent the same facility and cost but demonstrate how various reported capacity values can impact \$/kWh values.
- There is no industry standard for how \$/kWh is reported.
- 1898 & Co. unit cost values are based on the alternating current (AC) capacity at the point of interconnection (POI), including overbuild.

Example: Load Zone C			
\$/kWh Denominator	EPC Estimate	Energy Capacity (kWh)	Unit Price (\$/kWh)
Rated Nominal at POI	\$314,000,000	800,000	\$393
Overbuild at POI	\$314,000,000	903,000	\$348
Total AC Installed	\$314,000,000	960,000	\$327
Total DC Installed	\$314,000,000	1,000,000	\$314

Note: Table values for AC installed and DC installed are approximate



# Market Overview

# General Market Drivers



- Skilled labor shortages
  - Higher wages
  - Additional incentives
  - Reduced productivity
- Equipment pricing and lead times
  - Large frame gas turbines: 36-month lead times
  - Generator step-up (GSU) transformer: 24-36-month lead times
  - High voltage (HV) breakers: 24-60-month lead times
  - BESS equipment: 9-15 month lead times
- Commodity and material pricing
  - Electrical: 70-100% increase since last DCR
  - Piping: 30-40% increase since last DCR
  - Concrete: 30% increase since last DCR
- Contractor Market Risk
  - Increased contingency and fee
- Permitting schedules

# BESS Specific Market Drivers



- Change is constant in the stationary storage industry.
- Modular form factors are prevalent, but original equipment manufacturer (OEM) products are continually evolving.
- Lithium-iron phosphate (LFP) increasing market share in stationary storage applications.
- BESS product pricing generally follows major swings in lithium raw material pricing.
  - Stationary storage product pricing increased from 2021 - 2023.
  - Trending downward since approximately Q3 2023.
- Inflation Reduction Act (IRA) / Investment Tax Credit (ITC) leading to increasing project development activity.

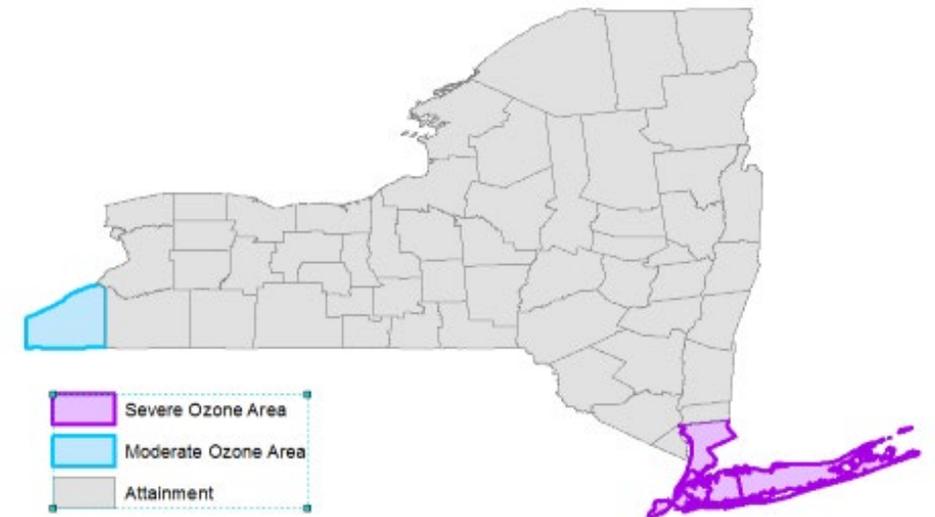


# Environmental Review

# Environmental Review

- Reviewed criteria pollutants to assess required emissions controls
- New Source Performance Standard (“NSPS”)
  - Subpart KKKK
    - NO<sub>x</sub> ppm limits
    - Applicable to new stationary combustion turbines
    - Heat Input > 850 MMBtu/hr, NO<sub>x</sub> limited to 15 ppm on gas
    - NO<sub>x</sub> limited to 42 ppm on fuel oil
- Attainment vs. Non-Attainment
  - Zones J and K are in Non-Attainment for ozone
    - Subject to Lowest Achievable Emissions Rate (“LAER”)
    - SCR and Oxidation Catalyst would be required
  - All other Zones are in Attainment
- NY part of Ozone Transport Region (“OTR”)
  - Applies to Attainment areas
  - Limits NO<sub>x</sub> thresholds to less than 100 tons per year

