Class Year 2023 Facilities Study System Upgrade Facilities (SUF) and System Deliverability Upgrade (SDU) Report

A Report by the New York Independent System Operator – Interconnection Project

September 20, 2024

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Executive Summary

The Class Year Interconnection Facilities Study[1] (Class Year Study or Facilities Study) is performed in accordance with the applicable rules and requirements set forth under Attachments S and X of the NYISO Open Access Transmission Tariff (OATT). One part of the Class Year Study identifies the interconnection facilities (*i.e.*, the System Upgrade Facilities (SUFs), the Connecting Transmission Owner Attachment Facilities (CTOAFs), and some Developer Attachment Facilities (DAFs), that would be required under the Minimum Interconnection Standard (MIS) for the reliable interconnection of a group of projects referred to as a Class Year (*e.g.*, Class Year 2023, or CY23). This portion of the Class Year Study is known as the "SUF Study." For the group of Class Year projects requesting Capacity Resource Interconnection Service (CRIS), the Class Year Study includes a Deliverability evaluation to determine the extent to which each project is deliverable at the requested CRIS MW level – the Class Year Deliverability Study for potential identification of System Deliverability Upgrades (SDU). This portion of the Class Year Study is known as the "SDU Study."

This report summarizes the results of the CY23 SUF and SDU Study. As described in more detail in Section 1 of this Report, the purpose of the SUF Study is to identify and cost allocate any interconnection facilities that may be required for the Class Year projects under the MIS. All Class Year projects other than CRIS-only Class Year projects must meet the MIS in order to interconnect and obtain Energy Resource Interconnection Service (ERIS).

Table 1 shows the list of "full" CY23 projects (*i.e.*, projects requesting both ERIS and CRIS) evaluated in the SUF Study with their respective requests for ERIS and CRIS, MW size, interconnection points, unit type and proposed In-Service Dates. In addition to these full CY23 projects, **Table 2** lists the additional "CRIS-only" projects that were additionally evaluated in the CY23 SDU Study.

Figure 1 shows CY23 projects on the NYCA Zonal map.

Table 1: Full CY23 Proposed Projects**

#	QUEUE POS.	PROJECT	ZONE	Point of Interconnection	Proposed COD	Requested Summer ERIS MW	Requested Summer CRIS MW	UNIT TYPE	CTO	CY Type
Full CY23 Project (ERIS and CRIS)										
1	Q522	NYC Energy	J	Hudson Avenue East 138kV	Apr-26	79.9	79.9	ES	ConEd	Full
2	Q560	Deer River Wind	E	Black River-Lighthouse Hill 115kV	Jan-26	100	100	W	NM-NG	Full
3	Q680	Juno Power Express	K	Ruland Rd. 138kV	Jan-28	1200	N/A	DC	LIPA	Full

[1] Capitalized terms not otherwise defined in this report have the meaning set forth in Attachments S and X of the OATT.

#	QUEUE POS.	PROJECT	ZONE	Point of Interconnection	Proposed COD	Requested Summer ERIS MW	Requested Summer CRIS MW	UNIT TYPE	CTO	CY Type
Full CY23 Project (ERIS and CRIS)										
4	Q700	Robinson Grid	J	Gowanus Substation 345kV	Feb-27	300	300	ES	ConEd	Full
5	Q716	Moraine Solar Energy Center	C	Moraine Substation 115kV	Nov-26	93.5	93.5	S	NYSEG	Full
6	Q770	KCE NY 8a	G	South Cairo 13.2kV substation	Dec-26	20	20	ES	CHGE	Full
7	Q774	Tracy Solar Energy Centre	E	Thousand Island - Lyme 115kV	Nov-27	119	119	S	NM-NG	Full
8	Q777	White Creek Solar	B	Sta 82 - Sta 128 115kV	Aug-26	135	135	S	RG&E	Full
9	Q785	Erie-Wyoming County Solar	C	High Sheldon - Stolle Road 230 kV	Aug-25	175	175	CSR	NYSEG	Full
10	Q800	Rich Road Solar Energy Center	E	Moses - Adirondack 230 kV Line #2 (MA2)	Dec-26	240	240	CSR	NYPA	Full
11	Q822	Whale Square Energy Storage 1	J	Narrows Barge Feeder 23162	Jun-26	58.2	58.2	ES	ConEd	Full
12	Q825	Setauket Energy Storage	K	Port Jefferson - Terryville 69kV	Apr-28	65.3	65.3	ES	LIPA	Full
13	Q834	Luyster Creek Energy Storage 2	J	Astoria West Substation 138kV	Jun-26	79	79	ES	ConEd	Full
14	Q852	Niagara Dolomite Solar	A	Robinson Rd - Stolle Rd 230kV Line 65	Oct-26	180	180	S	NYSEG	Full
15	Q858	Genesee Road Solar Energy Center	A	Stolle Rd - Five Mile Rd 345kV	Feb-28	250	250	S	NYSEG	Full
16	Q859	Ridge View Solar Energy Center	A	Somerset - Dysinger 345kV	Oct-27	350	350	CSR	NYSEG	Full
17	Q866	North Country Wind	D	Moses - Willis 230 kV (MW1)	Dec-26	306.6	306.6	W	NYPA	Full
18	Q869	Tabletop Solar	F	Clinton - Clinton Tap 115 kV	Dec-27	80	80	S	NM-NG	Full
19	Q878	Pirates Island	A	Huntley - Gardenville 115kV	Feb-28	100	100	ES	NM-NG	Full
20	Q880	Brookside Solar	D	Chateaugay - Willis 115kV	Jul-26	100	100	S	NYSEG	Full
21	Q882	Riverside Solar	E	Coffeen - Thousands 115 kV (Lyme tap)	Jul-26	100	100	S	NM-NG	Full
22	Q950	Hemlock Ridge Solar	B	Lockport - Mortimer	Apr-26	200	200	S	NM-NG	Full
23	Q952	Catskill Grid, LLC	G	North Catskill - Milan 115kV line	Apr-26	100	100	ES	CHGE	Full
24	Q953	Sugar Maple Solar	E	North Carthage - Taylorville #8 and Black River - Taylorville #2 115kV	Dec-26	125	125	S	NM-NG	Full
25	Q957	Holbrook Energy Storage	K	Holtsville - Patchogue 69kV	Dec-27	76.8	76.8	ES	LIPA	Full
26	Q967	KCE NY 5	G	Ohioville 115 KV Substation	Dec-26	94	94	ES	CHGE	Full
27	Q971	East Setauket Energy Storage	K	Holbrook – North Shore Beach 138kV	Apr-27	125	125	ES	LIPA	Full
28	Q974	KCE NY 19	G	Sugarloaf - Wisner 69kV	Oct-25	79	79	ES	O&R	Full
29	Q995	Alabama Solar Park LLC	B	Lockport - Batavia 115kV (Line#112)	Dec-27	130	130	S	NM-NG	Full
30	Q1007	NYC Energy LLC - Phase 2	J	Hudson Ave 138 kV Substation	Apr-26	220.1	220.1	ES	ConEd	Full
31	Q1009	Yellow Barn Solar	C	Milliken – Etna 115 kV line #975	Dec-25	160	160	S	NYSEG	Full
32	Q1012	Suffolk County Storage II	K	Southold 69 kV Substation	Apr-28	76.8	76.8	ES	LIPA	Full
33	Q1016	EI Steinway 1	J	Mott Haven - Rainey West 345kV, Mott Haven - Rainey East 345kV	Dec-27	1300	1300	OSW	ConEd	Full
34	Q1017	EI Steinway 2	J	Mott Haven - Rainey West 345kV, Mott Haven - Rainey East 345kV	Feb-28	1300	1300	OSW	ConEd	Full
35	Q1031	Mill Point Solar	E	Marcy - New Scotland 345kV Line #18	Nov-25	250	250	CSR	NM-NG	Full
36	Q1036	Mainesburg ESS	C	Mainesburg - Watercure 345kV	Jun-26	130	130	ES	NYSEG	Full
37	Q1042	Fort Edward Solar Farm (NY53)	F	Mohican - Battenkill 115kV Line #15	Dec-25	100	100	S	NM-NG	Full
38	Q1068	Buchanan Point BESS	H	Buchanan North Substation 345 kV	Apr-27	300	300	ES	ConEd	Full
39	Q1079	Somerset Solar	A	Kintigh 345 kV	Jul-26	125	125	S	NYSEG	Full

#	QUEUE POS.	PROJECT	ZONE	Point of Interconnection	Proposed COD	Requested Summer ERIS MW	Requested Summer CRIS MW	UNIT TYPE	CTO	CY Type
Full CY23 Project (ERIS and CRIS)										
40	Q1080	Mineral Basin Solar Power	C	Homer City- Mainesburg 345kV	Jul-26	401.6	401.6	S	NYSEG	Full
41	Q1088	Harvest Hills Solar	C	Wright Avenue – Milliken 115 kV line	Nov-25	200	200	CSR	NYSEG	Full
42	Q1089	Flat Creek Solar	F	Edic to Princetown 345kV Line 352	Dec-25	200	200	S	NYPA	Full
43	Q1096	Alfred Oaks Solar	C	Andover - Palmiter 115 kV, Line 932	Oct-25	120	100	CSR	NYSEG	Full
44	Q1115	Flat Creek Solar 2	F	Edic to Princetown 345kV Line 352	Dec-25	100	100	S	NYPA	Full
45	Q1117	CLIES 70MW	K	Sills Road 138kV substation.	Dec-25	70	70	ES	LIPA	Full
46	Q1122	East Fishkill	G	Shenandoah 115kV Substation	Jun-25	205	205	ES	CHGE	Full
47	Q1123	KCE NY 29	K	Kings 138 kV substation	Oct-25	150	150	ES	LIPA	Full
48	Q1130	Hoffman Falls Wind	C	Fenner - Cortland 115kV Line #3	Jun-26	72	72	W	NM-NG	Full
49	Q1136	Honey Ridge Solar	E	Black River 115 kV Substation	Sep-25	125	125	CSR	NM-NG	Full
50	Q1148	Agricola Wind	C	Milliken – Wright Ave 115 kV line #973	Jun-26	97	97	W	NYSEG	Full
51	Q1150	Moss Ridge Solar	E	Corning - Battle Hill 115 kV Line #4	May-27	60	60	S	NM-NG	Full
52	Q1151	York Run Solar	A	Falconer – Warren 115 kV line #171	Aug-26	90	90	S	NM-NG	Full
53	Q1174	NY48 – Diamond Solar	E	Porter - Valley 115kV line #4	Dec-25	60	60	S	NM-NG	Full
54	Q1178	NY115 – Newport Solar	E	Porter - Deerfield 115 kV Line # 9	Nov-26	130	130	S	NM-NG	Full
55	Q1180	Union Energy Center, LLC	H	Union Valley - Croton Falls 115 kV line #991	Oct-26	116	116	ES	NYSEG	Full
56	Q1182	NY128 - Foothills Solar	F	Mayfield-Northville 69kV	Nov-26	40	40	S	NM-NG	Full
57	Q1183	NY125A - Fort Covington Solar	D	Moses-Willis 230kV (MW1)	Dec-26	250	250	S	NYPA	Full
58	Q1184	NY125B - Two Rivers Solar	D	Moses - Willis 230 kV (MW2)	Dec-25	200	200	S	NYPA	Full
59	Q1188	North Seneca Solar Project	C	Hooks Road - Elbridge 115kV	May-27	105	105	S	NM-NG	Full
60	Q1194	Crane Brook Solar Project	C	State St - Clinton Corn 115kV Line	May-27	130	130	S	NM-NG	Full
61	Q1199	El Steinway 1.1	J	Mott Haven - Rainey West 345kV, Mott Haven - Rainey East 345kV	Nov-27	200	200	OSW	ConEd	Full
62	Q1236	Gravel Road Solar	C	Station 127 (Hook Rd) -Elbridge and Mortimer-Elbridge 115 kV lines	Oct-26	128	128	S	NM-NG	Full
63	Q1254	Barrett Hempstead Battery Storage	K	Barrett to Long Beach 33 kV circuit No 1(33-224)	Mar-25	40	40	ES	LIPA	Full
64	Q1255	Holtsville Brookhaven Battery Storage	K	Line 69-849 from West Yaphank to North Bellport	Mar-26	79.9	79.9	ES	LIPA	Full
65	Q1256	Canal Southampton Battery Storage	K	Canal Substation 138kV	Mar-25	100	100	ES	LIPA	Full
66	Q1257	Edwards Calverton Battery Storage	K	Edwards Avenue Substation at 138 kV	Mar-25	60	60	ES	LIPA	Full
67	Q1288	CPNY-X	E and J	Fraser 345 kV and Rainey 345 kV substations	Jun-27	1300	1300	DC	NYSEG and ConEd	Full

Note:

*Q785 Erie-Wyoming County Solar Project is a co-located project that is requesting 175 MW CRIS of solar and 0 MW CRIS of BESS (a total of 175 MW CRIS request)

*Q800 Rich Road Solar Energy Center Project is a co-located project that is requesting 220 MW CRIS of solar and 20 MW CRIS of BESS (a total of 240 MW CRIS request)

*Q800 Rich Road Solar Energy Center project POI is at 345 kV level due to the inclusion of Northern NY Priority Transmission in the baseline system.

*Q859 Ridge View Solar Energy Center Project is a co-located project that is requesting 330 MW CRIS of solar and 20 MW CRIS of BESS (a total of 350 MW CRIS request)

*Q866 North Country Wind project POI is at 345 kV level due to the inclusion of Northern NY Priority Transmission in the baseline system.

*Q971 East Setauket Energy Storage project POI is tapping the existing 138 kV transmission line, line# updated as 138-884.

*Q1031 Mill Point Solar Project is a co-located project that is requesting 250 MW CRIS of solar and 0 MW CRIS of BESS (a total of 250 MW CRIS request)

*Q1088 Harvest Hills Solar Project is a co-located project that is requesting 200 MW CRIS of solar and 0 MW CRIS of BESS (a total of 200 MW CRIS request)

*Q1096 Alfred Oaks Solar Project is a co-located project that is requesting 100 MW CRIS of solar and 0 MW CRIS of BESS (a total of 100 MW CRIS request)

*Q1136 Honey Ridge Solar Project is a co-located project that is requesting 65 MW CRIS of solar and 60 MW CRIS of BESS (a total of 125 MW CRIS request)

*Q1183 NY125A-Fort Covington Solar project POI is at 345 kV level due to the inclusion of Northern NY Priority Transmission in the baseline system.

*Q1184 NY125B-Two Rivers Solar project POI is at 345 kV level due to the inclusion of Northern NY Priority Transmission in the baseline system.

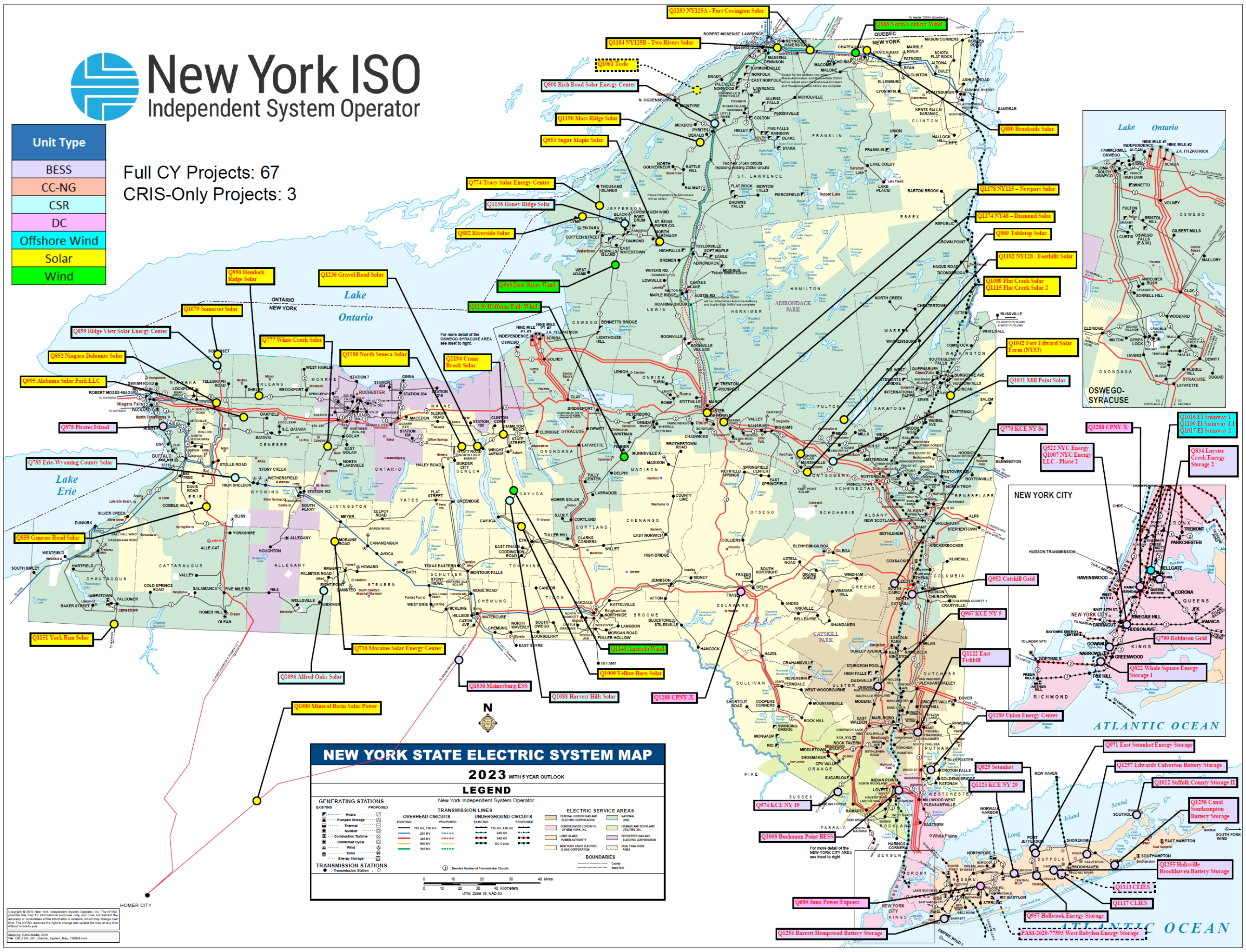
Table 2: CY23 CRIS-only Projects**

#	QUEUE POS.	PROJECT	ZONE	Point of Interconnection	Proposed COD	Requested Summer ERIS MW	Requested Summer CRIS MW	UNIT TYPE	CTO	CY Type
CY23 Project CRIS Only										
68	Q1061	Teele	E	Alcoa – North Ogdensburg 115 kV	Jun-26	N/A	19.8	S	NM-NG	CRIS only
69	Q1113	CLIES 20 MW	K	Sills Road 138 kV substation	Dec-25	N/A	20	ES	LIPA	CRIS only
70	PAM-2020-77593	West Babylon Energy Storage	K	West Babylon 13 kV	Aug-25	N/A	9.9	ES	LIPA	CRIS only

Note:

**COD dates in Table 1 and 2 reflect the most recent dates on NYISO Interconnection Projects Portal as of August 2024.

Figure 1: CY23 Projects in the on NYCA Zonal Map (approximate locations)



The CY23 SUF Study includes 67 full CY23 projects (ERIS and CRIS). If interconnected, the generation projects in the CY23 SUF Study would add approximately 14,000 MW (nameplate or summer peak net output, as applicable) to the New York State Transmission System (NYSTS). The HVDC transmission projects in the CY23 SUF Study propose to inject 1300 MW into the NYSTS. Note that for the HVDC project, **Figure 1** only points to the location of its rectifier substation at Rainey substation and the inverter substation at Fraser Substation, - the DC cable route is not shown in **Figure 1**.

There are eight (8) Connecting Transmission Owners (CTO) involved in the CY23 SUF Study:

- Consolidated Edison Company of New York (Con Edison or ConEd)
- Central Hudson Gas & Electric (CHGE)
- New York Power Authority (NYPA)

- New York State Electric and Gas (NYSEG)
- Niagara Mohawk Power Corporation d/b/a National Grid (NGrid)
- Public Service Electric & Gas Company Long Island (PSEG-LI)
- Rochester Gas & Electric (RG&E)
- Orange & Rockland (O&R)

Summary of Study Results:

Part 1 SUF Cost Allocation:

As reflected in this report and summarized in **Table 38**, the Project Developers in the CY23 SUF Study will be responsible for a total Part 1 SUF cost[2] of **$2,398,057,271** (-15%/+30%) to interconnect their projects into the NYSTS.

Time to construct:

The detailed schedules are reflected in the Part 1 Studies for each project. The schedules will be further refined and updated as necessary in the development of the respective Interconnection Agreements and Engineering, Procurement and Construction agreements.

Part 2 – Steady State Analysis:

During the sensitivity voltage analysis performed for CY23, overvoltage issues were identified at Mott Haven 345 kV Substation, NEW_AST_EST1 345 kV, NEW_AST_EST2 345 kV, and nearby tap buses on Mott Haven – Rainey West MH-RNE_TAP A and MH-RNW_TAP A when Q1016 EI Steinway 1, Q1017 EI Steinway 2, and Q1199 El Steinway 1.1 projects were all in-service. An SUF consisting of installing two (2) 20 MVAr shunt reactors at Mott Haven 345 kV Substation is required. The cost estimate for the shunt reactor SUF is $159,030,000 (-15%/+30%). The total cost is allocated among these CY23 projects:

- Q1016 EI Steinway 1
- Q1017 EI Steinway 2
- Q1199 El Steinway 1.1

[2] Any difference between a Project Cost Allocation and the actual cost of the Developer's share of required System Upgrade Facilities will be addressed in accordance with applicable provisions of Attachment S and Attachment X of the OATT, including Section 25.8.6 of Attachment S.

Part 2 – Transfer Analysis:

From the thermal transfer analysis, an SUF was identified for Dunwoodie South thermal transfer capability degradation impacted by the same three (3) CY23 projects:

- Q1016 EI Steinway 1
- Q1017 EI Steinway 2
- Q1199 El Steinway 1.1

In order to mitigate the above-referenced transfer capability degradation, an SUF was identified to uprate existing Mott Haven-Rainey 345 kV Circuits 1 & 2 (line # Q11 and Q12) to the LTE rating of 1015 MVA. The cost estimate for the above SUF upgrade is $220,260,000 (-15%/+30%). The total cost is allocated among these CY23 projects.

Part 2 – Fault Duty Assessment:

For the NYSEG area, the following upgrades were identified from fault analysis and individual breaker analysis.

- Q1036 Mainesburg ESS is responsible for an overdutied breaker at the Hillside 115 kV Station. The cost for replacing the breaker is $703,000 (-15%/+30%).
- Q785 Erie-Wyoming County Solar and Q852 Niagara Dolomite Solar are responsible for an overdutied breaker at the New Gardenville 115 kV Station. The cost for replacing the breaker is $630,000 (-15%/+30%).

Part 2 – Local Stability and NPCC A-10 Analysis:

There were no SUFs identified for local stability assessments.

During the NPCC A-10 analysis, an existing bus – Ruland Road 345 kV was identified as a BPS bus, requiring upgrades.

The cost of upgrading Ruland Road 345 kV to BPS is assigned to Q680 Juno Power Express with a total cost estimate of $5,909,498 (-15%/+30%).

Part 2 - Bus Flow Analysis:

Two (2) existing disconnect switches at the Hudson Ave East 138 kV substation were identified in the bus flow analysis which require replacement caused by Q1007 NYC Energy LLC - Phase 2 in the summer case. Q1007 NYC Energy LLC - Phase 2 is responsible for the cost of replacing those disconnect switches. The total cost estimate is $3,240,000 (-15%/+30%).

Twelve (12) existing disconnect switches at the Rainey 345 kV substation were identified in the bus flow analysis which require replacement caused by Q1288 CPNY-X in the summer case. Q1288 CPNY-X is responsible for the cost of replacing those disconnect switches. The total cost estimate is $23,750,000 (-15%/+30%).

Part 2 - Subsynchronous Torsional Interaction (SSTI) study:

The results of the SSTI screening study reveal that potential SSTI may occur when an HVDC/inverter-based technology is in radial or near radial connection with the nearby generation unit(s) under study. For CY23 SSTI screening analysis, the results require high level of "N-k" contingencies, specifically:

- N-5 outage level for Q522/Q1007 NYC Energy to have a potential interaction with the Brooklyn Navy Yard units;
- N-10 outage level for Q700 Robinson Grid to have a potential interaction with the Bayonne Energy Center units;
- N-5 outage level for Q822 Whale Square Energy Storage 1 to have a potential interaction with Gowanus units; N-6 outage level for Q822 Whale Square Energy Storage 1 to have a potential interaction with Kent Ave units; N-1 outage level for Q822 Whale Square Energy Storage 1 to have a potential interaction with Narrows units;
- N-7 outage level for Q834 Luyster Creek Energy Storage 2 to have a potential interaction with the Astoria Unit 3; N-14 outage level for Q834 Luyster Creek Energy Storage 2 to have a potential interaction with the NYPA Units;
- N-4 outage level for Q1016/Q1199/Q1017 EI Steinway to have a potential interaction with the Rainey GT unit 10; N-6 outage level for Q1016/Q1199/Q1017 EI Steinway to have a potential interaction with the Ravenswood unit 3; and
- N-4 outage level for Q1288 CPNY-X to have a potential interaction with the Rainey GT unit 10; N-5 outage level for Q1288 CPNY-X to have a potential interaction with the Ravenswood unit 3.

Part 2 – Headroom Calculation:

Utilization of Electrical Headroom was identified for two (2) projects in the CY23 SUF Study: CY23 Q858 Genesee Road Solar Energy Center and Q1080 Mineral Basin Solar Power. The CY19 Project Q596 Alle Catt II Wind paid for the PAR at the Hillside Station on the East Towanda – Hillside 230 kV Line 70. The CY23 Q858 Genesee Road Solar Energy Center and Q1080 Mineral Basin Solar Power must reimburse $14,284,046 to the CY19 Q596 Developer for use of this electrical Headroom. The Headroom cost allocation for each project is detailed in section 9.1.

Utilization of Functional Headroom related to upgrades at Holbrook 138 kV substation was identified for seven (7) projects in the CY23 SUF Study:

- Q825 Setauket Energy Storage;
- Q957 Holbrook Energy Storage;
- Q1012 Suffolk County Storage II;
- Q1117 CLIES 70MW;
- Q1255 Holtsville Brookhaven Battery Storage;
- Q1256 Canal Southampton Battery Storage; and
- Q1257 Edwards Calverton Battery Storage.

The Developer of CY21 Projects Q766 Sunrise Wind and Q987 Sunrise Wind II paid for upgrading Holbrook 138 kV to BPS substation. The seven (7) above-listed CY23 projects must reimburse $11,842,404 to the Developer of CY21 Q766 Sunrise Wind and Q987 Sunrise Wind II for use of this functional Headroom. The Headroom cost allocation for each project is detailed in section 9.2.

Utilization of Functional Headroom related to upgrades at New Bridge 138 kV substation was identified for one (1) project in the CY23 SUF Study: Q680 Juno Power Express. The Developer of CY21 Project Q959 EI Oceanside 2 paid for upgrading New Bridge 138 kV to BPS substation. Q680 Juno Power Express must reimburse $6,798,787 to the Developer of CY21 Q959 EI Oceanside 2 for use of this functional Headroom. The Headroom cost allocation for this project is detailed in section 9.2.

Utilization of Electrical Headroom was identified for one (1) project in the CY23 SDU Study: Q825 Setauket Energy Storage. The following CY17 Projects paid for the Terryville - Flowerfield 69 kV line SDU:

- Q467 Shoreham Solar;
- Q477 Riverhead Solar;
- Montauk Energy Storage; and
- East Hampton Energy Storage.

The Headroom allocation for CY23 Q825 Setauket Energy Storage will be identified in the SDU Project Cost Allocation as part of the Additional SDU Study decision process.

Utilization of Electrical Headroom was identified for one (1) project in the CY23 SDU Study: Q957 Holbrook Energy Storage. The following CY21 Projects paid for the Bayport – Great River 69 kV line SDU:

- Q766 Sunrise Wind;
- Q987 Sunrise Wind II;
- Q956 Holtsville 138 kV Energy Storage; and
- Q965 Yaphank Energy Storage.

The Headroom allocation for CY23 Q957 Holbrook Energy Storage will be identified in the SDU Project Cost Allocation as part of the Additional SDU Study decision process.