## Non-Attainment Areas in NY



# Selective Catalytic Reduction (SCR) Emissions Control Technology Assessment

- Load Zones J and K are in non-attainment and will require SCR emissions control technology and oxidation catalyst to comply with LAER
- Load Zones C, F, and G evaluated both a 7HA.03 with SCR emissions control technology and a 7HA.02 designed for a 15 ppm NOx emissions limit.
  - 7HA.03 is not offered with 15 ppm NOx operating design limit
  - 7HA.02 designed for 15 ppm NOx offers marginally lower \$/kW value but with severely limited ability to permit

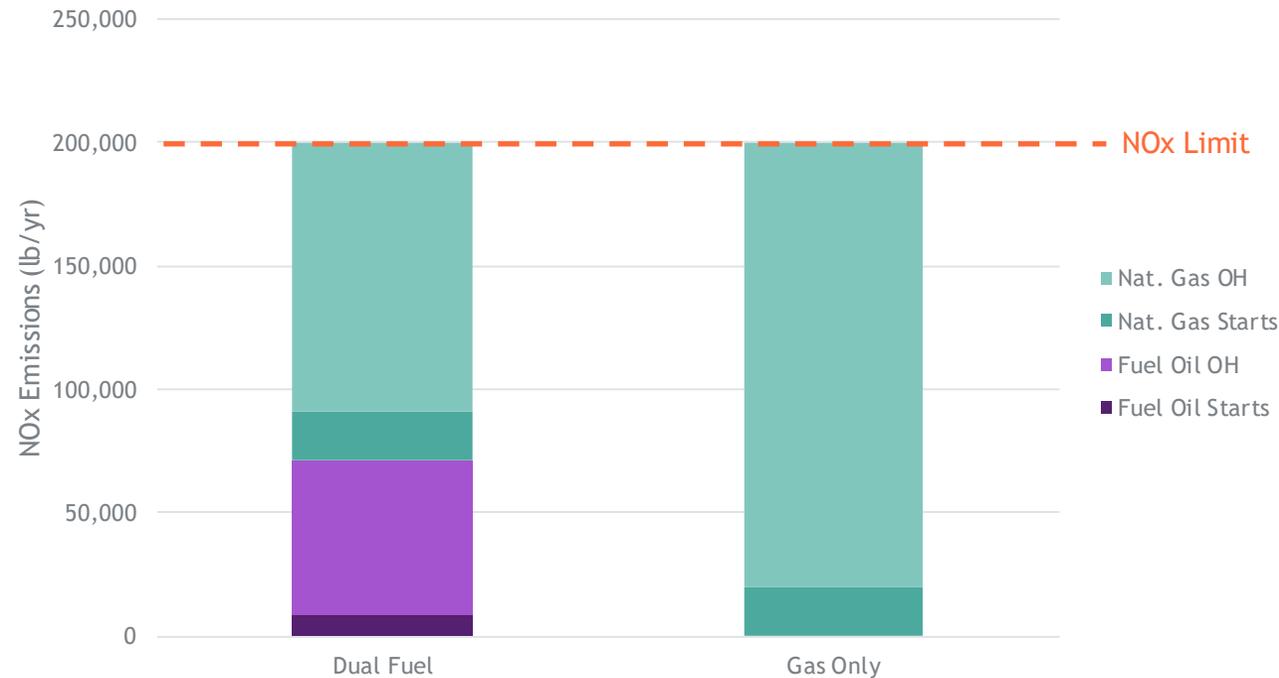
Maximum Permittable Operation (no SCR)	
Fuel Oil Run Hours	108
Fuel Oil Starts	13
Natural Gas Starts	100
Natural Gas Run Hours	640
Capacity Factor	7%

Estimated Operation in Each Load Zone (w/ SCR)

Load Zone	Annual Average	Annual Maximum	Total Starts	Oil Run Hours
C	20.7%	27.6%	122	0
F	27.2%	35.0%	161	40
G - Dutchess	15.6%	25.6%	130	27
G - Rockland	31.9%	35.0%	107	0
J	31.7%	35.0%	138	13
K	35.0%	35.0%	167	45

# SCR Emissions Control Technology Assessment (cont.)

- Recommendation is to evaluate the 7HA.03 with SCR emissions control technology for all locations
  - Operational limitations that would be required to permit the 7HA.02 without SCR emissions control technology do not appear sufficient to support the expected level of operations for such a peaking plant.