Part 2 – Deliverability Analysis:

The deliverability Byway tests in LI indicated that the following CY23 CRIS projects in the LI Capacity Region require LI Byway SDUs to be fully deliverable:

- Q825 Setauket Energy Storage;
- Q957 Holbrook Energy Storage;
- Q971 East Setauket Energy Storage;
- Q1012 Suffolk County Storage II;
- Q1117 CLIES 70MW;
- Q1123 KCE NY 29;
- Q1254 Barrett Hempstead Battery Storage;
- Q1255 Holtsville Brookhaven Battery Storage;
- Q1256 Canal Southampton Battery Storage; and
- Q1257 Edwards Calverton Battery Storage.

The Byway SDUs for the above-listed CY23 LI CRIS projects consist of the following, which are "new" (*i.e.*, not previously identified and cost allocated in a prior Class Year Study and not substantially similar to a SDU previously identified and cost allocated in a Class Year Study) and therefore require Additional SDU Studies:

- Reconductoring Q825-Terryville 69 kV;
- Adding a PAR controlled 138 kV line between Pilgrim 138 kV station - West Bus 138 kV station (2 cables per phase);
- Reconductoring portion of Holbrook-Holtsville 69 kV lines (circuits 1&2);

- Uprating West Yaphank-North Bellport 69 kV line; and
- Adding a 2 ohms series reactor to Ocean Ave or Barrett 34.5 kV with associated upgrades to accommodate the series reactor.

The Additional SDU Study for the new SDUs is being performed pursuant to Section 25.5.10 of Attachment S and is currently ongoing.

Conclusion:

The Project Developers in the CY23 SUF Study will be responsible for a total SUF cost of **$2,844,505,007** (-15%/+30%) to interconnect their projects into the NYSTS.

1. Introduction

1.1 Background

As described in more detail in Section 1.2 below, the purpose of the Class Year Study is to identify the interconnection facilities (*i.e.*, the Attachment Facilities and the SUFs), that would be required for the interconnection of a group of projects referred to as a Class Year. The Class Year Study also includes a Deliverability Study to identify any SDUs that may be required for the Class Year projects to be deliverable under the Deliverability Interconnection Standard (DIS).

The CY23 Facilities Study formally commenced on February 13, 2023 in accordance with Attachment S of the OATT. CY23. Both Part 1 and Part 2 studies commenced after the CY23 start date. CY23 study status updates were provided and discussed at the monthly Transmission Planning Advisory Subcommittee (TPAS) meetings after February 13, 2023. An initial meeting of the CY23 working group – the Interconnection Projects Facilities Study Working Group (IPFSWG) was held on. On May 14, 2024, CY23 Preliminary Deliverability Analysis was presented to TPAS and IPFSWG, and subsequently was approved by the Operating Committee on May 16, 2024. This was followed with the decision process for CY23 projects on Additional SDU studies.

1.2 Study Process Description

In the NYISO Interconnection Process, the Class Year Study is the last and most comprehensive study in the interconnection study process. Attachment X of the OATT calls for three successive Interconnection Studies of each proposed project. These interconnection studies analyze proposed projects in varying levels of detail:

First is the Optional Feasibility Study (FES), which is a high-level evaluation of the configuration and local system impacts.

The second study is the Interconnection System Reliability Impact Study (SRIS), which evaluates the project's impact on system reliability and transfer capability.

The final study in the Interconnection Study process is the Class Year Study – a detailed study which evaluates the cumulative impact of a group of projects that have completed similar milestones – a "Class Year" of projects.[3] The Facilities Study identifies and allocates the cost of upgrade facilities needed to

[3] All Large Facilities subject to evaluation the NYISO interconnection process under Attachment X are subject to the Class Year SUF Study. Certain Small Generating Facilities are also required to participate in the Class Year SUF Study pursuant to Section 32.3.5.3 of Attachment Z. In addition,

reliably interconnect all the projects in a Class Year.

The purposes of the Class Year Study are described below:

SUF Study:

The purpose of this study is to identify the interconnection facilities (*i.e.*, the SUFs, the CTOAFs, and certain DAFs) that would be required for the reliable interconnection of the group of Class Year projects under the MIS. The MIS is designed to ensure reliable access by the proposed project to the NYSTS and does not include any deliverability test or deliverability requirement. The Class Year projects must meet the MIS in order to interconnect to the NYSTS and to become qualified to provide ERIS.

SDU Study:

The purpose of this study is to identify any SDU that may be required for the Class Year CRIS projects under the NYISO Deliverability Interconnection Standard (DIS). The DIS is applied only to those projects electing CRIS. The DIS is designed to ensure that the proposed project (at the requested CRIS MW level) is deliverable throughout the New York Capacity Region where the project will interconnect.

The Class Year Study then allocates the cost of SUFs and SDUs identified in the study among the projects in the Class Year in accordance with the cost allocation methodologies set forth in Attachment S of the OATT.

Due to the complexity and extent of the assessments, the Class Year Study is divided into two parts, based on two significantly different aspects of the Class Year Study: "Part 1 Studies" (design engineering type of studies) and "Part 2 Studies" (system simulation type of studies, under both MIS and DIS).

Part 1 Studies:

Design and engineering studies are individually performed for each project in the Class Year SUF Study to address the CTOAFs and the Local SUFs (*i.e.*, the SUFs at each Point of Interconnection (POI) and the related metering, protection and telecommunication facilities) required for each project. The Connecting Transmission Owner (CTO) standards, design requirements and practices are applied for the Part 1 Studies.

Part 2 Studies:

Power system simulation studies are performed with the goal to identify the remainder of the SUFs

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facilities seeking to obtain or increase CRIS beyond the levels permitted by Attachment S without a deliverability evaluation are subject to a Class Year Deliverability Study. These are referred to as CRIS-only Class Year projects.

(under the MIS), and the SDUs (under the DIS), required for the Class Year projects in aggregate, by performing steady state, transient stability, and short circuit assessments.

Each project in the SUF Study will have a "Part 1 Study" report and supporting appendices identifying any required Local SUFs (*i.e.*, POI connection design/engineering, and protection/communication at POI and remote ends), CTOAF, and certain DAF.

The Part 2 Studies consist of various assessments performed on two system representation models, as described in Attachment S of the OATT: the Annual Transmission Baseline Assessment (ATBA) and the Annual Transmission Reliability Assessment (ATRA). The "ATRA system" is the "ATBA system" plus the Class Year projects and the respective re-dispatch. Together and under MIS, these studies result in the identification and cost allocation of the SUFs required for the subject Class Year projects to reliably interconnect to the system, and also in the determination of any Electrical or Functional Headroom reimbursements from the current Class Year to the prior Class Year projects. Under DIS, ATBA-Deliverability (ATBA-D) and ATRA-Deliverability (ATRA-D) studies are performed, to identify whether or not a project that requested CRIS evaluation is deliverable, and if not, what SDU are necessary to make it deliverable.

The ATBA and ATRA cases (power flow, stability, short circuit) are the foundations of the Part 2 Studies. It is the differences between these two cases (ATBA and ATRA) that establish a snapshot of the incremental collective[4] impact on the system caused by the studied Class Year projects (and the corresponding dispatch). If any SUFs are identified as needed, assessments are re-performed, as applicable, in order to either define system impacts of the newly-identified system elements, or to identify cost estimates and time to construct SUFs that are consistent with Good Utility Practice.[5] The SUF cost is allocated based on a pro-rata impact of each project on the respective SUFs if the impact can be measured in discrete electrical units (*e.g.*, Amperes, MW, etc.), or by the number of projects needing the respective SUFs, if the impact cannot be measured in discrete electrical units (*e.g.*, a new ring bus shared by more than

[4] Note: individual impact was studied during each project's SRIS.

[5] Attachment S to the NYISO OATT defines System Upgrade Facilities as "the least costly configuration of commercially available components of electrical equipment that can be used, consistent with good utility practice and Applicable Reliability Requirements, to make the modifications to the existing transmission system that are required to maintain system reliability due to … (ii) proposed interconnections. In the case of proposed interconnection projects, System Upgrade Facilities are the modifications or additions to the existing New York State Transmission System that are required for the proposed project to connect reliably to the system in a manner that meets the NYISO Minimum Interconnection Standard." Good Utility Practice is defined as "any of the practices, methods or acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods or acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather to delineate acceptable practices, methods, or acts generally accepted in the region, including those practices required by Federal Power Act Section 215(a)(4)."

one project).

The Class Year Study process also involves the review and compilation, as applicable, of a number of previously performed studies, in order to identify what needs to be re-evaluated specifically for the scope of the Class Year Study (defined in the Study Plan (Appendix A), circulated among the IPFSWG members for comments), and what can be relied upon with no further assessment.

The Class Year studies are conducted in coordination with the Market Participants (MPs), by creating a working group (WG) at the beginning of the Class Year process. The WG is created by the NYISO by direct communications with Class Year Developers as well as TPAS/OC notifications inviting all interested parties to join the Interconnection Projects Facilities Study Working Group (IPFSWG) for that Class Year Study. The IPFSWG members meet and also receive information regarding the Class Year Study via group email and regular status updates at TPAS. The IPFSWG members are encouraged to submit comments anytime during the study period. At the individual project level, there is also a focused, NYISO-coordinated 3-party communication process among the NYISO, the CTO(s) and the Developer, to review the Part 1 Studies for each of the Class Year projects.

1.3 Study Approval, Decision Rounds, and Settlement Processes

The SUF and SDU report and the supporting materials (appendices) are presented to TPAS/IPFSWG for review and recommendation for OC presentation and to OC for approval. After OC approval of the SUF and SDU report (the Initial Round report), the process enters a 30 calendar-day decision period during which the Class Year Developers are given the choice to accept or reject their respective Project Cost Allocation for SUFs and SDUs as summarized in the Initial Round Reports.

If any Developers in the Class Year SUF Study reject their Project Cost Allocation for SUFs, the associated projects are removed from the Class Year. Any Developers who in the Class Year SUF Study that accept their Project Cost Allocation for SUFs, but reject their Project Cost Allocation for SDUs, will remain in the Class, but will only be eligible for partial CRIS up to the amount of the proposed capacity of their project determined to be deliverable, if any. Any CRIS-only Class Year Developers that reject their Project Cost Allocation for SDUs, will remain in the Class, but will only be eligible for partial CRIS up to the amount of the proposed capacity of their project determined to be deliverable, if any.

A Developer that accepts an SUF and/or SDU Project Cost Allocation will not have the option to reject a Revised Project Cost Allocation in a subsequent round unless the Revised Project Cost Allocation provides for (1) an increase in the SUF or the SDU Project Cost Allocation; or (2) a decrease in the Class Year Project’s Deliverable MW.

For the remaining Class Year projects, the NYISO re-evaluates the SUFs and SDUs as applicable, makes any necessary adjustments, and issues revised SUF and Deliverability Reports (the Second Round Reports) in fourteen (14) Calendar Days. Then, the remaining Developers have seven (7) calendar days to decide if they accept/reject the new Project Cost Allocation. The process iterates until all remaining Developers accept their Project Cost Allocation(s) or Revised Project Cost Allocation(s) as applicable.

The Class Year settles after all remaining Developers have accepted their Project Cost Allocations for SUFs and SDUs as applicable and posted their respective Security with the applicable TO(s), for the full amount of their respective SUF/SDU Project Cost Allocation. The Security must be posted with the identified Transmission Owners within five (5) Business Days after NYISO issues a Notice of Acceptance of Project Cost Allocation. Developers also must make any applicable Headroom payments to prior Class Year Developers in the same timeframe. Headroom payments may be made in forms other than cash if the SUFs are not yet constructed, as described in Section 25.8.7.6 of Attachment S of the OATT.

1.4 ATBA and ATRA Systems Description

The ATBA and ATRA cases (*i.e.*, system representations) are the foundations of the studies that make up the Class Year Study process. The CY23 ATBA case is a five-year look-ahead of the New York Control Area (NYCA) system and represents a 2028 summer peak (coincident peak) 50/50 load forecast and system representation. The 2028 summer case included in the 2023 NYISO FERC Form No. 715 (the "FERC case") was the starting point for the CY23 Facility Study base cases. The FERC case went through a separate (*i.e.*, external to the Class Year process) base case development process, in which each TO participated, and reflects the 2023 Gold Book reported data[6] (*e.g.*, all generation and transmission facilities identified in the Gold Book 2023 as existing as of April 2023, 5-year ahead planned retirements and re-ratings, five-year ahead TO firm plans reported in the Gold Book, load forecast, etc.).

The FERC 715 case also included the latest available neighboring system representations as of the Class Year Start Date and the respective scheduled flows across the interties with neighboring Control Areas (obtained via the NPCC and the NERC Multiregional Model Working Group (MMWG) base case development processes).

The FERC case was then tailored to meet specific Attachment S Class Year Study requirements regarding the existing system representation (*e.g.*, including prior Class Year proposed projects (through

[6] 2023 Load and Capacity Data (Gold Book), New York Independent System Operator.

and including Class Year 2021) that accepted their Project Cost Allocations for SUFs, inclusion of SUFs and SDUs, the cost allocations for which were accepted in prior Class Year Studies; and inclusion of retirements, proposed generation and transmission projects that satisfy the inclusion rules in Section 25.5.5.1 of Attachment S to the OATT). This baseline system case (the ATBA case or "pre-project case") does not include the CY23 projects.

The CY23 ATRA case (or "post-project case") consists of the same system representation as the ATBA case with the addition of the CY23 projects at full output and associated system changes and dispatch patterns (CY23 ATRA = CY23 ATBA + CY23 projects). It is the differences between these two cases (the ATBA and the ATRA) that identify the incremental impact on the system collectively caused by new projects and the respective re-dispatch.

Below are tables identifying the generation retirements (**Tables 3 & 4**), generation additions (**Tables 5 & 6**), and the transmission projects (**Table 7**) reflected in the ATBA and ATRA pursuant to the inclusion rules in Section 25.5.5.1 of Attachment S of the OATT.

Table 3: CY23 ATBA/ATRA Retirements/Deactivations Assumptions under MIS

OWNER / OPERATOR	STATION UNIT	ZONE	CRIS (MW)		CAPABILITY (MW)		ATBA	Remarks
			SUMMER	WINTER	SUMMER	WINTER		
Somerset Operating Company, LLC	Somerset	A	686.5	686.5	676.4	684.4	O/S	Retirement
Entergy Nuclear Power Marketing LLC	Indian Point 2	H	1,026.5	1,026.5	1,011.5	1,029.4	O/S	Retirement
Albany Energy LLC	Albany LFGE	F	4.5	4.5	5.6	5.6	I/S	ICAP Ineligible Force Outage
Entergy Nuclear Power Marketing LLC	Indian Point 3	H	1,040.4	1,040.4	1,036.3	1,038.8	O/S	Retirement
Helix Ravenswood, LLC	Ravenswood 11	J	20.2	25.7	16.1	22.4	O/S	ICAP Ineligible Force Outage
Helix Ravenswood, LLC	Ravenswood 01	J	8.8	11.5	7.7	11.1	O/S	ICAP Ineligible Force Outage
Astoria Generating Company L.P.	Gowanus 1-8	J	16.1	21.0	16.0	21.0	O/S	Retirement
Exelon Generation Company, LLC	Madison County LF	E	1.6	1.6	1.6	1.6	I/S	ICAP Ineligible Force Outage
ENGIE Energy Marketing NA, Inc.	Nassau Energy Corporation	K	51.6	60.1	38.5	51.0	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 1-1	J	19.1	24.9	15.9	24.8	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 1-2	J	17.1	22.3	19.5	24.9	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 1-3	J	17.2	22.5	15.3	23.4	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 1-4	J	17.1	22.3	16.4	21.7	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 1-5	J	16.5	21.6	17.8	22.7	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 1-6	J	18.0	23.5	14.2	21.3	O/S	Retirement

OWNER / OPERATOR	STATION UNIT	ZONE	CRIS (MW)		CAPABILITY (MW)		ATBA	Remarks
			SUMMER	WINTER	SUMMER	WINTER		
Astoria Generating Company L.P.	Gowanus 1-7	J	17.6	23.0	18.0	22.4	O/S	Retirement
Consolidated Edison Co. of NY, Inc.	Hudson Ave 3	J	16.0	20.9	12.3	15.6	O/S	Retirement
Consolidated Edison Co. of NY, Inc.	Hudson Ave 5	J	15.1	19.7	15.3	18.6	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 4-1	J	16.8	21.9	15.2	24.1	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 4-2	J	17.3	22.6	18.5	23.5	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 4-3	J	17.6	23.0	18.4	22.0	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 4-4	J	17.1	22.3	16.0	21.5	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 4-5	J	17.1	22.3	16.6	22.1	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 4-6	J	18.6	24.3	18.5	24.3	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 4-7	J	16.6	21.7	18.4	23.6	O/S	Retirement
Astoria Generating Company L.P.	Gowanus 4-8	J	19.0	24.8	17.2	22.3	O/S	Retirement

Table 4: CY23 ATBA/ATRA Proposed Status Change to Comply with DEC Peaker Rule(1) under MIS

OWNER / OPERATOR	STATION UNIT	ZONE	CRIS (MW)		CAPABILITY (MW)		ATBA	Notes
			SUMMER	WINTER	SUMMER	WINTER		
Central Hudson Gas & Elec. Corp.	Coxsackie GT	G	21.6	26.0	19.0	23.6	O/S	2
Central Hudson Gas & Elec. Corp.	South Cairo	G	19.8	25.9	18.7	23.1	O/S	2
National Grid	Northport GT	K	13.8	18.0	8.3	12.7	O/S	2
National Grid	Port Jefferson GT 01	K	14.1	18.4	13.0	15.3	O/S	2
National Grid	Shoreham 1	K	48.9	63.9	41.3	61.4	O/S	2, 4
National Grid	Shoreham 2	K	18.5	23.5	16.5	20.3	O/S	2, 4
National Grid	Glenwood GT 03	K	54.7	71.5	49.9	67.2	O/S	2, 4
Consolidated Edison Co. of NY, Inc.	59 St. GT 1	J	15.4	20.1	13.1	18.8	O/S	2
NRG Power Marketing, LLC	Arthur Kill GT 1	J	16.5	21.6	12.3	15.8	O/S	2
Astoria Generating Company, L.P.	Gowanus 2-1 through 2-8	J	152.8	199.6	142.1	182.0	O/S	3
Astoria Generating Company, L.P.	Gowanus 3-1 through 3-8	J	146.8	191.7	136.9	179.9	O/S	3
Astoria Generating Company, L.P.	Narrows 1-1 through 2-8	J	309.1	403.6	285.9	369.2	O/S	3

Notes:

1. Units listed have not provided a notice to the NYSPSC or completed a Generator Deactivation Notice with the NYISO.
2. These units have indicated they will be out of service as noted in their compliance plans in response to the DEC Peaker Rule (https://www.dec.ny.gov/regs/2492.html).
3. These units have indicated they will be out of service during the ozone season (May through September) in their compliance plans in response to the DEC Peaker Rule.
4. Long Island Power Authority (LIPA) has submitted notifications to the DEC per Part 227-3 of the Peaker Rule stating that these units are needed for reliability allowing these units to operate as directed by PSEG Long Island, until at least May 1, 2025

Table 5: Prior Class Year Proposed Additions Modeled in CY23 ATBA System Representation

QUEUE POS.	OWNER / OPERATOR	STATION UNIT	ZONE	Proposed Date (M-YY)	NAMEPLATE RATING (MW)	CRIS (MW)	SUMMER (MW)	WINTE R (MW)	UNIT TYPE	CLASS YEAR
521	Bull Run Energy, LLC	Bull Run II Wind	D	Dec-26	449.0	449	449	449.0	Wind Turbines	2021
571	Heritage Renewables, LLC	Heritage Wind	B	Oct-25	200.1	200.1	200.1	200.1	Wind Turbines	2021
631	Champlain Hudson Power Express	NS Power Express	J	May-26	1000	1000	1000	1000	DC	2021
710	Horseshoe Solar Energy, LLC	Horseshoe Solar	B	Oct-25	180.0	180.0	180.0	180.0	Solar	2021
717	EDF Renewables Development, Inc.	Morris Ridge Solar Energy Center	C	Sep-24	177.0	177.0	177.0	177.0	Solar	2021
758	Sithe/Independence Power Partners, LP	Sithe Independence	C	I/S	1254	N/A	1013	1212	Combined Cycle	2021
766	Sunrise Wind LLC	Sunrise Wind	K	Dec-25	880.0	880.0	880.0	880.0	Wind Turbines	2021
783**	ConnectGen Chautauqua County LLC	South Ripley Solar and BESS	A	Jun-24	274.2	270.0	270.0	270.0	CSR(Solar+Energy Storage)	2021
787	Levy Grid, LLC	Levy Grid, LLC	A	Aug-25	150.0	150.0	150.0	150.0	Energy Storage	2021
801	Prattsburgh Wind, LLC	Prattsburgh Wind Farm	C	Dec-25	147.0	147.0	147.0	147.0	Wind Turbines	2021
805	Oxbow Hill Solar, LLC	Oxbow Hill Solar	C	Dec-24	140.0	140.0	140.0	140.0	Solar	2021
811	Hecate Energy Cider Solar LLC	Cider Solar	B	Nov-24	500.0	500.0	500.0	500.0	Solar	2021
815	Bayonne Energy Center, LLC	Bayonne Energy Center III	J	May-25	49.8	49.8	49.8	49.8	Energy Storage	2021
835	Astoria Generating Company, LP	Luyster Creek Energy Storage 1	J	May-26	59.1	56.3	56.3	56.3	Energy Storage	2021
840	Hecate Energy, LLC	Swiftsure Energy Storage	J	Nov-26	650.0	121.0	650.0	650.0	Energy Storage	2021
864	Greens Corners Solar, LLC	NY38 Solar	E	Dec-24	120.0	120.0	120.0	120.0	Solar	2021
883	Garnet Energy Center, LLC	Garnet Energy Center	B	Nov-25	200.0	200.0	200.0	200.0	Solar	2021
887	Champlain Hudson Power Express	CH Uprate	J	May-26	1250	250	250	250	DC	2021
907	Harlem River ESS, LLC	Harlem River Yard	J	Dec-26	100.0	100.0	100.0	100.0	Energy Storage	2021
931	East River ESS, LLC	Astoria Energy Storage	J	Mar-26	116.0	100.0	100.0	100.0	Energy Storage	2021
956	Holtsville Energy Storage, LLC	Holtsville 138 kV Energy Storage	K	Sep-25	112.1	110.0	110.0	110.0	Energy Storage	2021
965	Yaphank Energy Storage, LLC	Yaphank Energy Storage	K	Sep-25	79.65	76.8	76.8	76.8	Energy Storage	2021
987	Sunrise Wind LLC	Sunrise Wind II	K	Dec-25	966.0	44.0	44.0	44.0	Wind Turbines	2021

**Q783 South Ripley Solar Project is a co-located project that is requesting 270 MW ERIS of solar and 20 MW ERIS of BESS (a total of 270 MW ERIS request); 250 MW CRIS of solar and 20 MW CRIS of BESS (a total of 270 MW CRIS request).

Table 6: Small Generating Facilities Additions Modeled in ATBA System Representation[7]

QUEUE POS.	OWNER / OPERATOR	STATION UNIT	ZONE	Proposed Date* (M-YY)	NAMEPLATE RATING (MW)	CRIS (MW)	SUMMER (MW)	WINTER (MW)	UNIT TYPE
843	Sandy Creek Solar LLC	NY37 Solar	E	Nov-23	20.0	N/A	20.0	20.0	Solar
913	SED NY Holdings LLC	SunEast Manchester Solar	C	Dec-25	20.0	N/A	20.0	20.0	Solar
930	Astoria Generating Company, LP	Astoria BES to 27kV North Queens	J	Dec-25	15.0	N/A	15.4	15.0	Energy Storage
932	Oriden, LLC	Hatchery Solar	B	May-25	20.0	20.0	20.0	20.0	Solar
935	SED NY Holdings LLC	Augustus Solar	E	Dec-26	20.0	N/A	20.0	20.0	Solar
945	Niagara Grid I, LLC	Niagara Grid I	A	Dec-25	20.0	N/A	20.0	20.0	Energy Storage
1000	SED NY Holdings LLC	SunEast Flat Stone Solar LLC	E	Nov-26	20	N/A	20	20	Solar
1003	Clear View, LLC	Clear View Solar	C	Jun-24	20.0	20.0	20.0	20.0	Solar
1015	Granada Solar, LLC	Somers Solar, LLC	F	Dec-24	20.0	N/A	20.0	20.0	Solar
1018	Naturgy Candela DevCo LLC	Stone Mill Solar	F	Jan-25	20.0	N/A	20.0	20.0	CSR(Solar+Energy Storage)
1039	SED NY Holdings LLC	Morris Solar	E	Dec-25	20.0	N/A	20.0	20.0	Solar
1047	SED NY Holdings LLC	Millers Grove Solar	E	Dec-26	20.0	N/A	20.0	20.0	Solar
1051	SED NY Holding LLC	Transit Solar	B	Dec-25	20.0	N/A	20.0	20.0	Solar
1059	ACE DEVCO NC, LLC	Jaton	C	Nov-25	16.2	N/A	16.2	16.2	Solar
1061	ACE DEVCO NC, LLC	Teele	E	Jul-24	19.8	N/A	19.8	19.8	Solar
1092	SED NY Holding LLC	Hampton Corners Solar	B	Dec-25	20.0	N/A	20.0	20.0	Solar
1098	SED NY Holdings LLC	Kingbird Solar	A	Dec-26	20.0	N/A	20.0	20.0	Solar
1113	Caithness LI Energy Storage, LLC	CLIES 20 MW	K	Dec-25	20	N/A	20	20	Energy Storage
1212	EMEREN US, LLC	Roosevelt Solar LLC	D	Dec-25	19.9	N/A	19.9	19.9	CSR(Solar+Energy Storage)

*CODs used when the ATBA were developed.

[7] Small Generating Facilities included in the ATBA are those that reached the Facilities Study stage in the Small Generator Interconnection Procedures, specifically, execution of a Facilities Study Agreement. The projects listed in this table are in addition to the Small Generating Facilities already modeled in the FERC 715 2023 case.