# Scope Assumptions

**\*\*Note: Orange text throughout this section represents an assumption change from the 2021-2025 DCR\*\***

# Scope Boundaries - SCGT

- Generic site
  - Excludes removal of hazardous materials in all locations. Excludes demolition except in Load Zone J.
  - Load Zone J estimates include a nominal allowance for demolition of existing facilities and a storm hardening cost allowance to accommodate flood plain zoning requirements
- Inside the fence
  - Gas Turbine (“GT”), required emissions controls (including SCR emissions control technology), and GSU transformer procured by the facility owner.
  - Electrical scope up to the high-side of the GSU transformer.
  - Raw water wells for all locations except Load Zone J. New York City supplied water assumed for Load Zone J.
  - Wastewater delivered to site boundary. No treatment included.
  - Pipeline quality natural gas supplied at site boundary. Gas compressors included to raise gas pressure from 250 psig up to gas turbine requirements.
- Outside the fence
  - Switchyard and transmission interconnection
  - Any applicable System Deliverability Upgrade (“SDU”) costs will be determined based on NYISO’s deliverability analysis for the 2025-2029 DCR (based on tariff-prescribed level of excess conditions)
  - Water supply pipeline for Load Zone J
  - Natural gas pipeline (lateral, metering, and pressure regulation and conditioning)

# SCGT Scope Assumptions



	Load Zone C - Central	Load Zone F - Capital	Load Zone G - Dutchess	Load Zone G - Rockland	Load Zone J - NYC	Load Zone K - Long Island
Fuel Capability †	Dual Fuel					
GT Combustion NOx Controls	Gas: Dry Low NOx Combustors					
	Fuel Oil: Water Injection					
Post Combustion Controls	SCR	SCR	SCR	SCR	SCR	SCR

# SCGT Scope Assumptions (cont.)

- **SCR emissions controls technology and oxidation catalyst**
  - Air dilution fan with additional duct work to allow for sufficient mixing
  - 19% aqueous ammonia
- **Dual Fuel**
  - Natural gas and ultra-low sulfur diesel (“ULSD”)
  - 96 hours of storage (4 days round-the-clock or on peak [16 hours per day] for 6 days)
- Piling included under GT, SCR emissions controls, stack, and tanks.
- Standard gas turbine package
  - Installed indoors for noise mitigation
  - Evaporative coolers
- Administrative building with control room and attached warehouse/shop
- Combined raw water / fire water tank

# SCGT Scope Assumptions (Future CLCPA Compliance Alternative)

- Future Hydrogen Combustion Upgrade
  - Fuel piping to be replaced with stainless welded piping.
  - GT combustor hardware to be replaced. Assume no changes to compressor, transition pieces and turbine section hardware.
  - GT controls are retuned.
  - GT flame detection and gas detection instrumentation is replaced.
- Hydrogen Supply
  - Method of hydrogen delivery to site is unknown. Assumed delivery could be intermittent and require onsite storage.
    - Outside the plant boundary line (OSBL) pipeline costs are not included.
    - Hydrogen compression included for onsite storage

# BESS Scope Boundaries



- Generic Site Conditions
  - Excludes removal of hazardous materials in all Load Zones.
  - Demolition of existing facilities is excluded in all locations, except Load Zone J.
  - Load Zone J estimates include a nominal allowance for demolition of existing facilities and a storm hardening cost allowance to accommodate flood plain zoning requirements.
- Inside the Fence
  - Includes major equipment and materials necessary for facility.
  - Electrical scope up to the high side of the main power transformer (MPT).
  - Assumes Engineering, Procurement, and Construction (“EPC”) contract for project execution.
- Outside the Fence
  - Switchyard and transmission interconnection
  - Any applicable SDU costs will be determined based on NYISO’s deliverability analysis for the 2025-2029 DCR (based on tariff-prescribed level of excess conditions).

# Lithium-ion BESS Equipment Assumptions

- BESS Equipment
  - Form factor: integrated, modular, purpose-built enclosure with battery modules installed at factory. Single elevation, not stacked.
  - Integrated heating, ventilation and air conditioning (HVAC), battery management system (BMS), smoke/fire detection
  - Capital cost assumes BESS system is listed in accordance with UL standard 9540.
  - Cost used in Load Zone J estimate is intended to be representative of market for TM-2 listed equipment.
- Power conversion system (PCS) equipment
  - Inverter changes power between direct current (DC) to AC.
  - Medium voltage (MV) transformer steps voltage to 34.5 kV.
- Energy management system (EMS) for site level controls
- All equipment costs used in the estimates are intended to be representative of the current market. They do not represent a specific OEM or technology.

# BESS Balance of Plant (BOP) Scope Assumptions



- Project Substation
  - Medium voltage (MV) collection equipment oversized to accommodate future augmentation.
  - Main Power Transformer (MPT) for step up to assumed transmission voltage.
- Civil Scope
  - Site preparation and grading.
  - All locations except Load Zone J: Crushed rock site with paved entrance and loop road.
  - Load Zone J
    - Includes raising site 4 feet for storm hardening.
    - Site is paved throughout.
- Structural Scope
  - Helical piles for BESS and PCS
  - Slab foundation with oil containment for MPT

# BESS BOP Scope Assumptions (cont.)



- Fire Protection
  - Hydrant loop in all locations. Assumes municipal water available at fence line.
  - Assumes no external water suppression or flame detection for all locations except Load Zone J.
  - Load Zone J includes external flame detection, external water suppression, addressable fire panel.
- Accommodation for Augmentation
  - MV side of project substation includes breakers for future MV homerun cables.
  - Acreage estimates intended to include space for future augmentation.
- All locations include nominal allowance for sound walls.

# BESS Sizing Assumptions

- BESS Sizing Requirements
  - POI is interconnecting switchyard
  - Required at POI: 200 MW for rated duration (e.g., 800 MWh for 4-hour)
- Sizing Considerations / Assumptions
  - Electrical losses to POI
  - Equipment efficiencies
  - Auxiliary power requirements
  - Degradation during shipment/construction
- Overbuild
  - **Accounts for 4 years of degradation in initial installation**
  - Augmentation costs are included in operations and maintenance (O&M) estimates

Energy Capacity (MWh AC at POI)			
	4 Hour	6 Hour	8 Hour
Rated Nominal	800	1,200	1,600
Total Installed	903	1,355	1,806

# Capital Cost Methodology

**\*\*Note: Orange text throughout this section represents an assumption change from the 2021-2025 DCR\*\***

# Capital Cost Methodology



- EPC contract methodology
- All costs shown in 2024\$
- Single base estimate with adjustments for each location. Adjustments by location include:
  - Labor rates (based on RS Means)
  - Productivity factors
  - Scope adjustments
- EPC Direct Cost
  - Equipment, labor, construction materials, subcontracts
  - **BESS labor costs intended to accommodate prevailing wage and apprenticeship requirements for 30% investment tax credit.**
- EPC Indirect Cost
  - Construction management, engineering, startup, and warranty
- EPC Overheads, Contingency, and Fee

# Capital Cost Methodology



- Owner's Cost (Development Costs)
  - Generation Project Development Support
  - Owner's Project Management
  - Owner's Engineer
  - Owner's Legal Cost
  - Permitting Support
  - Public Outreach & Area Development Fees
- Development and permitting costs for laterals are included in respective OSBL line items.

# Capital Cost Methodology



- Owner's Cost (OSBL Infrastructure)
  - Transmission Interconnection
    - Switchyard
      - 3 position ring bus
      - Gas Insulated Substation (GIS) for Load Zone J. Air insulated substation for all other Zones.
    - Transmission
      - 1-mile underground transmission line in Load Zone J.
      - 3-mile overhead transmission line for all other Load Zones.
      - 138 kV for Load Zone K. 345 kV for all other Load Zones.
    - System Deliverability Upgrade Cost: TBD based on NYISO deliverability study results for the 2025-2029 DCR
  - Natural Gas Interconnection
    - 1-mile pipeline lateral for Load Zone J. 3-mile pipeline lateral for all other locations.
  - Water Supply Infrastructure
    - 1 mile of 8in water line in Load Zone J. All other locations do not include OSBL scope for water.