Table 7: Transmission Projects Included in the CY23 5-year-ahead Plans in the ATBA Summer 2028

Project Queue Position	Transmission Owner	Terminals		Line Length in Miles	Expected In-Service Date/Yr Prior to	Year	Nominal Voltage in kV		# of ckts	Thermal Ratings (3)	
							Operating	Design		Summer	Winter
545A	NextEra Energy Transmission NY	Dysinger (New Station)	East Stolle (New Station)	20	In-Service	2022	345	345	1	1356 MVA	1612 MVA
545A	NextEra Energy Transmission NY	Dysinger (New Station)	Dysinger (New Station)	N/A (PAR)	In-Service	2022	345	345	1	700 MVA	700 MVA
556	LSP/NGRID	Porter	Rotterdam	-71.8	Removed	2022	230	230	1	1066	1284
556	LSP/NGRID	Porter	Rotterdam	-72.1	Removed	2022	230	230	1	1066	1284
556	LSP/NGRID	Edic	New Scotland	-83.5	Removed	2022	345	345	1	2190	2718
556	NGRID	Rotterdam	New Scotland	-18.1	Removed	2022	115	230	1	1212	1284
556	LSP/NGRID	Edic	Gordon Rd (New Station)	68.7	In-Service	2022	345	345	1	3410	3709
556	LSP/NGRID	Gordon Rd (New Station)	New Scotland	24.9	In-Service	2022	345	345	1	2190	2718
556	LSP	Gordon Rd (New Station)	Rotterdam	N/A (Transformer)	In-Service	2022	345/230	345/230	1	637 MVA	760 MVA
556	LSP	Gordon Rd (New Station)	Rotterdam	N/A (Transformer)	In-Service	2022	345/230	345/230	1	637 MVA	783 MVA
556	LSP/NGRID	Gordon Rd (New Station)	New Scotland	-24.9	S	2023	345	345	1	2190	2718
556	LSP	Gordon Rd (New Station)	Princetown (New Station)	5.3	S	2023	345	345	1	3410	3709
556	LSP	Princetown (New Station)	New Scotland	20.1	S	2023	345	345	2	3410	3709
556	LSP/NGRID	Princetown (New Station)	New Scotland	19.8	S	2023	345	345	1	2190	2718
556	LSP/NYPA/NGRID	Edic	Princetown (New Station)	67.0	W	2023	345	345	2	3410	3709
556	NYPA	Edic	Marcy	1.4	W	2023	345	345	1	3150	3750
543	NGRID	Greenbush	Hudson	-26.4	W	2023	115	115	1	648	800
543	NGRID	Hudson	Pleasant Valley	-39.2	W	2023	115	115	1	648	800
543	NGRID	Schodack	Churchtown	-26.7	W	2023	115	115	1	937	1141
543	NGRID	Churchtown	Pleasant Valley	-32.2	W	2023	115	115	1	806	978
543	NGRID	Milan	Pleasant Valley	-16.8	W	2023	115	115	1	806	978
543	NGRID	Lafarge	Pleasant Valley	-60.4	W	2023	115	115	1	584	708
543	NGRID	North Catskill	Milan	-23.9	W	2023	115	115	1	937	1141
543	NGRID	New Scotland	Alps	-30.6	W	2023	345	765	1	2015	2140
543	New York Transco	Hudson	Churchtown	7.2	In-Service	2022	115	115	1	648	798
543	New York Transco	Churchtown	Blue Stores	9.0	In-Service	2022	115	115	1	1114	1360
	New York Transco	Blue Stores	Milan	10.8	In-Service	2023	115	115	1	879	1099
	New York Transco	Milan	Pleasant Valley	16.9	W	2023	115	115	1	648	848

Project Queue Position	Transmission Owner	Terminals		Line Length in Miles	Expected In-Service Date/Yr Prior to	Year	Nominal Voltage in kV		# of ckts	Thermal Ratings (3)	
							Operating	Design		Summer	Winter
543	NGRID	Lafarge	Churchtown	28.2	W	2023	115	115	1	582	708
543	NGRID	North Catskill	Churchtown	8.4	W	2023	115	115	1	648	848
543	New York Transco	Knickerbocker (New Station)	Pleasant Valley	54.5	W	2023	345	345	1	3844	4106
543	New York Transco	Knickerbocker (New Station)	Knickerbocker (New Station)	N/A (Series Capacitor)	W	2023	345	345	1	3862	4103
543	NGRID	Knickerbocker (New Station)	New Scotland	12.4	W	2023	345	345	1	2381	3099
543	NGRID	Knickerbocker (New Station)	Alps	18.1	W	2023	345	345	1	2552	3134
543	New York Transco	Rock Tavern	Sugarloaf	12.0	W	2023	115	115	1	1657	2026
543	New York Transco	Sugarloaf	Sugarloaf	N/A (Transformer)	W	2023	138/115	138/115	---	1652	1652
	New York Transco	Sugarloaf (Transco)	Sugarloaf (O&R)	0.14	W	2023	138	138	1	1657	2026
543	New York Transco	Van Wagner (New Station)	---	N/A (Capacitor Bank)	W	2023	345	345	---	N/A	N/A
543	NGRID	Athens	Pleasant Valley	-39.39	W	2023	345	345	1	2228	2718
543	NGRID	Leeds	Pleasant Valley	-39.34	W	2023	345	345	1	2228	2718
543	NGRID	Athens	Van Wagner (New Station)	38.65	W	2023	345	345	1	2228	2718
543	NGRID	Leeds	Van Wagner (New Station)	38.63	W	2023	345	345	1	2228	2718
543	New York Transco	Van Wagner (New Station)	Pleasant Valley	0.71	W	2023	345	345	1	3864	4096
543	New York Transco	Van Wagner (New Station)	Pleasant Valley	0.71	W	2023	345	345	1	3864	4096
543	New York Transco	Dover (New Station)	Dover (New Station)	N/A (Phase Shifter)	W	2023	345	345	---	2510	2510
543	ConEd	Cricket Valley	CT State Line	-3.46	W	2023	345	345	1	2220	2700
543	ConEd	Cricket Valley	Dover (New Station)	0.30	W	2023	345	345	1	2220	2700
543	ConEd	Dover (New Station)	CT State Line	3.13	W	2023	345	345	1	2220	2700
1125	NYPA	Edic	Marcy	1.4	W	2025	345	345	1	4030	4880
1125	NYPA	Moses	Haverstock	2	W	2025	230	230	3	1089	1330
1125	NYPA	Moses	Moses	N/A (Substation)_	W	2025	230	230	N/A	N/A	N/A
1125	NYPA	Haverstock 230 kV	Haverstock 345 kV	N/A (Transformer)	W	2025	230/345	230/345	3	753	753
1125	NYPA	Haverstock	Haverstock	N/A (Substation)_	W	2025	345	345	N/A	N/A	N/A
1125	NYPA	Haverstock	Adirondack	83.7	W	2025	345	345	2	2177	2663
1125	NYPA	Adirondack 115 kV	Adirondack 345 kV	N/A (Transformer)	W	2025	115/345	115/345	1	192	221
1125	NYPA	Adirondack	Adirondack	N/A (Substation)_	W	2025	345	345	N/A	N/A	N/A
1125	NYPA	Haverstock	Willis	34.99	W	2025	345	345	2	3119	3660

Project Queue Position	Transmission Owner	Terminals		Line Length in Miles	Expected In-Service Date/Yr Prior to	Year	Nominal Voltage in kV		# of ckts	Thermal Ratings (3)	
							Operating	Design		Summer	Winter
1125	NYPA	Willis 345 kV	Willis 230 kV	N/A (Transformer)	W	2025	345/230	345/230	2	2259	2259
1125	NYPA	Willis	Willis	N/A (Substation)_	W	2025	230	230	N/A	N/A	N/A
1125	NYPA	Willis	Patnode	8.65	W	2025	230	230	2	2078	2440
1125	NYPA	Willis	Ryan	6.59	W	2025	230	230	2	2078	2440
1125	NYPA	Ryan	Ryan	N/A (Substation)_	W	2025	230	230	N/A	N/A	N/A
1125	NYPA	Patnode	Patnode	N/A (Substation)_	W	2025	230	230	N/A	N/A	N/A
1125	NYPA	Willis (Existing)	Willis (New)	0.4	W	2025	230	230	2	2078	2440
1125	NYPA/NGRID	Adirondack	Austin Road	11.6	W	2025	345	345	1	3119	3660
1125	NYPA/NGRID	Adirondack	Marcy	52.6	W	2025	345	345	1	3119	3660
1125	NGRID	Austin Road	Edic	42.5	W	2025	345	345	1	3119	3660
1125	NGRID	Rector Road	Austin Road	1	W	2025	230	230	1	1089	1330
1125	NGRID	Austin Road 230 kV	Austin Road 345 kV	N/A (Transformer)	W	2025	230/345	230/345	1	753	753
1125	NGRID	Austin Road	Austin Road	N/A (Substation)_	W	2025	345	345	N/A	N/A	N/A
1125	NGRID	Edic	Edic	N/A (Substation)_	W	2025	345	345	N/A	N/A	N/A
1125	NGRID	Edic 345kV	Edic 230kV	N/A (Transformer)	W	2025	345/230	345/230	1	N/A	N/A
1125	NYPA	Marcy	Marcy	N/A (Substation)_	W	2025	345	345	N/A	N/A	N/A
1125	NGRID	Chases Lake	Chases Lake	N/A (Substation)_	W	2025	230	230	N/A	N/A	N/A
1125	NYPA	Moses	Massena	N/A (Series Reactor)	W	2025	230	230	2	3840	4560
1125	NYPA	Moses	Adirondack	-85.7	W	2025	230	230	2	N/A	N/A
1125	NYPA	Moses	Willis	-36.99	W	2025	230	230	2	N/A	N/A
1125	NGRID	Adirondack	Porter	-54.41	W	2025	230	230	1	N/A	N/A
1125	NGRID	Adirondack	Chases Lake	-11.05	W	2025	230	230	1	N/A	N/A
1125	NGRID	Chases Lake	Porter	-43.46	W	2025	230	230	1	N/A	N/A
1125	NYPA	Willis	Patnode	-8.65	W	2025	230	230	1	N/A	N/A
1125	NYPA	Willis	Ryan	-6.59	W	2025	230	230	1	N/A	N/A
1125	NGRID	Edic	Porter	-0.39	W	2025	230	230	1	N/A	N/A
1125	NGRID	Porter	Porter	N/A (Transformer)	W	2025	230/115	230/115	2	N/A	N/A
1125	NGRID	Porter	Porter	N/A (Substation)_	W	2025	230	230	N/A	N/A	N/A
	CHGE	Hurley Avenue	Leeds	N/A (Static Synchronous Series Compensator)	S	2023	345	345	1	2336	2866

Project Queue Position	Transmission Owner	Terminals		Line Length in Miles	Expected In-Service Date/Yr Prior to	Year	Nominal Voltage in kV		# of ckts	Thermal Ratings (3)	
							Operating	Design		Summer	Winter
	CHGE	Rock Tavern	Sugarloaf	-12.1	W	2022	115	115	1	N/A	N/A
	CHGE	Knapps Corners 115	Knapps Corners 69	N/A (Transformer)	S	2023	115/69	115/69	1	100 MVA	123 MVA
	CHGE	Kerhonkson	Kerhonkson	N/A (Transformer)	W	2023	115/69	115/69	1	827	1006
	CHGE	Kerhonkson	Kerhonkson	N/A (Transformer)	W	2023	115/69	115/69	1	827	1006
	CHGE	High Falls	Kerhonkson	10.03	W	2023	115	115	1	1010	1245
	CHGE	Galeville	Kerhonkson	9.16	W	2023	115	115	1	1010	1245
	CHGE	Sugarloaf	NY/NJ State Line	-10.3	W	2024	115	115	2	N/A	N/A
	CHGE	St. Pool	High Falls	5.69	W	2024	115	115	1	1010	1245
	CHGE	Modena	Galeville	4.62	W	2024	115	115	1	1010	1245
	CHGE	Knapps Corners	Spackenkill	2.36	W	2024	115	115	1	1280	1563
	CHGE	Hurley Ave	Saugerties	11.50	W	2025	69	115	1	1114	1359
	CHGE	Saugerties	North Catskill	12.46	W	2025	69	115	1	1114	1359
	ConEd	Hudson Ave East	New Vinegar Hill Distribution Switching Station	N/A (Transformer/ PAR/Feeders)	In-Service	2022	138/27	138/27		N/A	N/A
	ConEd	Rainey	Corona	N/A (Transformer/ PAR/Feeder)	S	2023	345/138	345/138		N/A	N/A
	ConEd	Millwood West	Millwood West	N/A (Transformer)	S	2024	345/138	345/138		N/A	N/A
	ConEd	Gowanus	Greenwood	N/A (Transformer/ PAR/Feeder)	S	2025	345/138	345/138		N/A	N/A
	ConEd	Goethals	Fox Hills	N/A (Transformer/ PAR/Feeder)	S	2025	345/138	345/138		N/A	N/A
	ConEd	Rainey	Rainey	N/A (Transformer)	S	2026	345/138	345		N/A	N/A
	ConEd	Buchanan North	Buchanan North	N/A (Reconfigurati on)	S	2026	345	345		N/A	N/A
	ConEd	Fresh Kills	Fresh Kills	N/A (Transformer)	S	2026	345/138	345		N/A	N/A
	ConEd	Astoria East	Astoria Annex	N/A (Feeder)	S	2026	138	138		2086	2599
	ConEd	Brooklyn Clean Energy Hub	-	N/A (Substation)_	S	2028	345/138	345/138		N/A	N/A
	LIPA	Round Swamp	Round Swamp	N/A	In-Service	2022	69	69		N/A	N/A
	LIPA	Round Swamp	Plainview	1.93	In-Service	2022	69	69	1	1217	1217
	LIPA	Round Swamp	Ruland Rd	3.81	In-Service	2022	69	69	1	1217	1217
	LIPA	Arverne	Far Rockaway	2.48	In-Service	2022	34.5	34.5	1	986	1035
	LIPA	Pilgrim	Pilgrim	N/A	S	2023	69	69		N/A	N/A
	LIPA	Terryville	Flowerfield	4.74	W	2023	69	69	1	996	1054
	NGRID	Volney	Clay	N/A	In-Service	2022	345	345	1	1200 MVA	1474 MVA

Project Queue Position	Transmission Owner	Terminals		Line Length in Miles	Expected In-Service Date/Yr Prior to	Year	Nominal Voltage in kV		# of ckts	Thermal Ratings (3)	
							Operating	Design		Summer	Winter
	NGRID	Mountain	Lockport	0.08	In-Service	2022	115	115	2	174MVA	199MVA
	NGRID	Golah	Golah	N/A (Transformer)	In-Service	2022	69	69		50MVA	50MVA
	NGRID	Niagara	Packard	3.7	In-Service	2022	115	115	1	344MVA	449MVA
	NGRID	Wolf Rd	Menands	1.34	In-Service	2022	115	115	1	182 MVA	222 MVA
	NGRID	Dunkirk	Dunkirk	N/A	W	2022	115	115	-	-	-
	NGRID	Lockport	Mortimer	56.5	W	2022	115	115	3	-	-
	NGRID	Niagara	Packard	3.7	In-Service	2022	115	115	2	344MVA	449MVA
	NGRID	Gardenville	Big Tree	6.3	W	2022	115	115	1	221MVA	221MVA
	NGRID	Big Tree	Arcade	28.6	W	2022	115	115	1	129MVA	156MVA
	NGRID	Batavia	Batavia	N/A	W	2022	115	115			
	NGRID	Kensington Terminal	Kensington Terminal	N/A	W	2022	115/23	115/23	-	50MVA	50MVA
	NGRID	Taylorville	Boonville	N/A	W	2022	115	115	1	584	708
	NGRID	Taylorville	Browns Falls	N/A	W	2022	115	115	1	569	708
	NGRID	Batavia	Batavia	N/A	W	2022	115	115			
	NGRID	Albany Steam	Albany Steam	N/A	W	2022	115	115			
	NGRID	Lockport	Lockport	N/A	W	2022	115	115	-	N/A	N/A
	NGRID	South Oswego	Indeck (#6)	N/A	S	2023	115	115	1	-	-
	NGRID	Porter	Porter	N/A	S	2023	230	230		N/A	N/A
	NGRID	Mountain	Lockport	N/A	S	2023	115	115	2	847	1000
	NGRID	Maplewood	Menands	3	S	2023	115	115	1	220 MVA	239 MVA
	NGRID	Maplewood	Reynolds	3	S	2023	115	115	1	217 MVA	265 MVA
	NGRID	Elm St	Elm St	N/A	S	2023	230/23	230/23	-	118MVA	133MVA
	NGRID	Ridge	Ridge	N/A	S	2023				N/A	N/A
	NGRID	Colton	Browns Falls	N/A	S	2023	115	115	1	629	764
	NGRID	Clay	Woodard	N/A	W	2023	115	115	1		
	NGRID/NYSEG	Mortimer	Station 56	N/A	W	2023	115	115	1	649	788
	NGRID	Gardenville	Dunkirk	0.20	W	2023	115	115	2	N/A	N/A
	NGRID	Cortland	Clarks Corners	0.2	S	2024	115	115	1	147MVA	170MVA
	NGRID	Homer Hill	Homer Hill	N/A	S	2024	115	115	-	N/A	N/A
	NGRID	Marshville	Marshville	N/A	S	2024	115/69	115/69		N/A	N/A

Project Queue Position	Transmission Owner	Terminals		Line Length in Miles	Expected In-Service Date/Yr Prior to	Year	Nominal Voltage in kV		# of ckts	Thermal Ratings (3)	
							Operating	Design		Summer	Winter
	NGRID	Packard	Huntley	9.1	W	2024	115	115	1	262MVA	275MVA
	NGRID	Walck	Huntley	9.1	W	2024	115	115	1	262MVA	275MVA
	NGRID	Station 56	Pannell	N/A	W	2024	115	115	1	649	788
	NGRID	Clay	Wetzel	3.7	W	2024	115	115	1	220 MVA	220 MVA
	NGRID	Watertown	Watertown	N/A	S	2025	115	115		N/A	N/A
	NGRID	Golah	Golah	N/A	S	2025				N/A	N/A
	NGRID	Malone	Malone	N/A	S	2025	115	115	-	753	753
	NGRID	Malone	Malone	N/A	S	2025	115	115	-	N/A	N/A
	NGRID	Terminal	Terminal	N/A	S	2025	115	115	-	N/A	N/A
	NGRID	Mohican	Mohican	N/A	W	2025	115	115		N/A	N/A
	NGRID	Oswego	Oswego	N/A	S	2026	345	345		N/A	N/A
	NGRID	Gardenville	Dunkirk	20.5	S	2026	115	115	2	1105	1346
	NGRID	Niagara	Gardenville	26.3	S	2026	115	115	1	275MVA	350MVA
	NGRID	Packard	Gardenville	28.2	S	2026	115	115	2	168MVA	211 MVA
	NGRID/NYSEG	Erie St	Gardenville	5.5	S	2026	115	115	1	139MVA	179MVA
	NGRID	Lockport	Batavia	20	S	2026	115	115	1	646	784
	NGRID	Packard	Packard	N/A	S	2026	115	115			
	NGRID	Rotterdam	Rotterdam	N/A	S	2026	115/69	115/69	-	67	76
	NGRID	Rotterdam	Schoharie	0.93	S	2026	69	115	1	77	93
	NGRID	Schenectady International	Rotterdam	0.93	S	2026	69	115	1	69	84
	NGRID	Tar Hill	Tar Hill	N/A	S	2026	115	115			
	NGRID	Inghams	Inghams	N/A	S	2026	115	115			
	NGRID	Browns Falls	Browns Falls	N/A	S	2026	115	115	-	N/A	N/A
	NGRID	Huntley	Lockport	1.2	W	2026	115	115	2	747	934
	NGRID	Oneida	Oneida	N/A	W	2026	115	115			
	NGRID	Amsterdam	Rotterdam	1	S	2027	69	69	2	584	708
	NGRID	Brockport	Brockport	3.5	S	2027	115	115	2	648	650
	NGRID	Colton	Dennison	N/A	S	2027	115	115	1	916	1118
	NGRID	Colton	Dennison	N/A	S	2027	115	115	1	916	1118

Project Queue Position	Transmission Owner	Terminals		Line Length in Miles	Expected In-Service Date/Yr Prior to	Year	Nominal Voltage in kV		# of ckts	Thermal Ratings (3)	
							Operating	Design		Summer	Winter
	NGRID	Pannell	Geneva	N/A	W	2027	115	115	2	N/A	N/A
	NGRID	Mortimer	Golah	9.7	W	2027	115	115	1	657	797
	NGRID	Lockport	Lockport	N/A	W	2027				N/A	N/A
	NGRID	Mortimer	Mortimer	N/A	W	2027	115	115		N/A	N/A
	NGRID	Boonville	Boonville	N/A	W	2027	115	115	-	N/A	N/A
	NGRID	Mortimer	Pannell	15.7	S	2028	115	115	2	221MVA	270MVA
	NGRID	SE Batavia	Golah	27.8	W	2028	115	115	1	648	846
	NRID	Indian River	Lyme Junction	8.6	W	2027	115	115	1	N/A	N/A
566	NYPA	Moses	Adirondack	78	S	2023	230	345	2	1088	1329
	NYPA	St. Lawrence 230kV	St. Lawrence 115kV	N/A (Transformer)	S	2023	230/115	230/115	1	TBD	TBD
	NYPA	Plattsburg 230 kV	Plattsburg 115 kV	N/A (Transformer)	S	2023	230/115	230/115	1	249	288
	NYPA	Fraser	Fraser	N/A (Static VAR Compensation Control)	S	2023	345	345	1	NA	NA
	NYPA	Y49 345kV	Y49 345kV	N/A (Reconductoring)	S	2023	345	345	1	TBD	TBD
580	NYPA/NGRID	STAMP	STAMP	N/A (substation_	S	2024	345/115	345/115		300 MVA	300 MVA
	NYPA	Moses	Moses	N/A (Replacement of Circuit Breakers)	W	2025	115/230	115/230		N/A	N/A
	NYSEG	Big Tree Road	Big Tree Road	N/A (Rebuild)	W	2022	115	115			
	NYSEG/ConEd	Pleasant Valley	Wood St	28	W	2023	345	345	2	3030	3480
	NYSEG/ConEd	Wood St	Millwood West	12.4	W	2023	345	345	2	3030	3480
	NYSEG/ConEd	Millwood West	Pleasant Valley	-40.4	W	2023	345	345	2	3030	3480
596	NYSEG	Hillside	E. Towanda (PJM)	N/A (Phase Shifter)	S	2025	230	230	1	498 MVA	498 MVA
	NYSEG	Wood Street	Wood Street	N/A (Transformer)	W	2023	345/115	345/115	1	327 MVA	378 MVA
	NYSEG	Coddington	E. Ithaca (to Coddington)	8.07	S	2024	115	115	1	307 MVA	307 MVA
	NYSEG	Fraser	Fraser	N/A (Transformer)	S	2024	345/115	345/115	1	305 MVA	364 MVA
	NYSEG	Fraser 115	Fraser 115	N/A (Rebuild)	S	2024	115	115		N/A	N/A
	NYSEG	Delhi	Delhi	N/A (Removal)	S	2024	115	115		N/A	N/A
	NYSEG	North Waverly	East Sayre	2.99	W	2025	115	115	1	218	261
	NYSEG	New Gardenville	New Gardenville	N/A (Transformer)	S	2026	230/115	230/115	1	316 MVA	370 MVA
	NYSEG	New Gardenville	New Gardenville	N/A (Transformer)	S	2026	115/34.5	115/34.5	1	50	60

Project Queue Position	Transmission Owner	Terminals		Line Length in Miles	Expected In-Service Date/Yr Prior to	Year	Nominal Voltage in kV		# of ckts	Thermal Ratings (3)	
							Operating	Design		Summer	Winter
	NYSEG	New Gardenville	New Gardenville	N/A (Transformer)	S	2026	115/34.5	115/34.5	2	50	60
	NYSEG	Wright Avenue	Wright Avenue	N/A (Rebuild)	S	2026	115	115		N/A	N/A
	NYSEG	Wright Avenue	Wright Avenue	N/A (Transformer)	S	2026	115/34.5	115/34.5	1	65	72.5
	NYSEG	Wright Avenue	Wright Avenue	N/A (Transformer)	S	2026	34.5/12.5	34.5/12.5	1	48.1	53.65
	NYSEG	Meyer	Meyer	N/A (Transformer)	W	2026	115/34.5	115/34.5	2	59.2MVA	66.9MVA
	NYSEG	Erie Street Rebuild	Erie Street Rebuild	N/A (Rebuild)	S	2027	115	115			
	NYSEG	South Perry	South Perry	N/A (Transformer)	S	2027	230/115	230/115	1	246 MVA	291 MVA
	NYSEG	Oakdale 115	Oakdale 115	N/A (Rebuild)	S	2027	115	115		N/A	N/A
	NYSEG	Westover 115	Westover	N/A (Removal)	S	2027	115	115		N/A	N/A
	NYSEG	Oakdale 345	Oakdale 115	N/A (Transformer)	S	2027	345/115	345/115 /34.5	1	494MVA	527 MVA
	O & R/ConEd	Ladentown	Buchanan	-9.5	S	2024	345	345	1	3000	3211
	O & R/ConEd	Ladentown	Lovett 345 kV Station (New Station)	5.5	S	2024	345	345	1	3000	3211
	O & R/ConEd	Lovett 345 kV Station (New Station)	Buchanan	4	S	2024	345	345	1	3000	3211
	O & R	Lovett 345 kV Station (New Station)	Lovett	N/A (Transformer)	S	2024	345/138	345/138	1	562 MVA	562 MVA
	RGE	Station 127	Station 127	N/A (Transformer)	W	2023	115/34.5	115/34.5	1	75MVA	75MVA
	RGE	Station 168	Mortimer (NG Trunk #2)	26.4	W	2025	115	115	1	145 MVA	176 MVA
	RGE	Station 168	Elbridge (NG Trunk # 6)	45.5	W	2025	115	115	1	145 MVA	176 MVA
	RGE	Station 418	Station 48	7.6	S	2026	115	115	1	175 MVA	225 MVA
	RGE	Station 33	Station 251 (Upgrade Line #942)	N/A	S	2026	115	115	1	400MVA	400MVA
	RGE	Station 33	Station 251 (Upgrade Line #943)	N/A	S	2026	115	115	1	400MVA	400MVA
	RGE	Station 418	Station 113 (Rebuild Line #947)	3.3	S	2027	115	115	1	267 MVA	326 MVA
	RGE	Station 113	Spencerport (Rebuild Line #947)	4.3	S	2027	115	115	1	267 MVA	326 MVA
	RGE	Spencerport	Station 70 (Rebuild Line #947)	4.5	S	2027	115	115	1	267 MVA	326 MVA
	RGE	Station 70	Station 71 (Rebuild Line #9467)	4.2	S	2027	115	115	1	267 MVA	326 MVA
	RGE	Station 71	Station 69 (Rebuild Line #945)	2.9	S	2027	115	115	1	267 MVA	326 MVA
	RGE	Station 69	Station 93 (Rebuild Line #917)	2	S	2027	115	115	1	267 MVA	326 MVA
	RGE	Station 93	Station 7 (Rebuild Line #917)	1.6	S	2027	115	115	1	218 MVA	272 MVA
	RGE	Station 82	Station 251 (Upgrade Line #902)	N/A	S	2028	115	115	1	400MVA	400MVA
	RGE	Mortimer	Station 251 (Upgrade Line #901)	1.00	S	2028	115	115	1	400MVA	400MVA

1.5 CY23 Contingent Facilities

Contingent Facilities are Attachment Facilities, SUFs and SDUs associated with prior Class Year projects which meet the ATBA inclusion rule requirements and upon which the CY23 cost allocations are dependent (*i.e.*, if delayed or not built, facilities that could impact the actual costs and timing factored into the CY23 projects' cost allocations for SUFs or SDUs.) The following were identified as Contingent Facilities for CY23 studies:

- SUF Contingent Facilities
  - The following Class Year 2017 SUFs:
    - Replacement of Wave Trap and Bushing CT at Hillside 230 kV substation
    - Reconductor of North Waverly-East Sayre 115 kV line
  - The following Class Year 2019 SUF:
    - Phase Angle Regulator (PAR) at Hillside 230 kV station on Hillside-East Towanda 230 kV line
  - The following Class Year 2021 SUFs:
    - Holbrook 138 kV BPS SUF
    - New Bridge 138 kV BPS SUF
- SDU Contingent Facilities
  - The following Class Year 2017 Long Island SDU:
    - New Terryville to Flowerfield 69 kV line
  - The following Class Year 2021 Long Island SDUs:
    - Reconductoring of South Farmingdale to Sterling 69 kV overhead line
    - Reconductoring portion of Macarthur to Bayport 69 kV overhead line
    - Reconductoring of Bayport to Greatriver 69 kV overhead
    - Reconductoring portion of Nesconset to Holbrook 69 kV overhead line

2. Thermal, Voltage, Stability and Short Circuit Analysis Introduction

The NYISO staff reviewed the results of the thermal, voltage, and stability analyses of the SRIS performed for each of the CY23 projects, and the results of other previously performed system studies (*e.g.*, most recent Area Transmission Review of the New York Bulk Power System, the Reliability Needs Assessment Study, etc.). As part of the CY23 process, NYISO staff identified specific study tasks (Study Plan) to be performed, as deemed relevant for identifying the SUFs triggered by CY23 projects under the MIS requirements, or alternatively, for informational purposes. The specific Study Plan was discussed and circulated with the CY23 IPFSWG for comments.

ATBA/ATRA transfer assessments: Based on the electrical location of CY23 projects, the following interfaces were proposed via the Study Plan definition process as potentially impacted, subject to further evaluation in the ATBA and ATRA: Dysinger East, West Central, Central East, Total East, UPNY-SENY, UPNY-ConEd, LIPA Import, Moses South, Dunwoodie South, NY-ON/ON-NY, NY-NE/NE-NY, NY-PJM/PJM-NY.

For the transfer assessments, a uniform dispatch (*i.e.*, the "t0 cases," starting from the "original cases") was employed in Zones A through I in the ATBA: All the units were placed in-service and generating at a given percentage of the unit Pmax, except specific units which were dispatched differently (*e.g.*, wind, nuclear plants, run of river units, solar, battery, flywheel, etc.). The base area interchange schedule was maintained. The ATRA starting transfer case was based on this ATBA transfer case, with CY23 projects dispatched at maximum against units throughout NYCA. While shifting power to stress an interface, the units that were set to a uniform dispatch are increased or decreased on a zonal basis, observing their maximum MW limit (Pmax). Different sources and sinks were used depending on the interface that was being analyzed, as detailed under each section. Some interfaces used shifts to discrete units to avoid creating local overloads.