# Capital Cost Methodology



- Owner's Cost (Other)
  - Temporary utilities during construction
  - Owner's operational personnel prior to commercial operations date (COD) (i.e., training / operations integration)
  - Initial fuel oil inventory: 2.5 million gallons of ULSD (96 hours of operation equivalent)
  - Site security during construction
  - Startup fuel and consumables
  - Operating spare parts
  - Builder's risk insurance
  - Owner's contingency: 5%

# O&M Cost Methodology

**\*\*Note: Orange text throughout this section represents an assumption change from the 2021-2025 DCR\*\***

# SCGT O&M Methodology

- Fixed O&M
  - Labor: 7 full-time equivalents (FTEs)
    - Burdened labor rates vary for each location
      - High: \$275k for Load Zone J
      - Low: \$160k for Load Zone C
  - Other Fixed O&M
    - Office, administration, training, environmental testing, safety equipment, tools, and standby energy.
    - Site leasing and property insurance allowance.
- Variable O&M
  - Water supply and treatment, consumables (ammonia), and routine maintenance.
- Major Maintenance
  - Assumes long term service agreement (LTSA) with OEM (Levelized Hot Gas Path and Major Inspections)
  - SCR catalyst replacement (levelized over 10 years)

# BESS O&M Methodology



- Fixed O&M
  - General Fixed O&M, \$/year
    - Assumes LTSA with BESS supplier (intended to account for maintenance, performance guarantees, and extended equipment warranties).
    - BOP Routine Maintenance (**includes allowance for inverter replacements**).
    - Asset management allowance
    - **Standby auxiliary loads (charge/discharge aux loads included in round trip efficiency [RTE] assumption used in assessing net energy and ancillary services [EAS] revenue)**
  - Augmentation: fixed component, levelized
  - Property Insurance Allowance
  - Site Leasing Allowance
- Variable O&M, \$/MWh
  - Augmentation: variable component, levelized.
  - Account for cycle adjustments in net EAS model.

# 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

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

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

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

# Salvage Value

# SCGT Salvage Value



- Since the fossil fuel fired SCGT unit (without an assumed conversion to future zero-emission operations) is amortized over 13 years and assumed to cease operating in 2040 to comply with CLCPA zero-emissions energy requirements, the gas turbine may have some remaining useful life.
  - Certain stakeholders requested consideration of potential salvage value given these assumptions
- Grey market equipment pricing is highly volatile and dependent on a number of factors.
  - Asset age, operating hours/starts, condition, time since last major maintenance activity, combustor technology compared to latest technology, gas turbine market, etc.
  - Impossible to project a grey market value in 2040 at this time
- Additional considerations that could reduce salvage value:
  - Facility decommissioning cost
  - Gas turbine equipment disassembly and transportation
- Due to the high level of price uncertainty and anticipated relatively small net value, salvage value has not been included in the preliminary cost estimates for the fossil fuel fired SCGT unit option.