The following are Applicable Reliability Requirements for transfer assessments:

- NYSRC Reliability Rules and Compliance Manual Section B. Transmission Planning [4] - While transfer limits across the transmission interfaces defined by the NYISO are not, by themselves, measures of reliability, there is potential for adverse reliability impacts to occur if transfer limits are degraded from their existing levels as the result of the addition of a new generator or transmission facility. The NYSRC Reliability Rules do not require that transfer limits be maintained at specific levels. However, in its processes to review the impacts of any proposed transmission or generation project, the NYISO should give due consideration to the possible reliability impacts that may result if the proposed project results in diminished transfer capability, per NPCC criteria.

- NYISO TEI Manual Section 3.6.1 [5]: Any potential adverse reliability impact identified by the Interconnection Study that can be managed through the normal operating procedures of the NYISO[8] and/or CTO will not be identified as a degradation of system reliability or noncompliance with the NERC, NPCC, or NYSRC reliability standards. It is assumed that the owners and operators of the proposed facilities will be subject to, and shall abide by, the applicable NYISO and/or CTO's operating procedures.

ATBA/ATRA base case assessments: thermal, voltage, stability, and short circuit (bus fault) assessments were performed on the two (ATBA and ATRA) systems, as deemed relevant for identifying the SUFs triggered by CY23 projects under the MIS requirements, or alternatively, for informational purposes. Otherwise, the SRIS results were deemed sufficient to indicate the project's relative impact on the system behavior, and already flagged potential operational limitations, which will be primarily addressed by security dispatch or other normal operating procedures.

As noted above, in addition to the assessments performed specifically for this study, NYISO also reviewed and referred to the results of the thermal, voltage, stability, short circuit, and resource adequacy studies performed in accordance with Applicable Reliability Requirements (as defined in Attachment S of the OATT). The most recent review of the New York State Bulk Power System is the 2023 Interim Area Transmission Review submitted in 2023 to NPCC, which concluded that the NY Bulk Power Transmission System, as planned through the year 2028, is in conformance with the NPCC and NYSRC criteria.

The following modeling assumptions were made in the study:

- Phase angle regulators ("PARs"), switched shunts, and LTC transformers are modeled as regulating pre-contingency and non-regulating post-contingency. The study uses PAR schedules established by the NYISO in coordination with the neighboring ISOs through the NERC and NPCC base case development processes.
- Leeds SVC, Fraser SVC and Marcy FACTS devices are set to zero pre-contingency and allowed to operate to full range post-contingency.
- In determining transfer limits, the analysis simulates generation redispatch according to the standard proportions used in NYISO transmission planning and operating studies, for NYISO interfaces. Where applicable, for local interfaces, generation re-dispatching is performed in

[8] See NYISO TEI Manual, Attachment L: Normal ISO Operating Procedures.

accordance with Transmission Owner standards and practices.

The study was performed in accordance with the Applicable Reliability Requirements, which include NYSRC Reliability Rules, NPCC Basic Design and Operating Criteria, NERC Planning Standards, ISO rules, practices and procedures, and the Connecting Transmission Owner criteria included in FERC Form No. 715.

The results of the specific CY23 assessments are discussed in the following sections. For analysis which were not repeated for local thermal and voltage studies, please refer to CY23 projects' individual SRIS reports for study results.

3. Thermal Transfer Analysis

3.1 Thermal Transfer Assessments

NYISO staff used the TARA program to perform the thermal transfer analysis. The NYCA open and closed interfaces identified in Section 2.0 and all the 100 kV and above transmission lines in the vicinity of these interfaces were monitored. The definition of the selected interfaces is in Appendix B.

As described in Section 1.4, developed design criteria contingencies were evaluated on both ATBA and ATRA systems. All contingencies studied were in accordance with the Applicable Reliability Rules. The Design Criteria Contingencies examined include the individual opening of all lines connected between buses with base voltage between 100 kV and 765 kV and all appropriate common structure, stuck breaker, generator, multiple elements, and loss of DC contingencies. Phase Angle Regulators (PARs) maintained their scheduled power flow pre-contingency and remained fixed at their corresponding pre-contingency angle for post-contingency. The general direction of generation shifts was from the North and West to Southeastern New York. When an interface besides the one being studied became limiting, the general shift pattern was modified, within the base case conditions and limitations, to minimize this effect. However, no attempt was made to find the maximum limits based on an ideal shift pattern.

Inter-Area Study Interfaces

In accordance with the CY23 Final Scope presented to IPFSWG on May 25, 2023, the CY23 Study included a thermal transfer assessment to determine the incremental impact of the Projects on the Normal and Emergency transfer limits of the NY-ON/ON-NY, NY-NE/NE-NY and NY-PJM/PJM-NY interfaces.

Table 8 and **Table 9** provide summaries using normal and emergency transfer criteria for thermal transfer limits determined for the inter-area interfaces, under the study assumptions. Additional details regarding the thermal transfer analysis results are provided in Appendix C.

The CY23 projects have no negative impact on the inter-area interfaces for normal transfer capability. The decrease observed on the inter-area interfaces for normal transfer capability can be alleviated through normal operating procedures (transmission and generation dispatch system adjustments) in accordance with the MIS.

The CY23 projects have no negative impact on the inter-area interfaces for emergency transfer capability. The decrease observed on the inter-area interfaces for emergency transfer capability can be alleviated through normal operating procedures (transmission and generation dispatch system adjustments) in accordance with the MIS.

Table 8: Normal Transfer Criteria – Thermal Limits for Inter-Area Interfaces (MW)

Interface	Source	Sink	ATBA		ATRA		Impact
			Flow	Constraint	Flow	Constraint	
NY-NE	Capital (F) 35% NYC (J) 65%	NE_South 50% NE_North 50%	1730	(1)	1744	(1)	13.3
NE-NY	NE_South 50% NE_North 50%	Capital (F) 35% NYC (J) 65%	1275	(2)	1345	(2)	70.2
NY-ON	Central (C) 60% Capital (F) 40%	ON	1238	(3)	1445	(4)	206.8
ON-NY	ON	Central (C) 60% Capital (F) 25% Hudson (G) 5% NYC (J) 10%	2167	(5)	2208	(6)	40.9
NY-PJM	A – G 90% I – J 10%	PJM	1099	(7)	1514	(8)	415.4
PJM-NY	PJM	A – G 90% I – J 10%	1004	(9)	1034.6*	(9)	31.1

*Applicable system adjustments were applied

Notes:

(1)	137885 HOOSICK 115 107931 NE_K6_NY 115 1	LTE	245	MW	L/O	BF_NTHFLD_2T
(2)	115005 NE_E205W_NY 230 137562 EASTOVER RD 230 1	LTE	505	MW	L/O	BO_393
(3)	147842 NIAGAR2W 230 157063 BECK_#2_PA27 230 1	LTE	460	MW	L/O	Beck 2 L35L76
(4)	147842 NIAGAR2W 230 157063 BECK_#2_PA27 230 1	LTE	460	MW	L/O	Beck 2 DT302
(5)	157051 BECK_#2_H302 345 147834 NIAG 345 345 1	LTE	1322	MW	L/O	SB:NIAG345_3008
(6)	157063 BECK_#2_PA27 230 147842 NIAGAR2W 230 1	LTE	460	MW	L/O	Beck 2 T301
(7)	130838 OAKDL115 115 200680 26LAUREL L 115 1	LTE	128	MW	L/O	PN_P1-2_PN-230-036_SRT-A
(8)	130838 OAKDL115 115 200680 26LAUREL L 115 1	LTE	128	MW	L/O	PN_P2-1_PN-230-003_SRT-A
(9)	200676 26E.SAYRE 115 130836 N.WAV115 115 1	Norm	176	MW		Base Case

Table 9: Emergency Transfer Criteria – Thermal Limits for Inter-Area Interfaces (MW)

Interface	Source	Sink	ATBA		ATRA		Impact
			Flow	Constraint	Flow	Constraint	
NY-NE	Capital (F) 35% NYC (J) 65%	NE_South 50% NE_North 50%	1966	(1)	1999	(1)	33
NE-NY	NE_South 50% NE_North 50%	Capital (F) 40% NYC (J) 60%	1461	(2)	1531	(2)	70
NY-ON	Central (C) 60% Capital (F) 40%	ON	1495	(3)	1717	(3)	223
ON-NY	ON	Central (C) 60% Capital (F) 25% Hudson (G) 5% NYC (J) 10%	2717	(4)	2751.1*	(4)	34.1
NY-PJM	A – G 90% I – J 10%	PJM	1258	(5)	1656	(6)	398
PJM-NY	PJM	A – G 90% I – J 10%	1004	(7)	1034.6*	(7)	31.1

*Applicable system adjustments were applied

Notes:

(1)	137450 ALPS345 345 116034 NE_393_NY 345 1	STE	1912	MW	L/O	GEN: SEAB&OMS
(2)	115005 NE_E205W_NY 230 137562 EASTOVER RD 230 1	STE	560	MW	L/O	ALPSBERK393
(3)	147842 NIAGAR2W 230 157063 BECK_#2_PA27 230 1	Norm	400	MW		Base Case
(4)	157063 BECK_#2_PA27 230 147842 NIAGAR2W 230 1	STE	558	MW	L/O	NIAGARA - BECK_TSA 345 PA301
(5)	130838 OAKDL115 115 200680 26LAUREL L 115 1	STE	143	MW	L/O	PN_P1-2_PN-230-036_SRT-A
(6)	130838 OAKDL115 115 200680 26LAUREL L 115 1	STE	143	MW	L/O	PN_P2-1_PN-230-003_SRT-A
(7)	200676 26E.SAYRE 115 130836 N.WAV115 115 1	Norm	176	MW		Base Case

Intra-Area Study Interfaces

In accordance with the final CY23 Study Scope presented to IPFSWG on May 25, 2023, the CY23 Study included a thermal transfer assessment to determine the incremental impact of the Projects on the Normal and Emergency transfer limits of the Dysinger East, West Central, Volney East, Moses South, Total East, Central East, UPNY-ConEd, UPNY-SENY, Dunwoodie South and LIPA Import interfaces.

Table 10 and **Table 11** provide summaries using normal and emergency transfer criteria for thermal transfer limits determined for the intra-area interfaces, under the study assumptions. Additional details regarding the thermal transfer analysis results are provided in Appendix C.

The CY23 projects have no negative impact on the intra-area interfaces for normal transfer capability. The decrease observed on the transfer limits for intra-area interfaces can be alleviated through normal operating procedures (transmission system adjustments and generation re-dispatch) in accordance with the MIS.

The CY23 projects have no negative impact on the intra-area interfaces for emergency transfer capability except. The decrease observed on the transfer limits for emergency intra-area interfaces can be alleviated through normal operating procedures (transmission system adjustments and generation re-dispatch) in accordance with the MIS.

Table 10: Normal Transfer Criteria – Thermal Limits for Intra-Area Interfaces (MW)

Interface	Source	Sink	ATBA		ATRA		Impact
			Flow	Constraint	Flow	Constraint	
Dysinger East (Open)	ON-A	G-I	1734	(1)	1886	(2)	152
Dysinger East (Closed)	ON-A	G-I	2914	(1)	3002*	(2)	88
West Central (Open)	ON-B	G-I	728	(1)	1316	(2)	588
West Central (Closed)	ON-B	G-I	1915	(1)	2319	(2)	404
Volney East (Open)	ON-C	G-I	5112	(3)	5111*	(4)	-1

Interface	Source	Sink	ATBA		ATRA		Impact
			Flow	Constraint	Flow	Constraint	
Volney East (Closed)	ON-C	G-I	5916	(3)	5915*	(4)	-1
Moses South (Open)	D	G-I	3471	(5)	3802	(6)	331
Moses South (Closed)	D	G-I	3543	(5)	3875	(6)	331
Total East	ON-E	G-I	7121	(7)	7391	(9)	270
Central East	ON-E	G-I	4230	(8)	4636	(9)	406
UPNY-ConEd (Open)	ON-G	J	8172	(10)	8191	(11)	18.8
UPNY-ConEd (Closed)	ON-G	J	9134	(10)	9153	(11)	18.9
UPNY-SENY (Open)	ON-F	J	7165	(12)	7349	(7)	185
UPNY-SENY (Closed)	ON-F	J	7449	(12)	7683	(7)	234
Dunwoodie South (Open)	ON-G	J	4167	(13)	4166*	(13)	-1
Dunwoodie South (Closed)	ON-G	J	4468	(13)	4466*	(13)	-2
LIPA Import	A-G	K	1621	(14)	1621*	(14)	0

*Applicable system adjustments were applied

Notes:

(1)	147834 NIAG 345	345 148770 DYSINGER 345 1	LTE	1501	MW	L/O	NIAG - DYSINGER ND2
(2)	148770 DYSINGER	345 148773 QP580_POI2 345 1	LTE	1501	MW	L/O	DYSINGER - Q580 STAMP POI1
(3)	135204 FRACCSC	345 130750 COOPC345 345 1	LTE	1721	MW	L/O	T:EDIC-PRNCTWN345&41
(4)	130755 OAKDL345	345 130753 FRASR345 345 1	LTE	1314	MW	L/O	T:40&41_CE07
(5)	136759 BRNS FLS	115 136807 TAYLORVL 115 1	LTE	120	MW	L/O	BUS:115:TAY WHITE
(6)	148975 Q800 POI	345 147835 ADRON B1 345 2	LTE	1501	MW	L/O	SB:ADK_108_PostQ1125
(7)	130750 COOPC345	345 148995 DOLSON_AVE 345 2	LTE	1793	MW	L/O	SB:ROCK345_31153

(8)	148963 Q556 NS66K 345 701800 KNICKERBOCKR 345 1	LTE	1931	MW	L/O	T:41&33_CE08
(9)	148965 PRNCTWN 345 137452 N.SCOT77 345 1	LTE	1512	MW	L/O	DCT:PRINCNTWN-NSCOT 361/362
(10)	126294 PLTVLLEY 345 126306 WOOD B 345 1	LTE	2330	MW	L/O	T:F38&F39_UC02
(11)	146874 LOVETT345 ST 345 126263 BUCHANAN S 345 1	LTE	1994	MW	L/O	T:F30&F31_UC21
(12)	130750 COOPC345 345 146754 MDTN TAP 345 1	LTE	1874	MW	L/O	DOLSON - ROCKT DART-44 345
(13)	126266 DUNWOODIE 345 126600 REAC71 345 SR	LTE	925	MW	L/O	SB:DUNW345_7
(14)	126266 DUNWOODIE 345 128835 SHORE RD 345 1	LTE	963	MW	L/O	SB:SPRA345_RNS2
(15)	126266 DUNWOODIE 345 128835 SHORE RD 345 1	LTE	963	MW	L/O	700881 Q680INVXFMR 345 700882 Q680INV 382 1

Table 11: Emergency Transfer Criteria – Thermal Limits for Intra-Area Interfaces (MW)

Interface	Source	Sink	ATBA		ATRA		Impact
			Flow	Constraint	Flow	Constraint	
Dysinger East (Open)	ON-A	G-I	2021	(1)	2167	(2)	145.2
Dysinger East (Closed)	ON-A	G-I	3248	(1)	3330*	(2)	82
West Central (Open)	ON-B	G-I	1038	(1)	1619	(2)	581.6
West Central (Closed)	ON-B	G-I	2275	(1)	2672	(2)	396.7
Volney East (Open)	ON-C	G-I	5545	(3)	5724	(4)	178.9
Volney East (Closed)	ON-C	G-I	6349	(3)	6577	(4)	228.1
Moses South (Open)	D	G-I	4185	(5)	4240	(6)	54.9
Moses South (Closed)	D	G-I	4258	(5)	4313	(6)	54.9
Total East	ON-E	G-I	7441	(7)	8335	(3)	894.2
Central East	ON-E	G-I	4923	(8)	5190	(3)	267.2
UPNY-ConEd (Open)	ON-G	J	9906	(9)	9964	(9)	58.6
UPNY-ConEd (Closed)	ON-G	J	10867	(9)	10926	(9)	58.6

Interface	Source	Sink	ATBA		ATRA		Impact
			Flow	Constraint	Flow	Constraint	
UPNY-SENY (Open)	ON-F	J	7925	(10)	7907*	(7)	-18
UPNY-SENY (Closed)	ON-F	J	8209	(10)	8192*	(7)	-17
Dunwoodie South (Open)	ON-G	J	4446	(11)	4501	(11)	55.4
Dunwoodie South (Closed)	ON-G	J	4746	(11)	4802	(11)	55.4
LIPA Import	A-G	K	1690	(12)	1674*	(12)	-16

*Applicable system adjustments were applied

Notes:

(1)	147834 NIAG 345 345 148770 DYSINGER 345 1	STE	1685	MW	L/O	NIAG - DYSINGER ND2
(2)	148770 DYSINGER 345 148773 QP580_POI2 345 1	STE	1685	MW	L/O	DYSINGER - Q580 STAMP POI1
(3)	135204 FRACCSC 345 130750 COOPC345 345 1	STE	1793	MW	L/O	MARCY - COOPERS 345 UCC2-41
(4)	130755 OAKDL345 345 130753 FRASR345 345 1	STE	1314	MW	L/O	MARCY - COOPERS 345 UCC2-41
(5)	148604 WILLISW345 345 147741 NH3453-B 345 1	STE	2086	MW	L/O	HW2
(6)	148975 Q800 POI 345 147835 ADRON B1 345 2	STE	1685	MW	L/O	HA1
(7)	130750 COOPC345 345 148995 DOLSON_AVE 345 2	STE	1793	MW	L/O	OE:COOPC_34
(8)	135204 FRACCSC 345 130750 COOPC345 345 1	Norm	1495	MW		Base Case
(9)	126294 PLTVLLEY 345 126306 WOOD B 345 1	Norm	1810	MW		Base Case
(10)	148995 DOLSON_AVE 345 125001 ROCK TAV 345 2	STE	2195	MW	L/O	OE:COOPC_34
(11)	126266 DUNWOODIE 345 126600 REAC71 345 SR	Norm	785	MW		Base Case
(12)	126266 DUNWOODIE 345 128835 SHORE RD 345 1	Norm	690	MW		Base Case

Sensitivity Analysis on Dunwoodie South Interface

A sensitivity analysis of intra-area thermal transfer assessment was performed for Dunwoodie South interface to evaluate the incremental impact of CY23 projects impact. Local design contingencies were tested on three sensitivity scenarios including Q1016+Q1017+Q1199 In-Service, Q1016+Q1199 only In-Service, and Q1017 only In-Service.

Table 12 and **Table 13** provide summaries of the normal and emergency transfer intra-area thermal transfer assessment sensitivity analysis for Dunwoodie South.

For normal transfer, degradations were observed for all three sensitivity scenarios. The observed transfer capability degradations cannot be managed through normal operating procedures and therefore require an SUF to mitigate the negative impact on transfer limits for Dunwoodie South interface. The SUF consists of uprating existing Mott Haven-Rainey 345 kV Circuits 1 & 2 (line # Q11 and Q12) to the LTE rating of 1015 MVA. Detailed cost allocation of this SUF is discussed in **Section 11.3**.

For emergency transfer, there were no degradations observed for the three sensitivity scenarios. Additional details regarding the thermal transfer analysis results are provided in Appendix C.

Table 12: Normal Transfer Criteria - Summary of Dunwoodie South Interface Sensitivity Results

Interface	Source	Sink	ATBA		ATRA (Q1016+Q1017+Q1199_In-service)		Impact	ATRA (Q1016+Q1199_ In-service)		Impact	ATRA (Q1017_ In-service)		Impact
			Flow	Constraint	Flow	Constraint		Flow	Constraint		Flow	Constraint	
Dunwoodie South (Open)	ON-G	J	4167	(11)	4083*	(12)	-84	4076*	(12)	-91	3991*	(13)	-176
Dunwoodie South (Closed)	ON-G	J	4468	(11)	4384*	(12)	-84	4377*	(12)	-91	4291*	(13)	-176

*Applicable system adjustments were applied

Notes:

(11)	126266 DUNWOODIE 345 126600 REAC71 345 SR	Norm	785	MW	L/O	Base Case
(12)	126641 MOTT HAVEN 345 700260 MH-RNE_TAPA 345 3	LTE	925	MW	L/O	A345:P1_Q12_MOTT_HAVEN
(13)	126641 MOTT HAVEN 345 700260 MH-RNE_TAPA 345 3	LTE	925	MW	L/O	SB:MOTT345_4

Table 13: Emergency Transfer Criteria - Summary of Dunwoodie South Interface Sensitivity Results

Interface	Source	Sink	ATBA		ATRA (Q1016+Q1017+Q1199_In-service)		Impact	ATRA (Q1016+Q1199_ In-service)		Impact	ATRA (Q1017_ In-service)		Impact
			Flow	Constraint	Flow	Constraint		Flow	Constraint		Flow	Constraint	
Dunwoodie South (Open)	ON-G	J	4446	(11)	4476	(11)	31	4472	(11)	27	4474	(11)	29
Dunwoodie South (Closed)	ON-G	J	4746	(11)	4777	(11)	31	4773	(11)	27	4775	(11)	29

Notes:

(11)	126266 DUNWOODIE 345 126600 REAC71 345 SR	Norm	785	MW	L/O	Base Case

Table 14 presents the results with proposed SUF solution applied to restore the transfer levels of Dunwoodie South interface for normal transfer assessment.

Table 14: Normal Transfer with SUF Solution - Summary of Dunwoodie South Interface

Interface	Source	Sink	ATBA		ATRA (Q1016+Q1017+Q1199_In-service) + SUF Solution		Impact	ATRA (Q1016+Q1199_ In-service) + SUF Solution		Impact	ATRA (Q1017_ In-service) + SUF Solution		Impact
			Flow	Constraint	Flow	Constraint		Flow	Constraint		Flow	Constraint	
Dunwoodie South (Open)	ON-G	J	4167	(11)	4262*	(14)	95	4255*	(15)	88	4170*	(15)	3
Dunwoodie South (Closed)	ON-G	J	4468	(11)	4563*	(14)	95	4556*	(15)	88	4470*	(15)	2

*Applicable system adjustments were applied

Notes:

(11)	126266 DUNWOODIE 345 126600 REAC71 345 SR	Norm	785	MW	L/O	Base Case
(14)	126641 MOTT HAVEN 345 700260 MH-RNE_TAPA 345 3	LTE	1015	MW	L/O	A345:P1_Q12_MOTT_HAVEN
(15)	126641 MOTT HAVEN 345 700260 MH-RNE_TAPA 345 3	LTE	1015	MW	L/O	SB:MOTT345_4

3.2 Voltage Transfer Analysis

Methodology

Voltage-constrained transfer limit analysis is performed to evaluate the adequacy of the system post-contingency voltage and to find the region of voltage instability. As the transfer level across an interface is increased, the voltage-constrained transfer limit is determined to be the lower of: (1) the pre-contingency power flow at which the pre/post-contingency voltage falls below the voltage limit criteria; or (2) 95% of the pre-contingency power flow at the “nose” of the post-contingency PV curve. The nose” is the point at which the slope of the PV curve becomes infinite (i.e., vertical). Reaching the “nose” (which is the point of voltage collapse) occurs when reactive capability supporting the transfer of real power is exhausted. The region near the “nose” of the curve is generally referred to as the region of voltage instability.

Voltage-constrained transfer limit analysis is performed using PowerGEM TARA software on both the ATBA (case without CY23 projects) and the ATRA (case with CY23 projects) summer peak load cases in accordance with the NYISO methodology for Assessment of Transfer Capability. The analysis assesses the impact of the CY23 projects on the voltage transfer limits of those interfaces that are most likely to be affected by the CY23 projects.

Voltage transfer cases are created from the summer 2028 peak load cases. A set of power flow cases with increasing transfer levels is created for each interface from the 2028 summer peak load voltage transfer case by applying generation shifts similar to those used for thermal transfer analysis. While constructing the voltage transfer cases, in order to maintain bus voltage within the applicable pre-and post-contingency limits under transfer conditions, adjustments are made to reactive power sources (*e.g.*, generators, PARs, autotransformers).

The NYISO evaluates the voltage-constrained transfer limits for the Dysinger East, West Central, Central East, Total East, UPNY-SENY, UPNY-ConEd, and Dunwoodie South interfaces. The other interfaces within NYCA either are historically thermally limited or show no potential degradation through the individual interconnection queue project system reliability impact studies (SRIS). The impact of the CY23 projects on the voltage transfer limits is measured by comparing the corresponding limit between ATBA and ATRA cases.

Discussion

Table 15 provides a summary of the voltage-constrained transfer limits.

Table 15: Voltage Transfer Limits

Interface	ATBA Limit (MW)	ATRA Limit (MW)	Delta (MW)
Dysinger East	3051(1)	3161(1)	110
West Central	1872(1)	2425(1)	553
Central East	4418(2)	4536(3)	118
Total East	7108(2)	7173(3)	65
UPNY-SENY	6426(4)	7158(5)	732
UPNY-CONED (Open)	6118(4)	6112(5)	-6
Dunwoodie South (Open)	4156(4)	4315(5)	159

(1) Low Voltage at Rochester at Base Case

(2) Low Voltage at Oakdale for L/O Tower 40/41(Marcy to Coopers Corners, Edic to Fraser 345kV)

(3) Low Voltage at New Scotland at Base Case

(4) Low Voltage at Rock Tavern at Base Case

(5) Low voltage at Pleasant Valley at Base Case

The results show that there is no negative impact on tested interfaces. Instead, there are increases on most of the voltage-constrained transfer limits. This is mainly due to the addition of reactive power generation from multiple CY23 new generators in close proximity to the study interfaces. Details regarding the voltage-constrained transfer limit analysis are provided in Appendix C.

4. Local Thermal and Voltage Assessments

Power flow steady state analysis was conducted to determine the impact of the full CY23 projects (branch overloading and voltage violations) within the applicable study areas under normal and contingency conditions. The analysis was performed without the CY23 projects and repeated with the CY23 projects to identify the incremental impact of the CY23 projects. Additional analyses from the projects' respective individual SRIS reports were not repeated for local thermal and voltage assessments.

In the power flow steady state analysis, tap settings of PARs and autotransformers were adjusted, within their capabilities, to regulate power flow and voltage in the pre-contingency cases but were fixed at their corresponding pre-contingency settings in the post-contingency cases. Switched shunt capacitors and reactors were switched at pre-determined voltage levels in the pre-contingency power flow cases but were held at their corresponding pre-contingency positions in the post-contingency cases. The reactive power outputs of generators were regulated, within the respective reactive capabilities of the units, to hold scheduled voltage in both the pre-contingency and post-contingency cases.

The Leeds SVC, Fraser SVC and Marcy FACTS device were modeled at near zero output in the pre-contingency ATBA and ATRA cases and were allowed to operate within full range during post-contingency conditions.

The monitored facilities for thermal and voltage violations included the bulk power system in the Study Area, as well as the local 138 kV, 115 kV, 69 kV and further lower kV networks when applicable and in proximity to the CY23 projects. The tested contingencies included outages of single lines and transformers, generator outages, tower contingencies and stuck breaker contingencies.

TARA program was used to simulate the selected contingencies and the application of security constrained dispatch/re-dispatch of generation was performed to mitigate thermal violations, if any. Appendix D contains details, along with one-line diagrams to show full CY23 projects' location. The evaluation was done through the comparison of the ATBA and ATRA systems; these scenarios where the projects' addition would worsen a pre-existing condition or create a new violation were identified and further evaluated for identification of mitigation solutions under the MIS.

Unless specified otherwise, any potential issues identified by this study are observed under specific system conditions, study assumptions, and dispatch patterns modeled in the respective study cases, and can be managed through the normal operating procedures of the NYISO and/or TOs, therefore are not considered a degradation of the system reliability or non-compliance with Applicable Reliability Requirements. Consequently, under the NYISO Minimum Interconnection Standard requirements, no SUFs are required to address them. However, either the affected Developers or the TO may elect to address any potential issue (as related with their project impacts) by submitting a Study Request under the NYISO Transmission Expansion process per Sections 3.7 or 4.5 of the NYISO OATT.

4.1 N-0 Analysis

The ATBA and ATRA summer peak power flow cases were developed as described in Section 1.4. For N-0, there were no thermal and voltage violations for both ATBA and ATRA conditions. For N-0 branch overload seen in the ATRA base case, CY23 Projects were dispatched down in accordance with the MIS (*e.g.,* Q680 at1070.3 MW, Q1016/Q1017/Q1199 at 938.8 MW). The CY23 projects did not impact pre-contingency conditions in the ATRA power flow case.

4.2 N-1 Analysis

In accordance with the final CY23 Study Scope presented to IPFSWG on May 25, 2023, the CY23 Study included applicable thermal and voltage steady state analyses, determined as needed by the NYISO, conducted for summer peak case, pre-contingency and also for relevant Design Criteria Contingencies conditions, and will be limited to the Study Areas. The following analytical work was conducted in light of the electrical proximity of the indicated CY23 projects. Detailed results of these analyses are presented in Appendix E.

For the following projects located in NGrid's area, contingencies 115 kV and above in NYCA Zones A, B, C and E were applied, and elements 69 kV and above in NYCA Zones A, B, C and E were monitored:

- Q560 Deer River Wind;
- Q774 Tracy Solar Energy Centre;
- Q878 Pirates Island;
- Q882 Riverside Solar;
- Q950 Hemlock Ridge Solar;
- Q953 Sugar Maple Solar;
- Q995 Alabama Solar Park LLC;
- Q1136 Honey Ridge Solar;
- Q1174 NY48 – Diamond Solar;
- Q1178 NY115 – Newport Solar;

- Q1188 North Seneca Solar Project, LLC; and
- Q1236 Gravel Road Solar.

These CY23 projects did not cause any new thermal and voltage violations after applicable system adjustments, applying normal operating procedures.

For the following projects located in NYSEG's area, contingencies 115 kV and above in NYCA Zones B to D were applied, and elements 69 kV and above in NYCA Zones B to D were monitored:

- Q785 Erie-Wyoming County Solar;
- Q800 Rich Road Solar Energy Center;
- Q852 Niagara Dolomite Solar;
- Q858 Genesee Road Solar Energy Center;
- Q866 North Country Wind;
- Q880 Brookside Solar;
- Q1009 Yellow Barn Solar;
- Q1036 Mainesburg ESS;
- Q1080 Mineral Basin Solar Power;
- Q1088 Harvest Hills Solar;
- Q1148 Agricola Wind; and
- Q1184 NY125B - Two Rivers Solar.

These CY23 projects did not cause any new thermal and voltage violations after applicable system adjustments, applying normal operating procedure.

For the following projects located in NYPA's area, contingencies 115 kV and above in NYCA Zones A, B, D and J were applied, and elements 69 kV and above in NYCA Zones A, B, D and J were monitored:

- Q800 Rich Road Solar Energy Center;
- Q866 North Country Wind;
- Q880 Brookside Solar;
- Q1089 Flat Creek Solar;

- Q1115 Flat Creek Solar 2;
- Q1183 NY125A - Fort Covington Solar; and
- Q1184 NY125B - Two Rivers Solar.

These CY23 projects did not cause any new thermal and voltage violations after applicable system adjustments, applying normal operating procedures.

For the following project located in CHGE's area, contingencies 115 kV and above in NYCA Zone G were applied, and elements 69 kV and above in NYCA Zone G were monitored:

- Q770 KCE NY 8a; and
- Q1122 East Fishkill.

Q770 KCE NY 8a project did not cause any new thermal and voltage violations after applicable system adjustments, applying normal operating procedures.

Thermal branch overloading of Merritt Park – Forgebrook 115 kV line, Merritt Park – Wiccopee 115 kV line, Chadwick – East Walden 115 kV line, E Fishkill – Fishkill 115 kV line, E Fishkill – Shenandoah 115 kV line, Forgebrook – N Chelsea 115 kV line, Pleasant Valley 115 kV – Pleasant Valley 345 kV line, and Shenandoah – Wiccopee 115 kV line were identified in a post- contingency condition when Q1122 East Fishkill project was in charging mode. These facilities are not currently secured in the NYISO's market models. However, the NYISO and CHGE agree that when the Q1122 East Fishkill project approaches Commercial Operation and integration into the NYISO's market system models, the NYISO will follow the process outlined in the T&D Manual to determine whether these facilities can be secured in BMS. Therefore, resource curtailment from Q1122 East Fishkill project was considered and would be required to mitigate potential overloads caused by Q1122 East Fishkill project and to avoid required SUFs. Consequently, if and to the extent that resource curtailment from Q1122 East Fishkill is required via an Out-of-Merit instruction to prevent an overload on the identified facilities, then Q1122 East Fishkill will not be eligible to receive a Day-Ahead Margin Assurance Payment (DAMAP).

For the following CY23 projects located in and near Con Edison's area, N-1 analysis immediate post-contingency in accordance with NYSRC Reliability Rules and N-1 analysis post-contingency after system adjustments in accordance with Con Edison TP-7100 Transmission Planning Criteria were conducted. Contingencies 115 kV and above in NYCA Zones I to J were applied, and elements 69 kV and above in NYCA Zones I to J were monitored:

- Q522 NYC Energy;

- Q700 Robinson Grid;
- Q822 Whale Square Energy Storage 1;
- Q834 Luyster Creek Energy Storage 2;
- Q1007 NYC Energy LLC - Phase 2;
- Q1016 EI Steinway 1;
- Q1017 EI Steinway 2;
- Q1068 Buchanan Point BESS;
- Q1199 El Steinway 1.1; and
- Q1288 CPNY-X.

These CY23 projects did not cause any new thermal and voltage violations after applying applicable system adjustments following normal operating procedure.

For the following projects located in PSEG-LI area, contingencies 34.5 kV and above in NYCA Zone K were applied, and elements 69 kV and above in NYCA Zone K were monitored:

- Q680 Juno Power Express;
- Q825 Setauket Energy Storage;
- Q957 Holbrook Energy Storage;
- Q971 East Setauket Energy Storage;
- Q1012 Suffolk County Storage II;
- Q1117 CLIES 70MW;
- Q1123 KCE NY 29;
- Q1254 Barrett Hempstead Battery Storage;
- Q1255 Holtsville Brookhaven Battery Storage;
- Q1256 Canal Southampton Battery Storage; and
- Q1257 Edwards Calverton Battery Storage;

These CY23 projects did not cause any new thermal and voltage violations after applying applicable system adjustments following normal operating procedure.

4.3 N-1-1 Analysis

In accordance with the final CY23 Study Scope presented to IPFSWG CY23 on May 25, 2023, the CY23 Study included applicable N-1-1 analysis, determined as needed by the NYISO, evaluating a selection of N-1-1 contingencies around the applicable CY23 projects. Consistent with the final CY23 Study Scope, the following analytical work was conducted in light of the electrical proximity of the indicated CY23 projects. Detailed results of these analyses are presented in Appendix E.

For the following projects located in NGrid's area, N-1-1 analysis was conducted using contingencies 115 kV and above in NYCA Zones A, B, C and E, and elements 69 kV and above in NYCA Zones A, B, C and E were monitored:

- Q560 Deer River Wind;
- Q774 Tracy Solar Energy Centre;
- Q878 Pirates Island;
- Q882 Riverside Solar;
- Q950 Hemlock Ridge Solar;
- Q953 Sugar Maple Solar;
- Q995 Alabama Solar Park LLC; and
- Q1136 Honey Ridge Solar..

These CY23 projects did not cause any new thermal violations after security constrained redispatch applied and did not cause any new voltage violations.

For the following projects located in NYSEG's area, N-1-1 analysis was conducted using contingencies 115 kV and above in NYCA Zones B to D, and elements 69 kV and above in NYCA Zones B to D were monitored:

- Q785 Erie-Wyoming County Solar;
- Q800 Rich Road Solar Energy Center;
- Q852 Niagara Dolomite Solar;
- Q858 Genesee Road Solar Energy Center;
- Q866 North Country Wind;
- Q880 Brookside Solar;

- Q1009 Yellow Barn Solar;
- Q1036 Mainesburg ESS;
- Q1080 Mineral Basin Solar Power;
- Q1088 Harvest Hills Solar;
- Q1148 Agricola Wind; and
- Q1184 NY125B - Two Rivers Solar.

These CY23 projects did not cause any new thermal violations after security constrained redispatch applied and did not cause any new voltage violations.

For the following projects located in NYPA's area, N-1-1 analysis was conducted using contingencies 115 kV and above in NYCA Zones A, B, D and J, and elements 69 kV and above in NYCA Zones A, B, D and J were monitored:

- Q800 Rich Road Solar Energy Center;
- Q866 North Country Wind;
- Q880 Brookside Solar;
- Q1089 Flat Creek Solar;
- Q1115 Flat Creek Solar 2;
- Q1183 NY125A - Fort Covington Solar; and
- Q1184 NY125B - Two Rivers Solar.

These CY23 projects did not cause any new thermal violations after security constrained redispatch applied and did not cause any new voltage violations.

For the following projects located in CHGE's area, N-1-1 analysis was conducted using contingencies 115 kV and above in NYCA Zone G, and elements 69 kV and above in NYCA Zone G were monitored:

- Q1122 East Fishkill.

This CY23 project did not cause any new thermal violations after security constrained redispatch applied and did not cause any new voltage violations.

For the following projects located in PSEG-LI area, contingencies 34.5 kV and above in NYCA Zone K were applied, and elements 69 kV and above in NYCA Zone K were monitored:

- Q680 Juno Power Express;
- Q825 Setauket Energy Storage;
- Q957 Holbrook Energy Storage;
- Q971 East Setauket Energy Storage;
- Q1012 Suffolk County Storage II;
- Q1117 CLIES 70MW;
- Q1123 KCE NY 29;
- Q1254 Barrett Hempstead Battery Storage;
- Q1255 Holtsville Brookhaven Battery Storage;
- Q1256 Canal Southampton Battery Storage; and
- Q1257 Edwards Calverton Battery Storage;

These CY23 projects did not cause any new thermal violations after security constrained redispatch and did not cause any new voltage violations. The analysis was repeated with Energy Storage projects in PSEG-LI area in charging mode and it is found that CY23 projects did not cause any new thermal and voltage violations after applicable system adjustments, applying normal operating procedures.

For CY23 projects connecting to or near Con Edison's system, N-1-1 analysis was conducted using two different methodologies: (1) N-1-1 analysis compared against applicable Long Term Emergency (LTE) or Short Term Emergency (STE) in accordance with NYSRC Reliability Rules; and (2) N-1-1-0 analysis compared against Normal ratings in accordance with Con Edison TP-7100 Transmission Planning Criteria. Applicable contingencies 115 kV and above in NYCA Zones I to J were applied, and elements 69 kV and above in NYCA Zones I to J were monitored:

- Q522 NYC Energy;
- Q700 Robinson Grid;
- Q822 Whale Square Energy Storage 1;
- Q834 Luyster Creek Energy Storage 2;
- Q1007 NYC Energy LLC - Phase 2;
- Q1016 EI Steinway 1;

- Q1017 EI Steinway 2;
- Q1068 Buchanan Point BESS;
- Q1199 El Steinway 1.1; and
- Q1288 CPNY-X.

These CY23 projects did not cause any new thermal and voltage violations after applying applicable system adjustments following normal operating procedure.

Sensitivity Voltage Analysis in NYC

A sensitivity voltage analysis was performed to evaluate the incremental impact of CY23 projects' impact on Con Edison's system. Local design contingencies were tested on three sensitivity scenarios including Q1016+Q1017+Q1199 In-Service, Q1016+Q1199 only In-Service, and Q1017 only In-Service.

In the sensitivity voltage analysis performed for CY23 projects in Con Edison's system, over voltage issues were identified at Mott Haven 345 kV Substation, NEW_AST_EST1 345 kV, NEW_AST_EST2 345 kV, and nearby tap buses on Mott Haven – Rainey West MH-RNE_TAP A and MH-RNW_TAP A. The over voltage issues observed were for all three sensitivity scenarios involving CY23 Q1016 EI Steinway 1, Q1017 EI Steinway 2, and Q1199 El Steinway 1.1 projects. **Table 16** provide summaries of the over voltage issues identified in the voltage analysis for all three sensitivity scenarios.

Table 16: Summary of Over Voltage Results

First Level Scenario	Bus Name	Base kV	Contingency Name	Cont Volt (Q1016, Q1017, Q1199 In-Service)	Cont Volt (Q1016, Q1199 In-Service)	Cont Volt (Q1017 In-Service)
A345:P1_Q1017_P1_INV	MOTT HAVEN	345	A345:P4_SBBT	1.0571	-	-
A345:P1_Q11_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB13	1.0538	-	-
A345:P1_Q11_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB12	1.0542	-	-
A345:P1_Q11_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB11	1.0637	-	
A345:P1_Q11_MOTT_HAVEN	MH-RNW_TAPA	345	A345:P4_SB11	1.0638	-	1.0552
A345:P1_Q11_MOTT_HAVEN	NEW_AST_EST2	345	A345:P4_SB11	1.0638	-	1.0552
A345:P1_Q12_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SBBT	1.0538	-	-
A345:P1_Q11_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB1	-	1.0607	-
A345:P1_Q11_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB7	-	1.0607	-
A345:P1_Q12_RAINEY	MOTT HAVEN	345	A345:P4_SB2	-	1.0674	-
A345:P1_Q12_RAINEY	MH-RNE_TAPA	345	A345:P4_SB2	-	1.0674	-
A345:P1_Q12_RAINEY	MH-RNW_TAPA	345	A345:P4_SB2	-	1.0674	-

First Level Scenario	Bus Name	Base kV	Contingency Name	Cont Volt (Q1016, Q1017, Q1199 In-Service)	Cont Volt (Q1016, Q1199 In-Service)	Cont Volt (Q1017 In-Service)
A345:P1_Q12_RAINEY	NEW_AST_EST1	345	A345:P4_SB2	-	1.0674	-
A345:P1_Q12_RAINEY	NEW_AST_EST2	345	A345:P4_SB2	-	1.0674	-
A345:P1_Q12_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB5	-	1.0618	-
A345:P1_Q11_RAINEY	MOTT HAVEN	345	A345:P4_SB11	-	-	1.0646
A345:P1_Q11_RAINEY	MH-RNE_TAPA	345	A345:P4_SB11	-	-	1.0647
A345:P1_Q11_RAINEY	MH-RNW_TAPA	345	A345:P4_SB11	-	-	1.0647
A345:P1_Q11_RAINEY	NEW_AST_EST1	345	A345:P4_SB11	-	-	1.0647
A345:P1_Q11_RAINEY	NEW_AST_EST2	345	A345:P4_SB11	-	-	1.0647
A345:P1_Q11_RAINEY	MOTT HAVEN	345	A345:P4_SB13	-	-	1.0545
A345:P1_Q12_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB1	-	-	1.059
A345:P1_Q12_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB3	-	-	1.059

Only over voltage results are presented in the table above.

The SUFs identified as the mitigation of the voltage violations requires two (2) 20 MVAr shunt reactors to be installed at Mott Haven 345 kV Substation. **Table 17** presents the results with proposed SUF solution applied to mitigate voltage violations. Detailed cost allocation of this SUF is discussed in **Section 11.3**.

Table 17: Summary of Voltage Sensitivity Results with SUF Solution

First Level Scenario	Bus Name	Base kV	Contingency Name	Cont Volt after SUF applied (Q1016, Q1017, Q1199 In-Service)	Cont Volt after SUF applied (Q1016, Q1199 In-Service)	Cont Volt after SUF applied (Q1017 In-Service)
A345:P1_Q1017_P1_INV	MOTT HAVEN	345	A345:P4_SBBT	1.0452	-	-
A345:P1_Q11_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB13	1.0494	-	-
A345:P1_Q11_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB12	1.0497	-	-
A345:P1_Q11_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB11	1.0487	-	1.05
A345:P1_Q11_MOTT_HAVEN	MH-RNW_TAPA	345	A345:P4_SB11	1.0488	-	1.05
A345:P1_Q11_MOTT_HAVEN	NEW_AST_EST2	345	A345:P4_SB11	1.0488	-	1.05
A345:P1_Q12_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SBBT	1.0467	-	-
A345:P1_Q11_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB1	-	1.049	-
A345:P1_Q11_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB7	-	1.0491	-
A345:P1_Q12_RAINEY	MOTT HAVEN	345	A345:P4_SB2	-	1.0496	-
A345:P1_Q12_RAINEY	MH-RNE_TAPA	345	A345:P4_SB2	-	1.0497	-
A345:P1_Q12_RAINEY	MH-RNW_TAPA	345	A345:P4_SB2	-	1.0497	-

First Level Scenario	Bus Name	Base kV	Contingency Name	Cont Volt after SUF applied (Q1016, Q1017, Q1199 In-Service)	Cont Volt after SUF applied (Q1016, Q1199 In-Service)	Cont Volt after SUF applied (Q1017 In-Service)
A345:P1_Q12_RAINEY	NEW_AST_EST1	345	A345:P4_SB2	-	1.0497	-
A345:P1_Q12_RAINEY	NEW_AST_EST2	345	A345:P4_SB2	-	1.0497	-
A345:P1_Q12_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB5	-	1.049	-
A345:P1_Q11_RAINEY	MOTT HAVEN	345	A345:P4_SB11	-	-	1.0491
A345:P1_Q11_RAINEY	MH-RNE_TAPA	345	A345:P4_SB11	-	-	1.0491
A345:P1_Q11_RAINEY	MH-RNW_TAPA	345	A345:P4_SB11	-	-	1.0491
A345:P1_Q11_RAINEY	NEW_AST_EST1	345	A345:P4_SB11	-	-	1.0491
A345:P1_Q11_RAINEY	NEW_AST_EST2	345	A345:P4_SB11	-	-	1.0491
A345:P1_Q11_RAINEY	MOTT HAVEN	345	A345:P4_SB13	-	-	1.0496
A345:P1_Q12_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB1	-	-	1.0486
A345:P1_Q12_MOTT_HAVEN	MOTT HAVEN	345	A345:P4_SB3	-	-	1.0486

Only voltage results with SUF applied to mitigate over voltage issues are presented in the table above.

5. Stability Assessment

In accordance with the CY23 Final Scope presented to IPFSWG CY23 on May 25, 2023, the CY23 Study included applicable local stability assessments, determined as needed by the NYISO, conducted for summer peak case, for relevant Design Criteria Contingencies conditions, limited to the Study Areas.

The goal of the CY23 local stability assessment was to evaluate the dynamic responses of CY23 projects and their overall impact on NYCA's dynamic performance. The main focus was to identify whether the CY23 projects will have any adverse impact to the local stability of the system. All contingencies studied were in accordance with the Applicable Reliability Rules (*e.g.*, NERC Reliability Standards, NPCC Directory 1, the NYSRC Reliability Rules, etc). The local contingencies were simulated since the analyzed CY23 projects were nearby one another and the results were examined to determine if there is a need for SUFs to address local stability issues. For analysis, which were not repeated for local stability assessments, please refer to CY23 projects' individual SRIS reports for study results.

The first step to this analysis was review of prior stability evaluations performed for each of the CY23 projects during respective SRIS.

The CY23 local stability assessment used the following materials:

- The most recent information on power system components and devices utilized by the CY23 projects based on the data provided by project developers, equipment manufacturers and dynamic model developers.
- Applicable data and materials included in the CY23 Facilities Study; Part 1 reports prepared for individual CY23 projects.

The second study stage was the development of the ATRA dynamic setup. In both the ATRA power flow base case and the dynamics database of the ATRA dynamic setup, most recent information and updates supplied by CY23 Facilities Study participants were implemented.

The third study stage was running local contingency simulations and analyzing their results. In accordance with the CY23 Final Scope presented to IPFSWG CY23 on May 25, 2023, applicable stability analysis for projects, determined as needed by the NYISO, was performed for summer peak conditions to determine the impact of the projects on system performance within the Study Areas.

For CY23 projects connecting to Con Edison, local stability analysis was conducted for Q522 NYC Energy, Q700 Robinson Grid, Q822 Whale Square Energy Storage 1, Q834 Luyster Creek Energy Storage 2, Q1007 NYC Energy LLC - Phase 2, Q1016 EI Steinway 1, Q1017 EI Steinway 2, Q1068 Buchanan Point BESS, Q1199 El Steinway 1.1, Q1288 CPNY-X. Additionally, a sensitivity analysis was conducted for Gowanus Series Reactors 41 and 42.

Local stability analysis was conducted for all the projects connecting to PSEG-LI system and NYPA system. Local stability analysis was not conducted for other CY23 projects, as per the projects' respective SRIS reports.

For all dynamic simulations, the Siemens PTI PSS/E software (Version 34) was used, along with the PSSPLT program for plotting calculation results. The detailed simulation results and corresponding plots showing both tested individual CY23 projects' and NYCA's dynamic response to the contingencies are included in Appendix F.

5.1 Power Flow Cases and Dynamic Simulation Setups

In accordance with the study scope, local contingencies were simulated on the summer peak load case for the Study Year 2028. The ATRA dynamic setup was derived from the ATBA dynamic database and using the most recent dynamics data and/or dynamic models supplied by the CY23 project Developers.

5.2 Local Stability Analysis

Local stability analysis was performed for the CY23 ATRA dynamic setup to determine the impact of the CY23 projects on the system dynamic performance. All contingencies studied were in accordance with the Applicable Reliability Rules (*e.g.*, NERC Reliability Standards, NPCC Directory 1, the NYSRC Reliability Rules, etc). The local contingencies selected in coordination with NYISO and the local transmission owners and, accordingly, considered during the SRIS for the respective CY23 projects were simulated. These contingencies comprised of three-phase (3PH) faults as well as single line-to-ground (SLG) faults. The summary of the simulation results are provided in **Table 18.** The detail list of contingencies and results from the dynamic simulations are provided in Appendix F.

Table 18: Summary of Local Stability Analysis

Project	No. of Local Contingencies Analyzed	Local Stability Analysis Results
Q522, Q1007	4	Stable
Q700	4	Stable
Q822	4	Stable
Q834	4	Stable
Q1016, Q1017, Q1199	6	Stable
Q1068	4	Stable
Q1288	3	Stable

Project	No. of Local Contingencies Analyzed	Local Stability Analysis Results
Q680, Q825, Q957, Q971, Q1012, Q1117, Q1123, Q1254, Q1255, Q1256, Q1257	9	Stable
Q800, Q866, Q880, Q1089, Q1115, Q1183, Q1184	12	Stable

Results indicate that the system is stable for all applicable local contingencies for each of the CY23 projects tested.

Sensitivity Analysis for SR 41 and 42 at Gowanus

In CY23 Fault Current Assessment, Farragut 345kV, Rainey 345kV, Brooklyn Clean Energy Hub 345kV, Gowanus 345kV, and East 13th Street 345kV were found to have a fault current exceeding lowest fault interrupting device rating in the ATRA case. Switching on the series reactors 41 and 42 at Gowanus station was identified as the mitigation for those overdutied breakers. A sensitivity analysis for stability simulation was performed with series reactors 41 and 42 at Gowanus station. The summary of the simulation results are provided in **Table 19**.

Table 19: Summary of Stability Analysis with SR41 and 42 at Gowanus Switched On

Stability Analysis	No. of Local Contingencies Analyzed	Local Stability Analysis Results
SR41 and 42 at Gowanus Switched On	15	Stable

Results indicate that the system is stable for all tested contingencies in the sensitivity analysis.

5.3 A-10 Analysis

The objective of the NPCC A-10 Testing is to identify whether any existing or new station associated with CY23 projects could be classified as BPS. Testing was completed in accordance with the approved NPCC A-10 criteria described in the NPCC A-10 "Classification of Bulk Power System Elements" version 3 dated May 6, 2020.

The testing consists of both transient stability and steady-state steps using CY23 Summer Peak load and CY23 Spring Light Load cases. As part of this study, only POIs of the CY23 projects that are not currently classified as BPS were tested. If a bus is classified as BPS as part of this test, the test is extended to the adjacent buses until a non-BPS classification is determined as per the criteria. Apart from the non-BPS

POI buses, the NYISO worked with CTOs to identify any buses that need to be tested for BPS for CY23 projects. **Table 20** has a list of buses that were tested as part of the initial A-10 test.

Table 20: List of CY23 Buses tested for A-10

QUEUE POS.	PROJECT	ZONE	Requested Summer ERIS MW	CTO	Point of Interconnection	POI kV	Bus Tested	Major Interface(s) Stressed
Q560	Deer River Wind	E	100	NM-NG	Black River-Lighthouse Hill 115kV	115	Q560_POI	Central East
Q680	Juno Power Express	K	1200	LIPA	Ruland Rd. 138kV	345	RULAND	None
Q785	Erie-Wyoming County Solar	C	175	NYSEG	High Sheldon - Stolle Road 230 kV	230	Q785_POI	NY-PJM
Q800	Rich Road Solar Energy Center	E	240	NYPA	Moses - Adirondack 230 kV Line #2 (MA2)	345	Q800_POI	Moses South
Q825	Setauket Energy Storage	K	65.3	LIPA	Port Jefferson - Terryville 69kV	69	Q825POI	N/A
Q852	Niagara Dolomite Solar	A	180	NYSEG	Robinson Rd - Stolle Rd 230kV Line 65	230	Q852_POI	Dysinger East
Q858	Genesee Road Solar Energy Center	A	250	NYSEG	Stolle Rd - Five Mile Rd 345kV	138	Q858POI	Dysinger East
Q859	Ridge View Solar Energy Center	A	350	NYSEG	Somerset - Dysinger 345kV	345	Q859_POI	Dysinger East
Q866	North Country Wind	D	306.6	NYPA	Moses - Willis 230 kV (MW1)	345	Q866_POI	Moses South
Q957	Holbrook Energy Storage	K	76.8	LIPA	Holtsville - Patchogue 69kV	69	Q957POI	None
Q971	East Setauket Energy Storage	K	125	LIPA	Holbrook – North Shore Beach 138kV	138	Q971_POI	None
Q974	KCE NY 19	G	79	O&R	Sugarloaf - Wisner 69kV	69	Q974_POI	UPNY-CONED
Q1016	EI Steinway 1	J	1300	ConEd	Mott Haven - Rainey West 345kV, Mott Haven - Rainey East 345kV	345	NEW_AST_EST1	None
Q1017	EI Steinway 2	J	1300	ConEd	Mott Haven - Rainey West 345kV, Mott Haven - Rainey East 345kV	345	NEW_AST_EST2	None
Q1031	Mill Point Solar	E	250	NM-NG	Marcy - New Scotland 345kV Line #18	345	Q1031_POI	Total East/Central East
Q1036	Mainesburg ESS	C	130	NYSEG	Mainesburg - Watercure 345kV	345	Q1036_POI	NY-PJM
Q1079	Somerset Solar	A	125	NYSEG	Kintigh 345 kV	345	SOMERSET345	Dysinger East

QUEUE POS.	PROJECT	ZONE	Requested Summer ERIS MW	CTO	Point of Interconnection	POI kV	Bus Tested	Major Interface(s) Stressed
Q1080	Mineral Basin Solar Power	C	401.6	NYSEG	Homer City-Mainesburg 345kV	345	BASIN_SOLAR	NY-PJM
Q1089	Flat Creek Solar	F	200	NYPA	Edic to Princetown 345kV Line 352	345	Q1089_POI	Central East/Total East
Q1115	Flat Creek Solar 2	F	100	NYPA	Edic to Princetown 345kV Line 352	345	Q1089_POI	Central East/Total East
Q1117	CLIES 70MW	K	70	LIPA	Sills Road 138kV substation.	138	SILLS RD	None
Q1122	East Fishkill	G	205	CHGE	Shenandoah 115kV Substation	115	SHENANDO	UPNY-CONED
Q1123	KCE NY 29	K	150	LIPA	Kings 138 kV substation	138	KINGS	None
Q1136	Honey Ridge Solar	E	125	NM-NG	Black River 115 kV Substation	115	BLACK RV	Central East
Q1174	NY48 – Diamond Solar	E	60	NM-NG	Porter - Valley 115kV line #4	115	Q1174_POI	Total East/Central East
Q1178	NY115 – Newport Solar	E	130	NM-NG	Porter - Deerfield 115 kV Line # 9	115	Q1178_POI	Total East/Central East
Q1183	NY125A - Fort Covington Solar	D	250	NYPA	Moses-Willis 230kV (MW1)	345	Q1183_POI	Moses South
Q1184	NY125B - Two Rivers Solar	D	200	NYPA	Moses - Willis 230 kV (MW2)	345	Q1184_POI	Moses South
Q1199	El Steinway 1.1	J	200	ConEd	Mott Haven - Rainey West 345kV, Mott Haven - Rainey East 345kV	345	NEW_AST_EST1	None
Q1256	Canal Southampton Battery Storage	K	100	LIPA	Canal Substation 138kV	138	CANAL	None
Q1257	Edwards Calverton Battery Storage	K	60	LIPA	Edwards Avenue Substation at 138 kV	138	EDWRDSAV	None
N/A	N/A	C	N/A	NYSEG	N/A	115	ETNA 115	Dysinger East / NY-PJM
N/A	N/A	K	N/A	LIPA	N/A	345	Ruland Road 345kV	None
N/A	N/A	K	N/A	LIPA	N/A	345	Expanded Newbridge 345kV	None
N/A	N/A	K	N/A	LIPA	N/A	138	EGC 138kV	None
N/A	N/A	K	N/A	LIPA	N/A	138	New Bridge 138kV	None
N/A	N/A	K	N/A	LIPA	N/A	138	Riverhead 138kV	None
N/A	N/A	K	N/A	LIPA	N/A	138	Barrett 138 kV	None
N/A	N/A	K	N/A	LIPA	N/A	138	Port Jefferson 138 kV	None

To perform the A-10 test, the major interfaces identified in **Table 20** were stressed to at or above 98th percentile of the flow (*i.e.*, flows not exceeded more than 2% of the time) based on all hours of the year. The generation dispatch, reactive power dispatch of generating units, static and dynamic reactive devices for all study cases represent credible conditions for the load level and transfer levels.