**1898**   
**CO**®

PART OF **BURNS**  **MCDONNELL**

# 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
<b>ESTIMATED CAPITAL AND O&amp;M COSTS (Note 1)</b>						
<b>EPC Project Capital Costs, 2024 MM\$ (w/o Owner's Costs)</b>						
Labor	\$77	\$84	\$86	\$111	\$154	\$144
Materials	\$58	\$58	\$58	\$58	\$60	\$58
Turbine or Batteries	\$154	\$154	\$154	\$154	\$154	\$154
Other	\$161	\$164	\$164	\$172	\$184	\$182
<b>EPC Project Capital Cost Subtotal, 2024 MM\$</b>	<b>\$450</b>	<b>\$459</b>	<b>\$462</b>	<b>\$495</b>	<b>\$551</b>	<b>\$537</b>
<b>Owner's Costs, 2024 MM\$</b>						
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
Sales Tax	\$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 & 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	\$29	\$29	\$30	\$34	\$32
<b>Owner's Cost Allowance Subtotal, 2024 MM\$</b>	<b>\$148</b>	<b>\$148</b>	<b>\$142</b>	<b>\$143</b>	<b>\$171</b>	<b>\$137</b>
AFUDC as a Percentage of Capital Costs (%) [2]	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%
<b>AFUDC, 2024 MM\$ [2]</b>						
EPC Portion	\$31	\$31	\$31	\$34	\$37	\$37
Non-EPC Portion	\$8	\$8	\$8	\$8	\$9	\$7
* <b>AFUDC Subtotal, 2024 MM\$</b>	<b>\$39</b>	<b>\$39</b>	<b>\$39</b>	<b>\$41</b>	<b>\$47</b>	<b>\$43</b>
<b>Total Project Costs, 2024 MM\$</b>	<b>\$636</b>	<b>\$646</b>	<b>\$642</b>	<b>\$679</b>	<b>\$768</b>	<b>\$718</b>

Notes:

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

\* [2] Placeholder. Subject to change.

# 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
<b>ESTIMATED CAPITAL COSTS</b>						
<b>EPC Project Capital Costs, 2024 MM\$ (w/o Owner's Costs)</b>	<b>\$314</b>	<b>\$315</b>	<b>\$314</b>	<b>\$320</b>	<b>\$361</b>	<b>\$324</b>
<b>Owner's Costs, 2024 MM\$</b>						
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	\$0.8	\$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)	\$1.4	\$1.4	\$1.4	\$1.4	\$1.6	\$1.5
Owner's Contingency (5% for Screening Purposes)	\$18.3	\$18.4	\$18.3	\$18.6	\$22.5	\$18.4
<b>Owner's Cost Allowance Subtotal, 2024 MM\$</b>	<b>\$70</b>	<b>\$70</b>	<b>\$70</b>	<b>\$70</b>	<b>\$112</b>	<b>\$62</b>
<b>AFUDC, 2024 MM\$ PLACEHOLDER. WILL BE UPDATED.</b>						
EPC Portion	\$18.8	\$18.8	\$18.8	\$19.1	\$21.6	\$19.4
Non-EPC Portion	\$4.2	\$4.2	\$4.2	\$4.2	\$6.7	\$3.7
<b>AFUDC Subtotal, 2024 MM\$</b>	<b>\$23</b>	<b>\$23</b>	<b>\$23</b>	<b>\$23</b>	<b>\$28</b>	<b>\$23</b>
<b>Total Project Costs, 2024 MM\$</b>	<b>\$407</b>	<b>\$408</b>	<b>\$407</b>	<b>\$413</b>	<b>\$501</b>	<b>\$409</b>

**Notes:**

[1] EPC electrical scope ends at the high side of the GSU. 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, and 4 years of overbuild.

[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
<b>ESTIMATED CAPITAL COSTS</b>						
<b>EPC Project Capital Costs, 2024 MM\$ (w/o Owner's Costs)</b>	<b>\$451</b>	<b>\$452</b>	<b>\$451</b>	<b>\$459</b>	<b>\$512</b>	<b>\$465</b>
<b>Owner's Costs, 2024 MM\$</b>						
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	\$0.8	\$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)	\$2.0	\$2.0	\$2.0	\$2.1	\$2.3	\$2.1
Owner's Contingency (5% for Screening Purposes)	\$25.2	\$25.3	\$25.2	\$25.6	\$30.1	\$25.5
<b>Owner's Cost Allowance Subtotal, 2024 MM\$</b>	<b>\$78</b>	<b>\$79</b>	<b>\$78</b>	<b>\$79</b>	<b>\$121</b>	<b>\$71</b>
<b>AFUDC, 2024 MM\$ PLACEHOLDER. WILL BE UPDATED.</b>						
EPC Portion	\$27.0	\$27.0	\$27.0	\$27.4	\$30.6	\$27.8
Non-EPC Portion	\$4.7	\$4.7	\$4.7	\$4.7	\$7.2	\$4.2
<b>AFUDC Subtotal, 2024 MM\$</b>	<b>\$32</b>	<b>\$32</b>	<b>\$32</b>	<b>\$32</b>	<b>\$38</b>	<b>\$32</b>
<b>Total Project Costs, 2024 MM\$</b>	<b>\$561</b>	<b>\$563</b>	<b>\$561</b>	<b>\$570</b>	<b>\$671</b>	<b>\$568</b>

**Notes:**

[1] EPC electrical scope ends at the high side of the GSU. 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, and 4 years of overbuild.