The test is based on application of 3-phase fault at a single voltage level that is un-cleared locally. The performance requirements for A-10 testing classify a bus as part of the BPS if the transient and/or steady-state testing shows that the net loss of source or load is greater than an area's threshold.

For NYCA BPS testing, the loss of source threshold is 1,310 MW. The loss of source is calculated by the maximum allowable generation (Pmax) for the machine that is impacted. There is no loss of load threshold. Voltage drop/rise for any bus which is 100 kV and above cannot exceed 9% as an initial threshold. An event should not propagate outside NYCA. Dynamic simulations should show positive damping within 30 seconds after the initiating event.

The A-10 testing resulted in the following buses being classified as BPS during CY23:

- NEW_AST_EST1 (Q1016 & Q1199 POI) 345 kV;
- NEW_AST_EST2 (Q1017 POI) 345 kV;
- Ruland Road 345 kV;
- Q866 POI 345 kV;
- Q1089 and Q1115 POI 345 kV;
- Q1183 POI 345 kV; and
- Q1184 POI 345 kV

For the buses that tested BPS as part of this test, the adjacent buses were tested as per the criteria until a non-BPS determination was obtained. No additional bus was classified as BPS as part of this test.

Conclusion

BPS buses were identified in NYPA, Long Island, and NYC: NEW_AST_EST1 345 kV, NEW_AST_EST2 345 kV, Ruland Road 345 kV, Q866 POI 345 kV, Q1089 and Q1115 POI 345 kV, Q1183 POI 345 kV, and Q1184 POI 345 kV in CY23 ATRA summer peak and/or light load condition.

Since CY23 projects POIs of Q1016 EI Steinway 1, Q1017 EI Steinway 2, Q1199 El Steinway 1.1, Q866 North Country Wind, Q1089 and Q1115 Flat Creek Solar 2, Q1183 NY125A – Fort Covington Solar, and Q1184 NY125B - Two Rivers Solar are designed to meet the requirements of NPCC (Directory No. 4, 8, 11 Standard as applicable), therefore no additional SUF upgrades are needed.

Detailed cost allocation of BPS SUF at Ruland Road 345 kV is discussed in **Section 11.3**.

Appendix I shows the simulation plots for the summer peak load case and the spring light load case for the buses tested for BPS as part of CY23.

6. Special Studies

As required by local planning criteria applicable to the CY23 projects, each CTO or Affected System has the opportunity to provide or request specific assessments, as related with identification of the current Class Year projects' impacts. If the assessments are of a different kind than what is usually performed under the Class Year Study, the results and conclusion will be summarized under this section. If the study types are similar and in addition to the general NYISO studies, there will be references under the applicable sections in this report.

6.1 Subsynchronous Torsional Interaction (SSTI) Screening Analysis

SSTI screening analysis was performed by the NYISO using Unit Interaction Factor (UIF) threshold of 0.10 between the following CY23 projects and existing generation units:

- Q522/Q1007 NYC Energy and Brooklyn Navy Yard;
- Q700 Robinson Grid and Bayonne Energy Center Units 1-10;
- Q822 Whale Square Energy Storage 1 and each of the following:
    - Gowanus Units 2, 3, 5, 6;
    - Kent Ave; and
    - Narrows Unit 1, 2;
- Q834 Luyster Creek Energy Storage 2 and each of the following
    - Astoria Unit 3; and
    - NYPA units at Astoria West
- Q1016/Q1199/Q1017 EI Steinway and each of the following
    - Rainey GT unit 10; and
    - Ravenswood unit 3;
- Q1288 CPNY-X and each of the following
    - Rainey GT unit 10; and
    - Ravenswood unit 3;

The CY23 ATRA short circuit case was used for evaluation of UIF across base case and outage conditions.

Table 21 below presents the tested conditions, and SSTI screening results of each tested CY23 Project. The outage condition listed in the table indicates at a specific outage condition a potential interaction for each tested generator was observed. This is the lowest number of outages when the interaction between tested generator and the tested Project may occur. The detailed SSTI simulation results are provided in Appendix H.

Table 21: SSTI Screening Results Between CY23 Projects and Existing Generation Units

Project	Tested Generator	Type	UIF
Q522/Q1007	Brooklyn Navy Yard CT	N-5	0.188
	Brooklyn Navy Yard ST	N-5	0.206
Q700	Bayonne Energy Center unit 1-8	N-14	0.154
	Bayonne Energy Center unit 9-10	N-10	0.171
Q822	Gowanus unit 2	N-10	0.116
	Gowanus unit 3	N-5	0.308
	Gowanus unit 5	N-11	0.176
	Kent Ave	N-6	0.595
	Narrows unit 1	N-11	0.238
	Narrows unit 2	N-1*	0.241
Q834	Astoria Unit 3-1	N-8	0.172
	Astoria Unit 3-2	N-8	0.148
	Astoria Unit 3-1&2	N-7	0.115
	NYPA Unit GT2	N-14	0.173
	NYPA Unit ST	N-14	0.174
Q1016/Q1199/Q1017	Rainey GT unit 10	N-4	0.102
	Ravenswood unit 3-1	N-7	0.263
	Ravenswood unit 3-2	N-6	0.186
	Ravenswood unit 3-1&2	N-6	0.293
Q1288 (Rainey POI)	Rainey GT unit 10	N-4	0.315
	Ravenswood unit 3-1	N-6	0.252
	Ravenswood unit 3-2	N-5	0.159
	Ravenswood unit 3-1&2	N-5	0.278

* Note: In the scenario of potential SSTI in N-1 conditions, although the UIF is over 0.10, Q822 battery storage project is isolated from New York State Transmission System (NYSTS) together with Narrows GT 2 that can be potentially impacted by the interaction. Thus, this potential interaction is an internal issue of the Generating Facility and does not have impact on NYSTS.

This SSTI screening analysis is based on planning short circuit models and not on detailed actual HVDC/inverter-based resource control system models and generation control system models. As a result, even with computed UIFs below 0.10 threshold for likely operating conditions or with UIFs above 0.10 threshold for unlikely operating conditions (*e.g.* N-3, N-6, N-7 or N-8 conditions), it is recommended for new HVDC/inverter-based resource interconnections that the actual design prevent unwanted potential SSTI with existing nearby generation units, and for new generation control actual design prevent unwanted potential SSTI with existing nearby HVDC/inverter-based generation.

6.2 Other Observations

The detailed design of the CY23 projects point vis-à-vis their respective substations will be finalized during the detailed design engineering studies, typically following the Class Year Facilities Study as part of an engineering and procurement agreement or Interconnection Agreement.

1. Detailed studies for phenomena such as very fast transient over-voltages and ferro-resonance were not included in this scope of work. Once detailed parameters for the stations and connected equipment are known, an analysis should be performed to verify that there are no concerns for very fast transient over-voltages or ferro-resonance.

2. Potential for SSTI

Since the SSTI screening results noted above indicate that potential interaction may occur at a specific outage condition, evaluation of the potential for SSTI between the new HVDC converter station or inverter-based technologies and NYCA synchronous generators or new generation and existing HVDC/inverter-based technologies shall be performed.

Based on the generator and HVDC/inverter data, the applicable vendor shall perform time domain simulations with multi-mass models in PSCAD to verify that positive damping is provided for all of the torsional frequencies of concern.

Developer shall provide the results from the SSTI study to the NYISO for review and comments when completed during the detailed design and construction phase for the HVDC/inverter-based system. If the SSTI study shows that the damping of critical torsional frequencies is not satisfactory, the HVDC/inverter control dynamics will be adjusted or the SSTI damping controller in the HVDC/inverter control system will be enabled to increase the electrical damping at critical frequencies. Such SSTI mitigation in the HVDC/inverter control system will not impact the power flow and short circuit study models of the project but may require some minor adjustments to the stability study model. However, based on past HVDC/inverter design experience, minor adjustments to the stability study model of an HVDC/inverter-based project during the detailed design due to SSTI mitigation is unlikely to have significant impact on stability study results.

3. Potential for Control Interaction with Other Power Electronics Based NYCA Components

Evaluation of the potential for control interaction between the new HVDC converter station or new inverter-based generation and other NYCA power-electronics-based components shall be performed in connection with a stability study and/or the dynamic performance study during the detailed design and construction phase for the new HVDC converter station or new inverter-based generation. Based on network data provided to the project owner by NYISO, including approved and verified PSS/E and/or PSCAD models of other NYCA power-electronics-based components, the applicable vendor will perform time domain simulations in PSS/E and/or PSCAD to tune the controls for the Project and to verify that the new HVDC converter station or new inverter based generation performs as specified and does not cause adverse interaction with other NYCA power-electronics-based components, including other existing HVDC transmissions or FACTS devices.

Developers shall provide the results from the dynamic performance study for NYISO review and comments when completed, during the detailed design and construction phase for the new HVDC converter station or new inverter-based generation. If the stability and/or dynamic performance study shows that the performance of the new HVDC converter station or new inverter-based generation is not satisfactory or causes adverse interaction with other existing NYCA power electronics-based components, the HVDC or inverter control parameters shall be adjusted until the performance is satisfactory and adverse interaction with other facilities is mitigated.

Such HVDC or inverter control system tuning shall not impact the power flow and short circuit study models of the project but may require some minor adjustments to the stability study model. However, based on past HVDC/inverter design experience, minor adjustments to the stability study model of an HVDC or inverter-based project during the dynamic performance study is unlikely to have significant impact on stability study results. In any event, stability study impacts can be easily documented through supplemental simulations of critical contingency events on the New York State Transmission System and further fine-tuning of the HVDC or inverter-based generator controls is possible if the impact on prior stability study results raises additional concerns.

4. AC Harmonics

The potential for AC harmonic interference is mitigated by designing the new HVDC converter station or new inverter-based generation projects according to performance requirements successfully used in the industry for the design of other HVDC or inverter-based generation projects. Based on results from detailed design studies performed by the applicable vendor of similar design and ratings, it is anticipated that the new HVDC or inverter-based generation projects can meet the specified harmonic performance requirements without installing the large banks of tuned harmonic filters that are typically required on the AC side of traditional line commutated converter stations.

The harmonic performance at the AC interconnection point of the new HVDC or inverter based generation projects shall be verified by calculations that will be performed by the applicable vendor during the detailed design phase of the Project based on a range of specified steady state operating characteristics for the new HVDC or inverter based generation projects and harmonic impedance data. The limit on individual harmonic distortion shall be verified by calculations using the worst-case impedance data within the system harmonic impedance loci for each individual harmonic. Also, total harmonic distortion (THD) and telephone influence factor shall be verified based on calculations using the worst-case data within the system harmonic impedance loci for the single individual harmonic that contribute the most to these factors. For all other harmonics, the AC network impedance at the interconnection point will be considered an open circuit. The applicable vendor's design shall meet the harmonic performance requirements.

Developer shall provide the results of harmonic performance calculations for NYISO review during the detailed design and construction phase of the new HVDC or inverter-based generation projects. If the harmonic performance calculations show that the damping of critical harmonic frequencies is not satisfactory, the impedance characteristic of the AC PLC filter in the converter stations may be slightly modified during the detailed design phase of the Project to mitigate the identified harmonic performance issue. Such fine tuning of the AC PLC filter characteristic will not impact the way the Project is represented in the NYISO CY23 power flow, short circuit and stability base cases.

5. DC Harmonics

Since the two cable cores are installed in close proximity to each other in a common trench, there is little risk for adverse impacts on adjacent facilities due to harmonics flowing on the DC side. Therefore, there are no specific performance requirements with regards to DC side harmonics in the new HVDC or inverter-based generation projects specification.

6. Potential for Radio, Television, Power Line Carrier and Telephone Interference

The potential for radio, television and power line carrier interference is mitigated by designing the new HVDC or inverter-based generation projects according to performance requirements successfully used in the industry for the design of other HVDC or inverter-based generation projects. Such fine-tuning of the AC PLC filter characteristic or add-on of high frequency filtering equipment will neither impact the way an HVDC or inverter-based generation project is represented in the NYISO CY23 power flow, short circuit and stability base cases nor require changes to topology or parameters of the adjacent part of NYCA. The potential for telephone interference is mitigated by designing the new HVDC or inverter-based generation projects according to performance requirements commonly used in the design of other HVDC or inverter-based generation projects.

7. System Restoration Path

For the following CY23 projects with proposed POIs 230 kV and above, the need for special studies to identify potential additional SUFs for system restoration paths was identified:

- Q700 Robinson Grid
- Q785 Erie-Wyoming County Solar
- Q800 Rich Road Solar Energy Center
- Q852 Niagara Dolomite Solar
- Q858 Genesee Road Solar Energy Center
- Q859 Ridge View Solar Energy Center
- Q866 North Country Wind
- Q1016 EI Steinway 1
- Q1017 EI Steinway 2
- Q1031 Mill Point Solar
- Q1036 Mainesburg ESS
- Q1068 Buchanan Point BESS
- Q1079 Somerset Solar
- Q1080 Mineral Basin Solar Power
- Q1089 Flat Creek Solar
- Q1115 Flat Creek Solar 2
- Q1183 NY125A - Fort Covington Solar
- Q1184 NY125B - Two Rivers Solar
- Q1199 El Steinway 1.1
- Q1288 CPNY-X

These projects may be subject to special studies that will be performed after the completion of current CY23. In accordance with Section 2.3.3.5 of TEI manual, "To the extent the NYISO or Connecting Transmission Owner determine, in accordance with Good Utility Practice, that such studies need to be performed after the Class Year Study, the Developer will be responsible for the study costs for such studies and any upgrade costs resulting from such studies, to the extent consistent with Attachment S to the NYISO OATT. "

7. Fault Duty Assessment

This section describes the results of the fault duty assessment performed within the scope of the CY23 Facilities Study.

7.1 Methodology

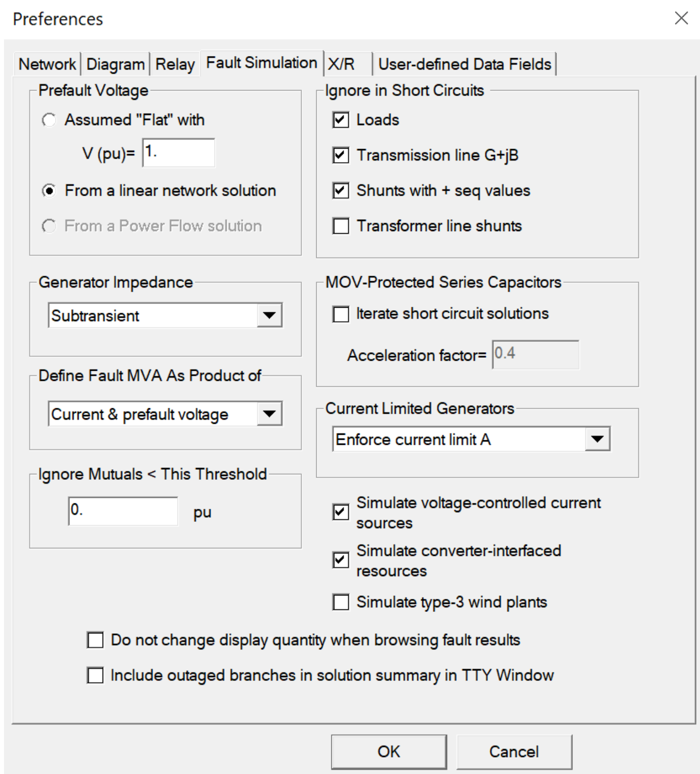
The "NYISO Guideline for Fault Current Assessment" was used to set up the parameters in the short circuit representations and generate the initial fault current levels on a consistent, statewide basis. **Figure 2** provides the assumptions used in ASPEN Oneliner. Key assumptions used under this methodology are as follows:

- All generating units are in-service;
- All transmission lines and transformers are in-service;
- All series elements (series reactors, series capacitors) are in-service except those that are normally out of service;
- Loads are ignored;
- Shunts (shunt capacitors, shunt reactors, line charging, etc.) are ignored;
- Delta-wye transformer phase shift is not ignored;
- Tap positions of fixed tap transformers are not ignored;
- All generator internal voltages are set at 1.0 pu with no phase displacement due to load (*i.e.*, called "linear network solution" voltage profile).
- Bus fault results (fault currents) provided by ASPEN Oneliner are based on the pre-fault voltages assigned by the program when linear network solution is used. For NYSEG and RG&E, the pre-fault voltages are scaled to 1.05 pu to meet NYSEG and RG&E's system operation standard, and the bus fault results (fault currents) are also scaled correspondingly; and

  The following faults are applied:

  - Three line to ground;
  - Double line to ground;
  - Single line to ground; and
  - Line to line.

Figure 2: Standard Fault Simulation Options (ASPEN 15.7)



Central Hudson, Con Edison, National Grid, NYPA, NYSEG, O&R, PSEG-LI and RG&E provided station breaker ratings derated from the nameplate symmetrical ratings for initial bus fault screening purposes.

The NYISO used the above methodology to determine the monitoring buses. All buses impacted by the current Class Year projects by 100 Amperes (*de minimus*) or more define the "monitoring list." To identify the list, the above fault types were applied on all buses (system substations/nodes are modeled as "buses" in both power flow and short circuit simulation packages) represented in both the ATBA and the ATRA systems, using the ASPEN Batch Module; all bus faults which resulted in a 100 Amperes or more difference (ATRA minus ATBA≥ 100 Amperes) were identified and included in a preliminary monitoring list (see Appendix G for the complete preliminary monitoring list). This preliminary list was then circulated among the impacted TOs who were asked to provide the minimum fault interrupting device rating for each station, or alternatively to identify if there is no fault interrupting device (*e.g.*, breaker/fuse, etc.) at that station. This method has the goal to assure that no New York State Transmission System bus will be missed, as impacted by a current Class Year project, and also filters out buses with no relevance for this study scope (*i.e.*, not impacted by projects in the CY23 SUF Study).

The highest of the three types of faults at each of the selected buses was compared against the respective lowest circuit breaker rating at that substation to determine whether the fault duty exceeds the lowest fault interrupting device rating.

A “higher than lowest FID rating” bus fault does not automatically mean that each circuit breaker at the respective station will be overdutied. Only an Individual Breaker Analysis can identify what fault current a particular fault interrupting device will see. When a “fault duty higher that the lowest FID” was identified through the initial bus fault assessment, the respective Transmission Owner was contacted and was asked to perform the Individual Breaker Analysis.

7.2 Bus Fault Assessment Results

Appendix G shows a complete monitoring list and fault duty results. The bus fault current magnitudes are shown in the appendix, for three-line to ground (3LG), double line to ground (2LG), single line to ground (1LG) and line to line (LL) faults applied at each of the substations evaluated. The tables include the lowest circuit breaker rating at each of these substations for comparison with the substations’ fault currents, as provided by the respective Transmission Owner.

The statewide ATRA case is essentially the same as the ATBA case, except that it includes all CY23 projects and system modifications that go with those projects (CY23 ATRA = ATBA + CY23 projects). The purpose of this case is to identify what incremental impacts these projects have, and how much it will cost to mitigate those impacts.

Table 22 presents the NYSEG stations with overdutied breakers found through NYSEG’s individual breaker analysis. Although the breakers did not initially appear overdutied in the preliminary bus fault analysis, through further individual breaker analysis those were determined they exceeded their fault interrupting capability in the ATRA case only. SUF of breaker replacement for breaker 96212 at Hillside 115 kV substation (proposed SUF interrupting capability of 40 kA) and for breaker T10-12 at New Gardenville 115 kV substation (proposed SUF interrupting capability of 63 kA) are identified as the mitigation for the overdutied breakers. The SUF cost allocations for the overdutied NYSEG breakers are discussed in **Section 11.3**.

Table 22: NYSEG Stations Fault Analysis

						ATBA 1.05PU						ATRA 1.05PU						Delta 1.05PU				
						__3LG__	__2LG__	__1LG__	__L-L__	Maximum		__3LG__	__2LG__	__1LG__	__L-L__	Maximum		__3LG__	__2LG__	__1LG__	__L-L__	Maximum
BUS	KV	BREAKER	TYPE	Breaker Capacity (A)	Prefault V 1.05PU	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Duty %	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Duty %	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)
HILLSIDE #4	115	HIL 96212	T	21055.5	1.05	18206	19047.2	19361.2	15703.4	19361.2	92.0	18473.7	19296.7	19577.7	15872.7	19577.7	93.0	267.688	249.507	216.541	169.306	216.541
NGARDNV(NY)	115	GNE T10-12	T	43799	1.05	37325.2	38019.1	38111.3	31359.4	38111.3	87.0	38712.5	39625.8	39600.2	32146.1	39625.8	90.5	1387.26	1606.71	1488.9	786.66	1514.52

Note: Hillside 115 kV and New Gardenville 115 kV were not flagged in the NYISO preliminary bus fault analysis. The overdutied breakers were identified during Individual Breaker Analysis (IBA) by NYSEG, see Appendix G for the IBA results.

Among the monitored buses in the Con Edison system, Farragut 345kV, Rainey 345kV, Brooklyn Clean

Energy Hub 345kV, Gowanus 345kV, and East 13th Street 345kV were found to have a fault current exceeding lowest fault interrupting device rating in the ATRA. **Table 23** presents the overdutied Con Edison buses. Upon further discussion with Con Edison, those overduties can be mitigated by switching on the series reactors 41 and 42 at Gowanus station. **Table 24** presents the results with SR 41 and 42 switched on.

Table 23: ConEd Stations Fault Analysis

			ATBA						ATRA						Delta				
			__3LG__	__2LG__	__1LG__	__L-L__	Maximum		__3LG__	__2LG__	__1LG__	__L-L__	Maximum		__3LG__	__2LG__	__1LG__	__L-L__	Maximum
BUS	KV	Lowest FID (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Duty %	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Duty %	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)
RAINEY	345	63000	51530.5	58478.7	59474.9	44703.3	59474.9	94.4	60692.4	69409.5	65108.8	48954	69409.5	110.2	9161.9	10930.8	5633.9	4250.7	9934.6
BCEH	345	63000	53191	62032.3	62475.7	46125.5	62475.7	99.2	60530.1	72315.6	67059.9	49830.5	72315.6	114.8	7339.1	10283.3	4584.2	3705	9839.9
BCEH N	345	63000	53191	62032.4	62475.7	46125.5	62475.7	99.2	60530.1	72315.6	67059.9	49830.5	72315.6	114.8	7339.1	10283.2	4584.2	3705	9839.9
BCEH S	345	63000	53191	62032.4	62475.7	46125.5	62475.7	99.2	60530.1	72315.6	67059.9	49830.5	72315.6	114.8	7339.1	10283.2	4584.2	3705	9839.9
FARRAGUT	345	63000	53294.3	62152	62664.9	46202.8	62664.9	99.5	60633.9	72439.7	67244.9	49906.2	72439.7	115.0	7339.6	10287.7	4580	3703.4	9774.8
E13ST 47	345	63000	48290.6	55981.3	54244.8	42550	55981.3	88.9	55739.7	63747.2	57323.7	45536.6	63747.2	101.2	7449.1	7765.9	3078.9	2986.6	7765.9
GOWANUS	345	63000	51084.7	59081.7	58392	44594.4	59081.7	93.8	58529.7	66804.4	61770.7	47456.2	66804.4	106.0	7445	7722.7	3378.7	2861.8	7722.7
E13ST 48	345	63000	47887.1	55412.2	53459.4	42155.6	55412.2	88.0	55310.5	63012.9	56453	45090.2	63012.9	100.0	7423.4	7600.7	2993.6	2934.6	7600.7

Table 24: ConEd Stations Fault Analysis with SR41 & 42 at Gowanus 345 kV Switched on

			ATBA - series reactors 41 and 42 at Gowanus in-service						ATRA - series reactors 41 and 42 at Gowanus in-service						Delta - series reactors 41 and 42 at Gowanus in-service				
			__3LG__	__2LG__	__1LG__	__L-L__	Maximum		__3LG__	__2LG__	__1LG__	__L-L__	Maximum		__3LG__	__2LG__	__1LG__	__L-L__	Maximum
BUS	KV	Lowest FID (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Duty %	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Duty %	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)	Phase Current (A)
RAINEY	345	63000	41062.3	47087.7	48727	35757.9	48727	77.3	49808.4	57522.1	53347.1	39324.5	57522.1	91.3	8746.1	10434.4	4620.1	3566.6	8795.1
BCEH	345	63000	41023	47831.7	48819.6	35846.6	48819.6	77.5	47880.3	57230.7	52263.6	38840.5	57230.7	90.8	6857.3	9399	3444	2993.9	8411.1
BCEH N	345	63000	41023	47831.8	48819.6	35846.6	48819.6	77.5	47880.3	57230.7	52263.6	38840.5	57230.7	90.8	6857.3	9398.9	3444	2993.9	8411.1
BCEH S	345	63000	41023	47831.8	48819.6	35846.6	48819.6	77.5	47880.3	57230.7	52263.6	38840.5	57230.7	90.8	6857.3	9398.9	3444	2993.9	8411.1
FARRAGUT	345	63000	41065.4	47867.8	48883.3	35877.5	48883.3	77.6	47920.8	57252	52311.2	38866.6	57252	90.9	6855.4	9384.2	3427.9	2989.1	8368.7
E13ST 47	345	63000	37950.5	44627.9	44101.7	33817.5	44627.9	70.8	44940.4	52243.6	46589.1	36331.8	52243.6	82.9	6989.9	7615.7	2487.4	2514.3	7615.7
GOWANUS	345	63000	29693.5	33098.8	33349.4	25343.8	33349.4	52.9	30120.8	33739.2	34089.8	25560.4	34089.8	54.1	427.3	640.4	740.4	216.6	740.4
E13ST 48	345	63000	37606.1	44245.9	43544.9	33544.6	44245.9	70.2	44634.1	51722.8	45975.3	36021.9	51722.8	82.1	7028	7476.9	2430.4	2477.3	7476.9

Among the monitored buses in the National Grid system, Edic 345 kV, New Scotland 345kV, and Rotterdam 115 kV were found to have a fault current exceeding lowest fault interrupting device rating in the ATRA. Upon further review with National Grid the limiting breakers were already scheduled to be replaced and no upgrades are required.

Among the monitored buses in NYPA system, St. Lawrence 230 kV was found to have a fault current exceeding lowest fault interrupting device rating in the ATRA. Upon further review with NYPA the breakers were already scheduled to be replaced and no upgrades are required.

8. Deliverability Analysis

This section presents SDUs identified in the OC approved Preliminary Deliverability Analysis.

The purpose of the Deliverability Study is to identify, and cost allocate any SDU that may be required for the projects requesting CRIS in CY23 under the NYISO DIS. The DIS is applied only to those Class Year projects electing CRIS. The DIS is designed to ensure that the proposed project (at the requested CRIS MW level) is deliverable throughout the New York Capacity Region where the project is interconnected or will interconnect, and also that the Developer of the project restores the transfer capability of any Other Interfaces degraded by its interconnection, as determined under the DIS.

8.1 Methodology

Please refer to CY23 Preliminary Deliverability Analysis report approved by OC on May 16, 2024, for details.