[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
<b>ESTIMATED CAPITAL COSTS</b>						
<b>EPC Project Capital Costs, 2024 MM\$ (w/o Owner's Costs)</b>	<b>\$585</b>	<b>\$588</b>	<b>\$586</b>	<b>\$596</b>	<b>\$664</b>	<b>\$604</b>
<b>Owner's Costs, 2024 MMS</b>						
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	\$0.7	\$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	\$0.8	\$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)	\$2.6	\$2.6	\$2.6	\$2.7	\$3.0	\$2.7
Owner's Contingency (5% for Screening Purposes)	\$32.0	\$32.1	\$32.0	\$32.5	\$37.8	\$32.5
<b>Owner's Cost Allowance Subtotal, 2024 MM\$</b>	<b>\$87</b>	<b>\$87</b>	<b>\$87</b>	<b>\$87</b>	<b>\$131</b>	<b>\$79</b>
<b>AFUDC, 2024 MM\$ PLACEHOLDER. WILL BE UPDATED.</b>						
EPC Portion	\$35.0	\$35.2	\$35.0	\$35.6	\$39.7	\$36.1
Non-EPC Portion	\$5.2	\$5.2	\$5.2	\$5.2	\$7.8	\$4.7
<b>AFUDC Subtotal, 2024 MM\$</b>	<b>\$40</b>	<b>\$40</b>	<b>\$40</b>	<b>\$41</b>	<b>\$48</b>	<b>\$41</b>
<b>Total Project Costs, 2024 MM\$</b>	<b>\$712</b>	<b>\$715</b>	<b>\$713</b>	<b>\$724</b>	<b>\$843</b>	<b>\$724</b>

**Notes:**

[1] EPC electrical scope ends at the high side of the GSU. 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, and 4 years of overbuild.

[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
<b>ESTIMATED O&amp;M COSTS (Note 1)</b>						
<b>FIXED O&amp;M COSTS, 2024 MM\$ (Note 1)</b>						
Fixed O&M Cost - Labor	\$1.1	\$1.2	\$1.4	\$1.8	\$1.9	\$1.9
Fixed O&M Cost - Other	\$1.6	\$1.6	\$1.6	\$1.6	\$1.6	\$1.6
Property Insurance Allowance	\$2.7	\$2.8	\$2.8	\$3.0	\$3.3	\$3.2
Site Leasing Allowance	\$0.4	\$0.4	\$0.4	\$0.4	\$3.8	\$0.5
<b>Total Fixed O&amp;M Cost 2024 MM\$/Yr</b>	<b>\$5.8</b>	<b>\$6.0</b>	<b>\$6.2</b>	<b>\$6.8</b>	<b>\$10.6</b>	<b>\$7.2</b>
<b>Total Fixed O&amp;M Cost 2024\$/kW-Yr</b>	<b>\$14.50</b>	<b>\$14.48</b>	<b>\$15.20</b>	<b>\$16.58</b>	<b>\$25.63</b>	<b>\$17.71</b>
<b>LEVELIZED CAPITAL MAINTENANCE COSTS (Note 2)</b>						
Major Maintenance Cost, 2024\$/GT-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
<b>NON-FUEL VARIABLE O&amp;M COSTS (EXCLUDES MAJOR MAINTENANCE) - GAS OPERATION, 2024\$/MWh (Note 3)</b>						
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
<b>Total Variable O&amp;M - Gas Operation, 2024\$/MWh</b>	<b>\$1.45</b>	<b>\$1.45</b>	<b>\$1.45</b>	<b>\$1.45</b>	<b>\$1.54</b>	<b>\$1.50</b>
<b>NON-FUEL VARIABLE O&amp;M COSTS (EXCLUDES MAJOR MAINTENANCE) - FUEL OIL OPERATION, 2024\$/MWh (Note 3)</b>						
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
<b>Total Variable O&amp;M - Fuel Oil Operation, 2024\$/MWh</b>	<b>\$8.75</b>	<b>\$8.55</b>	<b>\$8.59</b>	<b>\$8.59</b>	<b>\$8.73</b>	<b>\$8.49</b>

**Notes**

[1] All gas turbine FOM costs assume 7 full time personnel for first unit.