8.2 LI Byway SDU

The CY23 LI Byway Tests indicate that the following CY23 CRIS projects located in LI Capacity region, are not deliverable after applying the N-0 LI Byway SDU:

- Q825 Setauket Energy Storage;
- Q957 Holbrook Energy Storage;
- Q971 East Setauket Energy Storage;
- Q1012 Suffolk County Storage II;
- Q1117 CLIES 70MW;
- Q1123 KCE NY 29;
- Q1254 Barrett Hempstead Battery Storage;
- Q1255 Holtsville Brookhaven Battery Storage;
- Q1256 Canal Southampton Battery Storage; and
- Q1257 Edwards Calverton Battery Storage.

Therefore, LI Byway SDUs are required for these projects to be fully deliverable. **Table 25** summarizes the proposed SDU solutions in LI being evaluated in the Additional SDU Studies.

Table 25: CY23 LI Deliverability Assessment LI Byway SDU

CY23 LI Byway SDU for Deliverability Assessment	
1	Q825 – Terryville Rebuild to 149/177/193 MVA
2	A PAR (392/520/600) MVA plus UG circuit (2 cables per phase) between Pilgrim - West Bus 138 kV
3	Reconductoring portion of Holbrook – Holtsville Circuits 1&2 lines uprating to 183 MVA STE
4	W.Yaphank - N.Bell Port 69 kV Rebuild (41/51/53) to (73/73/73) MVA
5	Adding a 2 ohms series reactor to Ocean Ave or Barrett 34.5 kV with associated upgrades to accommodate the series reactor

As per CY23 Preliminary DIS Report, the remaining CY23 CRIS projects are all deliverable at their requested CRIS MW. **Table 26** summarizes the deliverable MW of CY23 CRIS projects without SDUs identified in the CY23 Preliminary Deliverability Analysis.

Table 26: CY23 Project's Deliverable MW

QUEUE POS.	PROJECT	Requested Summer CRIS MW	Deliverable Summer CRIS MW without SDUs	Deliverable Winter CRIS MW without SDUs
Q522	NYC Energy	79.9	79.9	79.9
Q560	Deer River Wind	100	100	100
Q700	Robinson Grid	300	300	300
Q716	Moraine Solar Energy Center	93.5	93.5	93.5
Q770	KCE NY 8a	20	20	20
Q774	Tracy Solar Energy Centre	119	119	119
Q777	White Creek Solar	135	135	135
Q785	Erie-Wyoming County Solar	175	175	175
Q800	Rich Road Solar Energy Center	240	240	240
Q822	Whale Square Energy Storage 1	58.2	58.2	58.2
Q825*	Setauket Energy Storage	65.3	-	-
Q834	Luyster Creek Energy Storage 2	79	79	79
Q852	Niagara Dolomite Solar	180	180	180
Q858	Genesee Road Solar Energy Center	250	250	250
Q859	Ridge View Solar Energy Center	350	350	350
Q866	North Country Wind	306.6	306.6	306.6

QUEUE POS.	PROJECT	Requested Summer CRIS MW	Deliverable Summer CRIS MW without SDUs	Deliverable Winter CRIS MW without SDUs
Q869	Tabletop Solar	80	80	80
Q878	Pirates Island	100	100	100
Q880	Brookside Solar	100	100	100
Q882	Riverside Solar	100	100	100
Q950	Hemlock Ridge Solar	200	200	200
Q952	Catskill Grid, LLC	100	100	100
Q953	Sugar Maple Solar	125	125	125
Q957*	Holbrook Energy Storage	76.8	-	-
Q967	KCE NY 5	94	94	94
Q971*	East Setauket Energy Storage	125	-	-
Q974	KCE NY 19	79	79	79
Q995	Alabama Solar Park LLC	130	130	130
Q1007	NYC Energy LLC - Phase 2	220.1	220.1	220.1
Q1009	Yellow Barn Solar	160	160	160
Q1012*	Suffolk County Storage II	76.8	-	-
Q1016	EI Steinway 1	1300	1300	1300
Q1017	EI Steinway 2	1300	1300	1300
Q1031	Mill Point Solar	250	250	250
Q1036	Mainesburg ESS	130	130	130
Q1042	Fort Edward Solar Farm (NY53)	100	100	100
Q1068	Buchanan Point BESS	300	300	300
Q1079	Somerset Solar	125	125	125
Q1080	Mineral Basin Solar Power	401.6	401.6	401.6
Q1088	Harvest Hills Solar	200	200	200
Q1089	Flat Creek Solar	200	200	200
Q1096	Alfred Oaks Solar	100	100	100
Q1115	Flat Creek Solar 2	100	100	100
Q1117*	CLIES 70MW	70	-	-
Q1122	East Fishkill	205	205	205
Q1123*	KCE NY 29	150	-	-
Q1130	Hoffman Falls Wind	72	72	72
Q1136	Honey Ridge Solar	125	125	125
Q1148	Agricola Wind	97	97	97
Q1150	Moss Ridge Solar	60	60	60
Q1151	York Run Solar	90	90	90
Q1174	NY48 – Diamond Solar	60	60	60
Q1178	NY115 – Newport Solar	130	130	130

QUEUE POS.	PROJECT	Requested Summer CRIS MW	Deliverable Summer CRIS MW without SDUs	Deliverable Winter CRIS MW without SDUs
Q1180	Union Energy Center, LLC	116	116	116
Q1182	NY128 - Foothills Solar	40	40	40
Q1183	NY125A - Fort Covington Solar	250	250	250
Q1184	NY125B - Two Rivers Solar	200	200	200
Q1188	North Seneca Solar Project	105	105	105
Q1194	Crane Brook Solar Project	130	130	130
Q1199	El Steinway 1.1	200	200	200
Q1236	Gravel Road Solar	128	128	128
Q1254*	Barrett Hempstead Battery Storage	40	-	-
Q1255*	Holtsville Brookhaven Battery Storage	79.9	-	-
Q1256*	Canal Southampton Battery Storage	100	-	-
Q1257*	Edwards Calverton Battery Storage	60	-	-
Q1288	CPNY-X	1300	1300	1300
Q1061	Teele	19.8	19.8	19.8
Q1113	CLIES 20 MW	20	20	20
PAM-2020-77593	West Babylon Energy Storage	9.9	9.9	9.9

* Note: These projects are currently in CY2023 Additional SDU study.

9. Headroom Impact

Headroom is the functional or electrical capacity of an SUFs (or the electrical capacity of an SDU) that is in excess of the functional or electrical capacity actually used by a Class Year Developer's generation or transmission project.

9.1 Electrical Headroom

During prior Class Year studies, various SUFs were identified in order to reliably interconnect the respective Class Year projects into the system. Some of those SUFs (*e.g.*, series reactors, circuit breakers, etc.) created measurable capabilities (Amperes, or other discrete electrical units) larger than what was needed for the Class Year projects to which costs for such SUFs were allocated. This created "Electrical Headroom," which could be used by future Class Year projects (in the ATRA) or by load growth and changes in load pattern system modifications (in the ATBA).

Attachment S requires that future Class Year projects pay for Electrical Headroom usage to owners of the Headroom. If the fault current contribution is equal to or higher than the "*de minimus*," the Developer is responsible for reimbursement of the Headroom used. If such impact is identified, the NYISO calculates the Headroom usage and cost responsibility in accordance with the terms of the settlement of the Class 2001 litigation and applicable rules under Attachment S.

The "Headroom Buses" identified in Class Year 2001 met their 10-year expiration date on August 20, 2014,[9] therefore the Headroom accounts for those Headroom Buses are all extinguished. The "Headroom Buses" identified in Catch-up Class Year 2003-2005 met their 10-year expiration date on June 6, 2016,[10] therefore the Headroom accounts for those Headroom Buses are extinguished. The "Headroom Buses" identified in Class Year 2006 met their 10-year expiration date on July 12, 2017,[11] therefore the Headroom accounts for those Headroom Buses have been extinguished. The "Headroom Buses" identified in Class Year 2007 met their 10-year expiration date on September 16, 2018,[12] therefore the Headroom accounts for those Headroom Buses have been extinguished. The "Headroom Buses" identified in Class Year 2008 met their 10-year expiration date on February 1, 2020,[13] therefore the Headroom accounts for those Headroom Buses have been extinguished. The "Headroom Buses" identified in Class Year 2009 met their 10-year

[9] For CY01, the 10 –year expiration date is calculated from the August 20, 2004 Financial Settlement, while for all the subsequent Classes this date is calculated from the applicable Class settlement date.

[10] For CY03-05, the 10 –year expiration date is calculated from the June 6, 2006, the Class settlement date.

[11] For CY06, the 10 –year expiration date is calculated from the July 12, 2007 Financial Settlement, while for all the subsequent Classes this date is calculated from the applicable Class settlement date.

[12] For CY07, the 10 –year expiration date is calculated from the September 16, 2008, the Class settlement date.

[13] For CY08, the 10 –year expiration date is calculated from the February 1, 2010, the Class settlement date.

expiration date on November 30, 2021,[14] therefore the Headroom accounts for those Headroom Buses have been extinguished. The "Headroom Buses" identified in Class Year 2010 met their 10-year expiration date on November 30, 2021,[15] therefore the Headroom accounts for those Headroom Buses have been extinguished.

Electrical Headroom Calculation for CY17 SDU

One project in the CY23 SDU study was identified as using electrical Headroom: Q825 Setauket Energy Storage. The following CY17 projects accepted their respective SDU Project Cost Allocation and posted Security for SDU for a new Terryville - Flowerfield 69 kV line:

- Q467 Shoreham Solar;
- Q477 Riverhead Solar;
- Montauk Energy Storage; and
- East Hampton Energy Storage.

The Headroom allocation for CY23 Q825 Setauket Energy Storage will be identified in the SDU Project Cost Allocation as part of the Additional SDU Study decision process.

Electrical Headroom Calculation for CY21 SDU

One project in the CY23 SDU study was identified as using electrical Headroom: Q957 Holbrook Energy Storage. The following CY21 projects accepted their respective SDU Project Cost Allocation and posted Security for SDU for a new Bayport – Great River 69 kV line:

- Q766 Sunrise Wind;
- Q987 Sunrise Wind II;
- Q956 Holtsville 138 kV Energy Storage; and
- Q965 Yaphank Energy Storage.

The Headroom allocation for CY23 Q957 Holbrook Energy Storage will be identified in the SDU Project

[14] For CY09, the 10 –year expiration date is calculated from the November 30, 2011, the Class settlement date.
[15] For CY10, the 10 –year expiration date is calculated from the November 30, 2011, the Class settlement date.

Cost Allocation as part of the Additional SDU Study decision process.

Electrical Headroom Calculation for CY19 SUF

Two (2) projects in the CY23 SUF study were identified as using electrical Headroom: Q858 Genesee Road Solar Energy Center and Q1080 Mineral Basin Solar Power. CY19 Q596 Alle Catt II Wind project paid for the SUF PAR at the Hillside Station on the East Towanda – Hillside 230 kV Line 70. In the CY21 study, Q783 South Ripley Solar and BESS was identified as using this electrical Headroom and paid Headroom to the Q596 Developer.

The CY23 Q858 Genesee Road Solar Energy Center and Q1080 Mineral Basin Solar Power projects must reimburse $14,284,046 to the Q596 Developer. **Table 27, 28 and 29** below show the calculation details.

1. Electrical Headroom: depreciated calculation

Table 27: Calculation of Depreciation of Prior Class Year Upgrades

CY19 SUF with Electrical Headroom used by CY23 Q858 & Q1080 projects	Actual Hillside Station Contracted Cost ($)	Reimbursement amount of CY21 project Q783 South Ripley Solar and BESS (Settled in CY21 Study)	Electrical Headroom SUF cost estimates (from CY19) ($)	Annual Depreciation Rate (%, from CTO)	Years of Depreciation (2024-2021 = 3y)	Depreciation ($)	Electrical Headroom SUF Depreciated Cost Estimate ($)	Total Depreciated Cost Estimate ($)
PAR at Hillside	$32,681,551	$4,026,087	$28,655,464	1.777%	3	$1,527,623	$27,127,841	$27,127,841

2. Electrical Headroom allocation

Table 28: Allocation Of Payments for Upgrades from Previous Class Years

Queue Project	Class Year	PJM - NY Transfer Degradation Contribution (MW)	Each Project Total % of Contribution	Electrical Headroom SUF (depreciated value) ($)	How much each project (including CY19) would have paid if in the same Class Year ($)
Q596	2019	206	47.35%	$27,127,841	$12,843,795
Q858	2023	76.3	17.54%		$4,757,192
Q1080		152.8	35.12%		$9,526,854

3. Electrical Headroom $ reimbursement

Table 29: Total Reimbursement Amount to Previous Class Year Projects

Reimbursement amount of CY23 projects	To CY19 Q596 Alle Catt II Wind
From CY23 Q858 Genesee Road Solar Energy Center	$4,757,192
From CY23 Q1080 Mineral Basin Solar Power	$9,526,854
Total to Q596 Alle Catt II Wind	$14,284,046

9.2 Functional Headroom

Starting with CY07, the Class Year Facilities Study included a new category of Headroom – *i.e.*, "Functional Headroom" – which provides for Headroom payments for certain SUFs that have an excess functional capacity not readily measured in Amperes or other discrete electrical units, (*e.g.*, system protection facilities, a shared ring bus, etc).

As defined in Attachment S, in the case of Functional Headroom, the use that each subsequent project makes of the entity-created Headroom will be measured solely by using the total number of projects in the current and prior Class Years needing or using the SUF.

Functional Headroom Calculation for CY21 SUF - Holbrook 138 kV BPS SUF

Seven (7) projects in the CY23 SUF studies were identified as using this functional Headroom:

- Q825 Setauket Energy Storage;
- Q957 Holbrook Energy Storage;
- Q1012 Suffolk County Storage II;
- Q1117 CLIES 70MW;
- Q1255 Holtsville Brookhaven Battery Storage;
- Q1256 Canal Southampton Battery Storage; and
- Q1257 Edwards Calverton Battery Storage.

The Developer of CY21 projects Q766 Sunrise Wind and Q987 Sunrise Wind II paid for upgrading Holbrook 138 kV substation to BPS substation. The above-listed seven (7) CY23 projects must reimburse $11,842,404 to the Developer of Q766 Sunrise Wind and Q987 Sunrise Wind II. **Table 30, 31 and 32** below show the calculation details.

1. Functional Headroom: Depreciated Calculation

Table 30: Calculation of Depreciation of Prior Class Year Upgrades

CY21 SUF with Functional Headroom used by CY23 Q825, Q957, Q1012, Q1117, Q1255, Q1256, and Q1257 projects	Functional Headroom SUF cost estimates (from CY21) ($)	Annual Depreciation Rate (%, from CTO)	Years of Depreciation (2024-2023 = 1y)	Depreciation ($)	Functional Headroom SUF Depreciated Cost Estimate ($)	Total Depreciated Cost Estimate ($)
Upgrading Holbrook 138 kV to BPS substation	$15,600,356	2.4%	1	$374,409	$15,225,947	$15,225,947

2. Functional Headroom Allocation

Table 31: Allocation Of Payments for Upgrades from Previous Class Years

Queue Project	Class Year	Each Project Total % of Contribution	Functional Headroom SUF (depreciated value) ($)	How much each project (including CY21) would have paid if in the same Class Year ($)
Q766	2021	11.11%	$15,225,947	$1,691,772
Q987		11.11%		$1,691,772
Q825	2023	11.11%		$1,691,772
Q957		11.11%		$1,691,772
Q1012		11.11%		$1,691,772
Q1117		11.11%		$1,691,772
Q1255		11.11%		$1,691,772
Q1256		11.11%		$1,691,772
Q1257		11.11%		$1,691,772

3. Functional Headroom $ Reimbursement

Table 32: Total Reimbursement Amount to Previous Class Year Projects

Reimbursement Amount of CY23 Projects	To CY21 Q766 Sunrise Wind and Q987 Sunrise Wind I
From CY23 Q825 Setauket Energy Storage	$1,691,772
From CY23 Q957 Holbrook Energy Storage	$1,691,772
From CY23 Q1012 Suffolk County Storage II	$1,691,772
From CY23 Q1117 CLIES 70MW	$1,691,772
From CY23 Q1255 Holtsville Brookhaven Battery Storage	$1,691,772
From CY23 Q1256 Canal Southampton Battery Storage	$1,691,772
From CY23 Q1257 Edwards Calverton Battery Storage	$1,691,772
Total to CY21 Q766 Sunrise Wind and Q987 Sunrise Wind II	$11,842,404

Functional Headroom Calculation for CY21 SUF - New Bridge 138 kV BPS SUF

Project Q680 Juno Power Express in the CY23 SUF studies was identified as using this functional Headroom. The Developer of CY21 project Q959 EI Oceanside 2 paid for upgrading New Bridge 138 kV substation to BPS substation. Q680 Juno Power Express project must reimburse $6,798,787 to the Developer of Q959 EI Oceanside 2. **Table 33, 34 and 35** below show the calculation details.

4. Functional Headroom: Depreciated Calculation

Table 33: Calculation of Depreciation of Prior Class Year Upgrades

CY21 SUF with Functional Headroom used by CY21 Q959	Functional Headroom SUF cost estimates (from CY21) ($)	Annual Depreciation Rate (%, from CTO)	Years of Depreciation (2024-2023 = 1y)	Depreciation ($)	Functional Headroom SUF Depreciated Cost Estimate ($)	Total Depreciated Cost Estimate ($)
Upgrading New Bridge 138 kV to BPS substation	$13,931,941	2.4%	1	$334,367	$13,597,574	$13,597,574

5. Functional Headroom Allocation

Table 34: Allocation of Payments for Upgrades from Previous Class Years

Queue Project	Class Year	Each Project Total % of Contribution	Functional Headroom SUF (depreciated value) ($)	How much each project (including CY21) would have paid if in the same Class Year ($)
Q959	2021	50.00%	$13,597,574	$6,798,787
Q680	2023	50.00%		$6,798,787

6. Functional Headroom $ Reimbursement

Table 35: Total Reimbursement Amount to Previous Class Year Projects

Reimbursement Amount of CY23 Project	To CY21 Q959 EI Oceanside 2
From CY23 Q680 Juno Power Express	$6,798,787
Total to CY21 Q959 EI Oceanside 2	$6,798,787

10. Bus Flow Analysis

The objective of the bus flow analysis is to identify upgrades/modifications to existing equipment and the addition of new equipment as a result of the Developers' new interconnections (this may include circuit breakers, disconnect switches, and bus sections).

Con Edison performed bus flow analyses for the following CY23 projects;

- Q522 NYC Energy;
- Q700 Robinson Grid;
- Q822 Whale Square Energy Storage 1;
- Q834 Luyster Creek Energy Storage 2;
- Q1007 NYC Energy LLC - Phase 2;
- Q1016 EI Steinway 1/Q1199 El Steinway 1.1 Uprate;
- Q1017 EI Steinway 2;
- Q1068 Buchanan Point BESS; and
- Q1288 CPNY-X.

For CY23 energy storage Projects the bus flow analyses were conducted with the projects in both the discharging (GEN) and charging (LOAD) modes of operation.

The results of the bus flow analysis are summarized below:

- The Project Q522 NYC Energy does not have an adverse thermal impact on the existing equipment of the Hudson Ave E 138 kV Substation in summer case for pre- and post-contingency simulations with the Project in GEN mode or in LOAD mode.
- The Project Q700 Robinson Grid does not have an adverse thermal impact on the existing equipment of the Gowanus 345 kV Substation in summer case for pre- and post-contingency simulations with the Project in GEN mode or in LOAD mode.
- The Project Q822 Whale Square Energy Storage 1 does not have an adverse thermal impact on the existing equipment of the Greenwood 138 kV Substation in both summer and winter cases for pre- and post-contingency simulations with the Project in GEN mode or in LOAD mode.
- The Project Q834 Luyster Creek Energy Storage 2 does not have an adverse thermal impact on the existing equipment of the Astoria West 138 kV Substation in summer case for pre- and post-

contingency simulations with the Project in GEN mode or in LOAD mode.

- The Project Q1007 NYC Energy LLC - Phase 2 has an adverse thermal impact on two (2) existing disconnect switches 3-2, 3-3 at the Hudson Ave E 138 kV Substation in summer case.
- The Project Q1016 EI Steinway 1, evaluated with its Q1199 El Steinway 1.1 Uprate, does not have an adverse thermal impact on the equipment in both single ring and double ring configurations of the new GIS 345 kV Substation in summer case for pre- and post-contingency simulations.
- The Project Q1017 EI Steinway 2 does not have an adverse thermal impact on the equipment of the new GIS 345 kV Substation in summer case for pre- and post-contingency simulations.
- The Project Q1068 Buchanan Point BESS does not have an adverse thermal impact on the existing equipment of the Buchanan 345 kV Substation in summer case for pre- and post-contingency simulations with the project in GEN mode or in LOAD mode.
- The Project Q1288 CPNY-X has an adverse thermal impact on twelve (12) existing disconnect switches 1E-1, 1E-8, 2E-1, 2E-2, 3E-2, 3E-3, 7E-6, 7E-7, 8E-7, 8E-8, 9E-8, 9E-9 at the Rainey 345 kV Substation in summer case.

The SUFs identified in Bus Flow Analysis:

- Q1007 NYC Energy LLC - Phase 2 SUF: Replacement of disconnect switches 3-2, 3-3 at the Hudson Ave E 138 kV substation
- Q1288 CPNY-X SUF: Replacement of disconnect switches 1E-1, 1E-8, 2E-1, 2E-2, 3E-2, 3E-3, 7E-6, 7E-7, 8E-7, 8E-8, 9E-8, 9E-9 at the Rainey 345 kV substation

The detailed cost estimates for SUFs and cost allocation is discussed in **Section 11.3**.

The full bus flow analysis as provided by Con Edison is included as Appendix J.

11. SUFs and Cost Allocation

The following sections summarize the SUFs identified in various studies performed under the CY23 SUF Study, and cost responsibility for such SUFs.

11.1 SUFs Identified via the Part 1 Studies

As described above, each Part 1 Study addresses various facilities required for each project in the CY23 SUF Study, including Local SUFs (*e.g.*, POI connection, related protection/communication facilities), CTOAFs, and certain DAFs as related to integration of CTOAFs and SUFs. The Part 1 Studies are performed for each Full CY23 project, or are combined if projects share Local SUFs, such as a ring bus. These upgrades are the minimum requirements to reliably interconnect to the NYSTS.

Expansion of Security Room in Marcy Control Center SUF

The NYPA facilities are monitored from Marcy Control Center, and with the addition of the following two (2) CY23 Projects' new interconnection substations, the Marcy Control Center security room requires expansion to accommodate new monitors and supporting equipment necessary for securing those new interconnection substations.

- Q1089 Flat Creek Solar and Q1115 Flat Creek Solar 2 – These two projects interconnect to the transmission line via the same new interconnection substation and gen-tie line.

The total estimated cost of the work associated with the SUFs is $264,400 (-15%/+30%).

Table 36 shows the cost allocations for Q1089 Flat Creek Solar and Q1115 Flat Creek Solar 2.

Table 36: Expansion of Security Room in Marcy Control Center SUF Cost Allocation

Project	Cost Allocation %	Cost Allocation $ (-15%/+30%)
Q1089	50%	$ 132,200
Q1115	50%	$ 132,200
Total	100%	$ 264,400

New Babbits Corner Station and Tar Hill Station SUF

With the interconnection of the CY23 Projects listed in **Table 37**, the fault current on the National Grid's Tar Hill/Lighthouse Hill (LHH) Line 6 to Staplin Creek Station (station replacing the Middle Road Station) decreases below acceptable thresholds. To resolve this issue, a three-breaker ring bus station must be installed in the immediate vicinity of the Babbits Corners Station; a customer-owned singe breaker tap station located between the existing LHH and Middle Road stations. Additionally, the introduction of the New Babbits Corners Station will require system modifications at Tar Hill Station. The estimated costs of the work associated with the installation of the new station as well as the contribution of each Class Year 2023 project are presented in **Table 37** below.

Table 37: New Babbits Corner Station and Tar Hill Station SUF Cost Allocation

Project	Phase Ground Contribution (Amps)	Cost Allocation %	Cost Allocation $ (-15%/+30%)
Q560	3221	67.46%	$10,566,094
Q1136	1554	32.54%	$5,097,706
Total	4775	100%	$15,663,800

Table 38 summarizes the SUF cost allocation identified in Part 1 and the TOs to which SUFs Security payments should be made. All the related details are in the respective Part 1 Study Reports.