[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
<b>ESTIMATED O&amp;M COSTS</b>						
<b>FIXED O&amp;M COSTS</b>						
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	\$1.9	\$1.9	\$1.9	\$1.9	\$2.2	\$1.9
<b>Total Fixed O&amp;M Cost 2024\$MM/Yr</b>	<b>\$7.7</b>	<b>\$7.7</b>	<b>\$7.7</b>	<b>\$7.7</b>	<b>\$10.4</b>	<b>\$7.7</b>
<b>VARIABLE O&amp;M COSTS (Augmentation Model)</b>						
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: BESS 6-Hour Preliminary 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
<b>ESTIMATED O&amp;M COSTS</b>						
<b>FIXED O&amp;M COSTS</b>						
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	\$2.7	\$2.7	\$2.7	\$2.8	\$3.1	\$2.8
<b>Total Fixed O&amp;M Cost 2024\$MM/Yr</b>	<b>\$10.8</b>	<b>\$10.8</b>	<b>\$10.8</b>	<b>\$10.9</b>	<b>\$14.5</b>	<b>\$10.9</b>
<b>VARIABLE O&amp;M COSTS (Augmentation Model)</b>						
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
<b>ESTIMATED O&amp;M COSTS</b>						
<b>FIXED O&amp;M COSTS</b>						
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	\$3.5	\$3.5	\$3.5	\$3.6	\$4.0	\$3.6
<b>Total Fixed O&amp;M Cost 2024\$MM/Yr</b>	<b>\$13.8</b>	<b>\$13.8</b>	<b>\$13.8</b>	<b>\$13.9</b>	<b>\$18.4</b>	<b>\$14.0</b>
<b>VARIABLE O&amp;M COSTS (Augmentation Model)</b>						
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
<b>BASE PLANT DESCRIPTION</b>						
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 <sub>x</sub> Control	Dry Low NO <sub>x</sub> on Gas / Water Injection on Fuel Oil SCR Included	Dry Low NO <sub>x</sub> on Gas / Water Injection on Fuel Oil SCR Included	Dry Low NO <sub>x</sub> on Gas / Water Injection on Fuel Oil SCR Included	Dry Low NO <sub>x</sub> on Gas / Water Injection on Fuel Oil SCR Included	Dry Low NO <sub>x</sub> on Gas / Water Injection on Fuel Oil SCR Included	Dry Low NO <sub>x</sub> 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)						

# 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
<b>ESTIMATED PERFORMANCE (BASED ON NATURAL GAS OPERATION) (Note 4)</b>						
<b>Summer Base Load Performance</b>						
Net Plant Output, kW	400,200	411,800	408,000	408,000	413,900	407,200
Net Plant Heat Rate, Btu/kWh (HHV)	9,000	9,000	9,000	9,000	9,000	9,040
Heat Input, MMBtu/hr	3,600	3,710	3,670	3,670	3,730	3,680
<b>Winter Base Load Performance</b>						
Net Plant Output, kW	414,300	429,100	426,900	426,900	435,000	423,600
Net Plant Heat Rate, Btu/kWh (HHV)	8,930	8,870	8,850	8,850	8,820	8,850
Heat Input, MMBtu/hr	3,700	3,810	3,780	3,780	3,840	3,750
<b>Estimated Startup Fuel Usage, MMBtu</b>						
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: 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
<b>BASE PLANT DESCRIPTION</b>						
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
<b>ESTIMATED PERFORMANCE</b>						
<b>BESS Performance</b>						
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
<b>BASE PLANT DESCRIPTION</b>						
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
<b>ESTIMATED PERFORMANCE</b>						
<b>BESS Performance</b>						
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
<b>BASE PLANT DESCRIPTION</b>						
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
<b>ESTIMATED PERFORMANCE</b>						
<b>BESS Performance</b>						
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.