Table 38: CY23 Part 1 SUF Project Cost Allocation - $ Flow from CY23 Project to Transmission Owner

CTO		CHG&E	ConEd	NextEra	NGrid	NYSEG	NYPA	O&R	PSEG-LI	RG&E	LS Power	NY Transco	Total Part 1 SUF Cost ($)
Queue	Project Name												
Q522	NYC Energy	-	$ 39,700,000	-	-	-	-	-	-	-	-	-	$ 39,700,000
Q560	Deer River Wind	-	-	-	$ 25,464,494	-	-	-	-	-	-	-	$ 25,464,494
Q680	Juno Power Express	-	-	-	-	-	-	-	$ 197,033,514	-	-	-	$ 197,033,514
Q700	Robinson Grid	-	$ 33,000,000	-	-	-	-	-	-	-	-	-	$ 33,000,000
Q716	Moraine Solar Energy Center	-	-	-	-	$ 3,653,000	-	-	-	-	-	-	$ 3,653,000
Q770	KCE NY 8a	$ 420,000	-	-	-	-	-	-	-	-	-	-	$ 420,000
Q774	Tracy Solar Energy Centre	-	-	-	$ 6,638,200	-	-	-	-	-	-	-	$ 6,638,200
Q777	White Creek Solar	-	-	-	-	-	-	-	-	$ 29,675,000	-	-	$ 29,675,000
Q785	Erie-Wyoming County Solar	-	-	-	-	$ 43,172,000	-	-	-	-	-	-	$ 43,172,000
Q800	Rich Road Solar Energy Center	-	-	-	-	-	$ 40,330,807	-	-	-	-	-	$ 40,330,807
Q822	Whale Square Energy Storage 1	-	$ 26,160,000	-	-	-	-	-	-	-	-	-	$ 26,160,000
Q825	Setauket Energy Storage	-	-	-	-	-	-	-	$ 19,847,616	-	-	-	$ 19,847,616
Q834	Luyster Creek Energy Storage 2	-	$ 169,000	-	-	-	-	-	-	-	-	-	$ 169,000
Q852	Niagara Dolomite Solar	-	-	-	-	$ 48,034,000	$ 100,000	-	-	-	-	-	$ 48,134,000
Q858	Genesee Road Solar Energy Center	-	-	$ 230,000	$ 572,200	$ 63,161,000	-	-	-	-	-	-	$ 63,963,200
Q859	Ridge View Solar Energy Center	-	-	$ 256,400	-	$ 46,981,000	$ 100,000	-	-	-	-	-	$ 47,337,400
Q866	North Country Wind	-	-	-	-	-	$ 41,367,926	-	-	-	-	-	$ 41,367,926
Q869	Tabletop Solar	-	-	-	$ 24,638,900	-	-	-	-	-	-	-	$ 24,638,900
Q878	Pirates Island	-	-	-	$ 18,071,900	-	-	-	-	-	-	-	$ 18,071,900
Q880	Brookside Solar	-	-	-	$ 30,000	$ 42,902,000	$ 11,223,960	-	-	-	-	-	$ 54,155,960
Q882	Riverside Solar	-	-	-	$ 6,305,400	-	-	-	-	-	-	-	$ 6,305,400
Q950	Hemlock Ridge Solar	-	-	-	$ 22,576,300	-	-	-	-	-	-	-	$ 22,576,300
Q952	Catskill Grid, LLC	$ 5,370,000	-	-	$ 50,000	-	-	-	-	-	-	$ 196,700	$ 5,616,700
Q953	Sugar Maple Solar	-	-	-	$ 27,211,400	-	-	-	-	-	-	-	$ 27,211,400
Q957	Holbrook Energy Storage	-	-	-	-	-	-	-	$ 20,777,015	-	-	-	$ 20,777,015
Q967	KCE NY 5	$ 20,000	-	-	-	-	-	-	-	-	-	-	$ 20,000
Q971	East Setauket Energy Storage	-	-	-	-	-	-	-	$ 15,521,556	-	-	-	$ 15,521,556
Q974	KCE NY 19	-	-	-	-	-	-	$ 20,390,375	-	-	-	-	$ 20,390,375
Q995	Alabama Solar Park LLC	-	-	-	$ 14,560,700	-	-	-	-	-	-	-	$ 14,560,700
Q1007	NYC Energy LLC - Phase 2	-	$ -	-	-	-	-	-	-	-	-	-	$ -
Q1009	Yellow Barn Solar	-	-	-	-	$ 31,200,000	-	-	-	-	-	-	$ 31,200,000
Q1012	Suffolk County Storage II	-	-	-	-	-	-	-	$ 3,118,356	-	-	-	$ 3,118,356
Q1016	EI Steinway 1	-	$ 400,100,000	-	-	-	-	-	-	-	-	-	$ 400,100,000
Q1017	EI Steinway 2	-	$ 400,100,000	-	-	-	-	-	-	-	-	-	$ 400,100,000
Q1031	Mill Point Solar	-	-	-	$ 27,081,000	-	$ 1,903,310	-	-	-	-	-	$ 28,984,310
Q1036	Mainesburg ESS	-	-	-	-	$ 55,846,000	-	-	-	-	-	-	$ 55,846,000
Q1042	Fort Edward Solar Farm (NY53)	-	-	-	$ 20,251,700	$ 1,917,000	-	-	-	-	-	-	$ 22,168,700
Q1068	Buchanan Point BESS	-	$ 32,020,000	-	-	-	-	-	-	-	-	-	$ 32,020,000
Q1079	Somerset Solar	-	-	-	-	$ 5,623,000	-	-	-	-	-	-	$ 5,623,000
Q1080	Mineral Basin Solar Power	-	-	-	-	$ 42,242,000	-	-	-	-	-	-	$ 42,242,000
Q1088	Harvest Hills Solar	-	-	-	-	$ 34,840,000	-	-	-	-	-	-	$ 34,840,000
Q1089	Flat Creek Solar	-	-	-	$ 40,000	-	$ 21,074,881	-	-	-	$ 184,200	-	$ 21,299,081
Q1096	Alfred Oaks Solar	-	-	-	$ 1,876,600	$ 26,216,000	-	-	-	-	-	-	$ 28,092,600
Q1115	Flat Creek Solar 2	-	-	-	$ 40,000	-	$ 21,074,881	-	-	-	$ 184,200	-	$ 21,299,081
Q1117	CLIES 70MW	-	-	-	-	-	-	-	$ -	-	-	-	$ -
Q1122	East Fishkill	$ 260,000	-	-	-	-	-	-	-	-	-	-	$ 260,000
Q1123	KCE NY 29	-	-	-	-	-	-	-	$ 3,330,774	-	-	-	$ 3,330,774
Q1130	Hoffman Falls Wind	-	-	-	$ 17,418,000	-	-	-	-	-	-	-	$ 17,418,000
Q1136	Honey Ridge Solar	-	-	-	$ 9,062,006	-	-	-	-	-	-	-	$ 9,062,006
Q1148	Agricola Wind	-	-	-	-	$ 26,736,000	-	-	-	-	-	-	$ 26,736,000
Q1150	Moss Ridge Solar	-	-	-	$ 17,857,000	-	-	-	-	-	-	-	$ 17,857,000
Q1151	York Run Solar	-	-	-	$ 18,297,600	-	-	-	-	-	-	-	$ 18,297,600
Q1174	NY48 - Diamond Solar	-	-	-	$ 17,604,700	-	-	-	-	-	-	-	$ 17,604,700
Q1178	NY115 - Newport Solar	-	-	-	$ 1,361,500	-	-	-	-	-	-	-	$ 1,361,500
Q1180	Union Energy Center, LLC	-	-	-	-	$ 41,968,000	-	-	-	-	-	-	$ 41,968,000
Q1182	NY128 - Foothills Solar	-	-	-	$ 23,258,000	-	-	-	-	-	-	-	$ 23,258,000
Q1183	NY125A - Fort Covington Solar	-	-	-	-	-	$ 36,833,882	-	-	-	-	-	$ 36,833,882
Q1184	NY125B - Two Rivers Solar	-	-	-	-	-	$ 35,780,090	-	-	-	-	-	$ 35,780,090
Q1188	North Seneca Solar Project, LLC	-	-	-	$ 17,021,200	-	-	-	-	-	-	-	$ 17,021,200
Q1194	Crane Brook Solar Project, LLC	-	-	-	$ 14,912,400	$ 1,632,000	-	-	-	-	-	-	$ 16,544,400
Q1199	EI Steinway 1.1	-	$ 237,000	-	-	-	-	-	-	-	-	-	$ 237,000
Q1236	Gravel Road Solar	-	-	-	$ 19,475,600	-	-	-	-	-	-	-	$ 19,475,600
Q1254	Barrett Hempstead Battery Storage	-	-	-	-	-	-	-	$ 15,325,672	-	-	-	$ 15,325,672
Q1255	Holtsville Brookhaven Battery Storage	-	-	-	-	-	-	-	$ 12,543,189	-	-	-	$ 12,543,189
Q1256	Canal Southampton Battery Storage	-	-	-	-	-	-	-	$ 8,639,185	-	-	-	$ 8,639,185
Q1257	Edwards Calverton Battery Storage	-	-	-	-	-	-	-	$ 5,303,982	-	-	-	$ 5,303,982
Q1288	CPNY-X	-	$ 22,930,000	-	-	$ 7,424,000	-	-	-	-	-	-	$ 30,354,000
Total		$ 6,070,000	$ 954,416,000	$ 486,400	$ 351,676,800	$ 523,547,000	$ 209,789,737	$ 20,390,375	$ 301,440,859	$ 29,675,000	$ 368,400	$ 196,700	$ 2,398,057,271

Notes

(1) Q866 and Q1183 SUFs are based on the assumption both Projects will accept cost allocations.
(2) Q1089 and Q1115 SUFs are based on the assumption both Projects will accept cost allocations.
(3) Q1016, Q1199 and Q1017 SUFs are based on the assumption three Projects will accept cost allocations.
(4) Q1088 and Q1148 SUFs are based on the assumption both Projects will accept cost allocations.
(5) Q1188 and Q1236 SUFs are based on the assumption both Projects will accept cost allocations.
(6) Q1007 is the Phase 2 of Q522 and will use the SUFs designed for Q522.

11.2 Other Upgrade Facilities (OUF)

Other Upgrade Facilities (OUFs) are upgrades identified by Affected System and/or upgrades required on facilities other than the NYSTS. CY23 Developers with identified OUFs are required to coordinate with the Affected System or other entity that owns the transmission facilities on which the OUFs will be constructed for applicable Facility Study Agreements or Engineering Agreements, as applicable, if they decide to move forward. The following are the results of Affected System studies evaluating potential reliability impacts on facilities other than the NYSTS.

As reported in CY23 Q1042 Fort Edward Solar Farm (NY53) project Part 1 Affected System study, the Q1042 Fort Edward Solar Farm (NY53) project has OUFs identified at Dolan Solar Collector Station and Somers Solar Collector Station (CS Energy) with a total estimated cost of $240,000 (-15%/+30%), which includes protection system upgrades and coordination.

As reported in CY23 Q1236 Gravel Road Solar project Part 1 Affected System study, Q1236 Gravel Road Solar project has an OUF identified at Lawler Substation and Hogan Substation (Fairport Municipal) with a total estimated cost of $513,000 (-15%/+30%), which includes relay upgrades and drawings upgrades.

PJM has identified no potential OUFs on the PJM system in PJM Affected System Study for CY23 Projects Q858 Genesee Road Solar Energy Center, Q1036 Mainesburg ESS, Q1080 Mineral Basin Solar Power and Q1151 York Run Solar performed by PJM. The PJM Reports are provided in Appendix K.

11.3 SUFs Identified via the Part 2 Studies

SUF Identified in Steady State Analysis

No SUFs were identified in the ATBA, as related with the electrical vicinity of the proposed interconnection of the projects in the CY23 SUF Study.

In a sensitivity analysis of steady state analysis in NYC, an SUF was identified for the Con Edison's Mott Haven 345 kV substation.

Table 39 shows the cost allocations for Q1016 EI Steinway 1, Q1017 EI Steinway 2 and Q1199 El Steinway 1.1 for two (2) 20 MVAr shunt reactors to be installed at Mott Haven 345 kV Substation. The cost estimate for the shunt reactor SUF is $159,030,000 (-15%/+30%). The total cost is allocated among the three CY23 projects based on projects impact. Distribution factor (DFAX) was considered for cost allocation of the shunt reactor SUF. Since Q1016, Q1017 and Q1199 projects are interconnecting to the same POI, DFAX of all three projects are identical. The cost allocations are to be paid to Con Edison, which owns the existing substation.

Table 39: Two 20 MVAR Shunt Reactors at Mott Haven 345 kV SUF Cost Allocation

Project	Project Size (MW)	Cost Allocation %	Cost Allocation $ (-15%/+30%)
Q1016 EI Steinway 1	1300	46.43%	$73,835,357
Q1017 EI Steinway 2	1300	46.43%	$73,835,357
Q1199 El Steinway 1.1	200	7.14%	$11,359,286
Total		100%	$159,030,000

SUF Identified in Thermal Transfer Analysis

In the sensitivity analysis performed for Dunwoodie South interface, an SUF was identified for the Con Edison's Mott Haven – Rainey East 345 kV line and Mott Haven – Rainey West 345 kV line.

Table 40 shows the cost allocations for Q1016 EI Steinway 1, Q1017 EI Steinway 2 and Q1199 El Steinway 1.1 for the reconductoring of the Q11 and Q12 lines from Mott Haven – Rainey East 345 kV line and Mott Haven – Rainey West 345 line. The cost estimate for the reconductoring SUF is $220,260,000 (-15%/+30%). The total cost is allocated between the three CY23 projects based on the impact of each project to the thermal violation. Distribution factor (DFAX) was considered for cost allocation of the shunt reactor SUF. Since Q1016, Q1017 and Q1199 projects are interconnecting to the same POI, DFAX of all three projects are identical. The cost allocations are to be paid to Con Edison, which owns the existing lines.

Table 40: Reconductoring of Q11 and Q12 345 kV line SUF Cost Allocation

Project	Project Size (MW)	Cost Allocation %	Cost Allocation $ (-15%/+30%)
Q1016 EI Steinway 1	1300	46.43%	$102,263,571
Q1017 EI Steinway 2	1300	46.43%	$102,263,571
Q1199 El Steinway 1.1	200	7.14%	$15,732,857
Total		100%	$220,260,000

SUF Identified in Fault Current Assessment

Table 41 shows the cost allocations for Q785 Erie-Wyoming County Solar, Q852 Niagara Dolomite Solar, and Q1036 Mainesburg ESS. The upgrades include two breakers for NYSEG at Hillside and New Gardenville 115 kV. The cost estimate for the Hillside 115kV Breaker 96212 Replacement SUF is $703,000 (-15%/+30%). The cost estimate for the New Gardenville 115kV Breaker T10-12 Replacement SUF is

$630,000 (-15%/+30%).

Table 41: Overdutied Breakers' Upgrade Allocation

Project	NYSEG Hillside 115kV Breaker 96212 Replacement		NYSEG New Gardenville 115kV Breaker T10-12 Replacement	
	%	$ (-15%/+30%)	%	$ (-15%/+30%)
Q785	-	-	68.65%	$ 432,506
Q852	-	-	31.35%	$ 197,494
Q1036	100.00%	$ 703,000	-	-
Total	100.00%	$ 703,000	100.00%	$ 630,000

SUF Identified in NPCC A-10 Testing

In CY23 NPCC A-10 testing, one existing bus Ruland Road 345 kV is classified as BPS bus.

Table 42 summarizes the cost estimates of upgrading Ruland Road 345 kV to BPS substation. The cost of upgrading the Ruland Road 345 kV to BPS is assigned to Q680 Juno Power Express and with a total cost estimate of $5,909,498 (-15%/+30%).

Table 42: SUF Cost Estimates for Upgrading Ruland Road 345 kV Bus in LI to BPS Bus

TO	Ruland Road 345 kV - BPS SUF ($) (-15%/+30%)
PSEG-LI	$5,909,498

SUF Identified in Bus Flow Analysis

Two (2) existing disconnect switches at the Hudson Ave East 138kV substation were identified in the bus flow analysis which require replacement. The cost estimate for this SUF is $3,240,000 (-15%/+30%). Q1007 NYC Energy LLC - Phase 2 is allocated with the overloaded disconnect switches 3-2, 3-3 at Hudson Ave East 138kV substation. The portion of the cost allocated to Q1007 for replacing these disconnect switches is $3,240,000 (-15%/+30%).

Twelve (12) existing disconnect switches at the Rainey 345 kV substation were identified in the bus flow analysis which require replacement. The cost estimate for this SUFs is $23,750,000 (-15%/+30%). Q1288 CPNY-X is allocated with the overloaded disconnect switches 1E-1, 1E-8, 2E-1, 2E-2, 3E-2, 3E-3, 7E-6, 7E-7, 8E-7, 8E-8, 9E-8, 9E-9 at Rainey 345 kV substation. The portion of the cost allocated to Q1288 for replacing these disconnect switches is $23,750,000 (-15%/+30%). **Table 43** summarizes the cost estimates for Q1007 NYC Energy LLC - Phase 2 and Q1288 CPNY-X projects.

Table 43: Bus Flow Analysis SUF Allocation

Project	ConEd Hudson Ave East 115kV Two (2) Disconnect Switches Replacement		ConEd Rainey 345kV Twelve (12) Disconnect Switches Replacement	
	%	$ (-15%/+30%)	%	$(-15%/+30%)
Q1007	100%	$3,240,000	-	-
Q1288	-	-	100%	$23,750,000
Total	100%	$3,240,000	100%	$23,750,000

SDU Identified in Deliverability Analysis

The CY23 LI Byway Tests indicate that the following CY23 CRIS projects located in LI Capacity region, are not deliverable:

- Q825 Setauket Energy Storage;
- Q957 Holbrook Energy Storage;
- Q971 East Setauket Energy Storage;
- Q1012 Suffolk County Storage II;
- Q1117 CLIES 70MW;
- Q1123 KCE NY 29;
- Q1254 Barrett Hempstead Battery Storage;
- Q1255 Holtsville Brookhaven Battery Storage;
- Q1256 Canal Southampton Battery Storage; and
- Q1257 Edwards Calverton Battery Storage.

LI Byway SDUs are required for these projects to be fully deliverable.

The high-level non-binding cost estimate for reconductoring Q825-Terryville 69 kV is **$ 8,765,680** (±50%). Physical feasibility will be confirmed in Additional SDU Studies. The Additional SDU Study for the new SDUs per Section 25.5.10 of Attachment S are ongoing.

The high-level non-binding estimated cost for installing a new PAR controlled 138 kV lines between

Pilgrim and West Bus with two 138 kV underground cables per phase is **$294,879,951** (±50%). Physical feasibility will be confirmed in Additional SDU studies. The Additional SDU Study for the new SDUs per Section 25.5.10 of Attachment S are ongoing.

The high-level non-binding estimated cost for reconductoring portion of Holbrook – Holtsville Circuits 1&2 lines uprating to 183 MVA STE is **$4,978,222** (±50%). Physical feasibility will be confirmed in Additional SDU studies. The Additional SDU Study for the new SDUs per Section 25.5.10 of Attachment S are ongoing.

The high-level non-binding estimated cost for W.Yaphank to N.Bell Port 69kV rebuild is **$14,126,452** (±50%). Physical feasibility will be confirmed in Additional SDU studies. The Additional SDU Study for the new SDUs per Section 25.5.10 of Attachment S are ongoing.

The high-level non-binding estimated cost for a 2 ohms series reactor to Ocean Ave or Barrett 34.5 kV with associated upgrades to accommodate the SR is **$5,000,000** (±50%). Physical feasibility will be confirmed in Additional SDU studies. The Additional SDU Study for the new SDUs per Section 25.5.10 of Attachment S are ongoing.

Headroom Discussion

There was electrical Headroom utilization identified for one project in the CY23 SDU Study: Q825 Setauket Energy Storage. The Developers of the following CY17 Projects paid for the Terryville - Flowerfield 69 kV line SDU:

- Q467 Shoreham Solar;
- Q477 Riverhead Solar;
- Montauk Energy Storage; and
- East Hampton Energy Storage

The Headroom allocation for CY23 Q825 Setauket Energy Storage will be identified in the SDU Project Cost Allocation as part of the Additional SDU Study decision process.

There was electrical Headroom utilization identified for one project in the CY23 SDU Study: Q957 Holbrook Energy Storage. The Developers of the following CY21 Projects paid for the Bayport – Great River 69 kV line SDU:

- Q766 Sunrise Wind;
- Q987 Sunrise Wind II;

- Q956 Holtsville 138 kV Energy Storage; and
- Q965 Yaphank Energy Storage

The Headroom allocation for Q957 Holbrook Energy Storage will be identified in the SDU Project Cost Allocation as part of the Additional SDU Study decision process.

There was electrical Headroom utilization identified for two (2) projects in the CY23 SUF Study:

- CY23 Q858 Genesee Road Solar Energy Center; and
- Q1080 Mineral Basin Solar Power.

The Developer of CY19 Project Q596 Alle Catt II Wind paid for the PAR at the Hillside Station on the East Towanda – Hillside 230 kV Line 70. Q858 Genesee Road Solar Energy Center and Q1080 Mineral Basin Solar Power must reimburse $14,284,046 to the CY19 Q596 Developer for use of this electrical Headroom.

There was functional Headroom utilization identified for seven (7) projects in the CY23 SUF Study:

- Q825 Setauket Energy Storage;
- Q957 Holbrook Energy Storage;
- Q1012 Suffolk County Storage II;
- Q1117 CLIES 70MW;
- Q1255 Holtsville Brookhaven Battery Storage;
- Q1256 Canal Southampton Battery Storage; and
- Q1257 Edwards Calverton Battery Storage.

The Developer of CY21 Project Q766 Sunrise Wind and Q987 Sunrise Wind II paid for upgrading Holbrook 138 kV to BPS substation. The seven (7) above-listed CY23 Developers must reimburse $11,842,404 to the Developer of CY21 Q766 Sunrise Wind and Q987 Sunrise Wind II for use of this functional Headroom.

There was functional Headroom utilization identified for one (1) project in the CY23 SUF Study: Q680 Juno Power Express. The Developer of CY21 Project Q959 EI Oceanside 2 paid for upgrading New Bridge 138 kV to BPS substation. The CY23 Q680 Juno Power Express must reimburse $6,798,787 to the Developer of CY21 Q959 EI Oceanside 2 for use of this functional Headroom.

11.4 SUF Cost Allocation Tables

The total SUFs cost allocation for both Part 1 and Part 2 for all CY23 projects is summarized below in **Table 44.**

Table 44: CY23 SUF Project Total Cost Allocation

Queue Number	Project Name	Part 1 Cost Allocation	Part 2 SUF Cost Allocation											Headroom Payment	Total Cost Allocation
			CHG&E	ConEd	NextEra	NGrid	NYSEG	NYPA	O&R	PSEG-LI	RG&E	LS Power	NY Transco		
Q522	NYC Energy	$ 39,700,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 39,700,000
Q560	Deer River Wind	$ 25,464,494	-	-	-	-	-	-	-	-	-	-	-	-	$ 25,464,494
Q680	Juno Power Express	$ 197,033,514	-	-	-	-	-	-	-	$ 5,909,498	-	-	-	$ 6,798,787	$ 209,741,799
Q700	Robinson Grid	$ 33,000,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 33,000,000
Q716	Moraine Solar Energy Center	$ 3,653,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 3,653,000
Q770	KCE NY 8a	$ 420,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 420,000
Q774	Tracy Solar Energy Centre	$ 6,638,200	-	-	-	-	-	-	-	-	-	-	-	-	$ 6,638,200
Q777	White Creek Solar	$ 29,675,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 29,675,000
Q785	Erie-Wyoming County Solar	$ 43,172,000	-	-	-	-	$ 432,506	-	-	-	-	-	-	-	$ 43,604,506
Q800	Rich Road Solar Energy Center	$ 40,330,807	-	-	-	-	-	-	-	-	-	-	-	-	$ 40,330,807
Q822	Whale Square Energy Storage 1	$ 26,160,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 26,160,000
Q825	Setauket Energy Storage	$ 19,847,616	-	-	-	-	-	-	-	-	-	-	-	$ 1,691,772	$ 21,539,388
Q834	Luyster Creek Energy Storage 2	$ 169,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 169,000
Q852	Niagara Dolomite Solar	$ 48,134,000	-	-	-	-	$ 197,494	-	-	-	-	-	-	-	$ 48,331,494
Q858	Genesee Road Solar Energy Center	$ 63,963,200	-	-	-	-	-	-	-	-	-	-	-	$ 4,757,192	$ 68,720,392
Q859	Ridge View Solar Energy Center	$ 47,337,400	-	-	-	-		-	-	-	-	-	-	-	$ 47,337,400
Q866	North Country Wind	$ 41,367,926	-	-	-	-	-	-	-	-	-	-	-	-	$ 41,367,926
Q869	Tabletop Solar	$ 24,638,900	-	-	-	-	-	-	-	-	-	-	-	-	$ 24,638,900
Q878	Pirates Island	$ 18,071,900	-	-	-	-	-	-	-	-	-	-	-	-	$ 18,071,900
Q880	Brookside Solar	$ 54,155,960	-	-	-	-	-	-	-	-	-	-	-	-	$ 54,155,960
Q882	Riverside Solar	$ 6,305,400	-	-	-	-	-	-	-	-	-	-	-	-	$ 6,305,400
Q950	Hemlock Ridge Solar	$ 22,576,300	-	-	-		-	-	-	-	-	-	-	-	$ 22,576,300
Q952	Catskill Grid, LLC	$ 5,616,700	-	-	-	-	-	-	-	-	-	-	-	-	$ 5,616,700
Q953	Sugar Maple Solar	$ 27,211,400	-	-	-	-	-	-	-	-	-	-	-	-	$ 27,211,400
Q957	Holbrook Energy Storage	$ 20,777,015	-	-	-	-	-	-	-	-	-	-	-	$ 1,691,772	$ 22,468,787
Q967	KCE NY 5	$ 20,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 20,000
Q971	East Setauket Energy Storage	$ 15,521,556	-	-	-	-	-	-	-	-	-	-	-	-	$ 15,521,556
Q974	KCE NY 19	$ 20,390,375	-	-	-	-	-	-	-	-	-	-	-	-	$ 20,390,375
Q995	Alabama Solar Park LLC	$ 14,560,700	-	-	-	-	-	-	-	-	-	-	-	-	$ 14,560,700
Q1007	NYC Energy LLC - Phase 2	$ -	-	$ 3,240,000	-	-	-	-	-	-	-	-	-	-	$ 3,240,000
Q1009	Yellow Barn Solar	$ 31,200,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 31,200,000
Q1012	Suffolk County Storage II	$ 3,118,356	-	-	-	-	-	-	-	-	-	-	-	$ 1,691,772	$ 4,810,128
Q1016	EI Steinway 1	$ 400,100,000	-	$ 176,098,929	-	-	-	-	-	-	-	-	-	-	$ 576,198,929
Q1017	EI Steinway 2	$ 400,100,000	-	$ 176,098,929	-	-	-	-	-	-	-	-	-	-	$ 576,198,929
Q1031	Mill Point Solar	$ 28,984,310	-	-	-	-	-	-	-	-	-	-	-	-	$ 28,984,310
Q1036	Mainesburg ESS	$ 55,846,000	-	-	-	-	$ 703,000	-	-	-	-	-	-	-	$ 56,549,000
Q1042	Fort Edward Solar Farm (NY53)	$ 22,168,700	-	-	-	-	-	-	-	-	-	-	-	-	$ 22,168,700
Q1068	Buchanan Point BESS	$ 32,020,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 32,020,000
Q1079	Somerset Solar	$ 5,623,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 5,623,000
Q1080	Mineral Basin Solar Power	$ 42,242,000	-	-	-	-	-	-	-	-	-	-	-	$ 9,526,854	$ 51,768,854
Q1088	Harvest Hills Solar	$ 34,840,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 34,840,000
Q1089	Flat Creek Solar	$ 21,299,081	-	-	-	-	-	-	-	-	-	-	-	-	$ 21,299,081
Q1096	Alfred Oaks Solar	$ 28,092,600	-	-	-	-	-	-	-	-	-	-	-	-	$ 28,092,600
Q1115	Flat Creek Solar 2	$ 21,299,081	-	-	-	-	-	-	-	-	-	-	-	-	$ 21,299,081
Q1117	CLIES 70MW	$ -	-	-	-	-	-	-	-	-	-	-	-	$ 1,691,772	$ 1,691,772
Q1122	East Fishkill	$ 260,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 260,000
Q1123	KCE NY 29	$ 3,330,774	-	-	-	-	-	-	-	-	-	-	-	-	$ 3,330,774
Q1130	Hoffman Falls Wind	$ 17,418,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 17,418,000
Q1136	Honey Ridge Solar	$ 9,062,006	-	-	-	-	-	-	-	-	-	-	-	-	$ 9,062,006
Q1148	Agricola Wind	$ 26,736,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 26,736,000
Q1150	Moss Ridge Solar	$ 17,857,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 17,857,000
Q1151	York Run Solar	$ 18,297,600	-	-	-	-	-	-	-	-	-	-	-	-	$ 18,297,600
Q1174	NY48 - Diamond Solar	$ 17,604,700	-	-	-	-	-	-	-	-	-	-	-	-	$ 17,604,700
Q1178	NY115 - Newport Solar	$ 1,361,500	-	-	-	-	-	-	-	-	-	-	-	-	$ 1,361,500
Q1180	Union Energy Center, LLC	$ 41,968,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 41,968,000
Q1182	NY128 - Foothills Solar	$ 23,258,000	-	-	-	-	-	-	-	-	-	-	-	-	$ 23,258,000
Q1183	NY125A - Fort Covington Solar	$ 36,833,882	-	-	-	-	-	-	-	-	-	-	-	-	$ 36,833,882
Q1184	NY125B - Two Rivers Solar	$ 35,780,090	-	-	-	-	-	-	-	-	-	-	-	-	$ 35,780,090
Q1188	North Seneca Solar Project, LLC	$ 17,021,200	-	-	-	-	-	-	-	-	-	-	-	-	$ 17,021,200
Q1194	Crane Brook Solar Project, LLC	$ 16,544,400	-	-	-	-	-	-	-	-	-	-	-	-	$ 16,544,400
Q1199	EI Steinway 1.1	$ 237,000	-	$ 27,092,143	-	-	-	-	-	-	-	-	-	-	$ 27,329,143
Q1236	Gravel Road Solar	$ 19,475,600	-	-	-	-	-	-	-	-	-	-	-	-	$ 19,475,600
Q1254	Barrett Hempstead Battery Storage	$ 15,325,672	-	-	-	-	-	-	-	-	-	-	-	-	$ 15,325,672
Q1255	Holtsville Brookhaven Battery Storage	$ 12,543,189	-	-	-	-	-	-	-	-	-	-	-	$ 1,691,772	$ 14,234,961
Q1256	Canal Southampton Battery Storage	$ 8,639,185	-	-	-	-	-	-	-	-	-	-	-	$ 1,691,772	$ 10,330,957
Q1257	Edwards Calverton Battery Storage	$ 5,303,982	-	-	-	-	-	-	-	-	-	-	-	$ 1,691,772	$ 6,995,754
Q1288	CPNY-X	$ 30,354,000	-	$ 23,750,000	-	-	-	-	-	-	-	-	-	-	$ 54,104,000
Total		$ 2,398,057,271	$ -	$ 406,280,001	$ -	$ -	$ 1,333,000	$ -	$ -	$ 5,909,498	$ -	$ -	$ -	$ 32,925,237	$ 2,844,505,007

Notes

(1) Q866 and Q1183 SUFs are based on the assumption both Projects will accept cost allocations.
(2) Q1089 and Q1115 SUFs are based on the assumption both Projects will accept cost allocations.
(3) Q1016, Q1199 and Q1017 SUFs are based on the assumption three Projects will accept cost allocations.
(4) Q1088 and Q1148 SUFs are based on the assumption both Projects will accept cost allocations.
(5) Q1188 and Q1236 SUFs are based on the assumption both Projects will accept cost allocations.
(6) Q1007 is the Phase 2 of Q522 and will use the SUFs designed for Q522.
(7) Q680 will reimburse the cost amount in Headroom Payment to CY21 Q959 developer.
(8) Q858 and Q1080 will reimburse the cost amounts in Headroom Payment to CY19 Q596 developer.
(9) Q825, Q957, Q1012, Q1117, Q1255, Q1256 and Q1257 will reimburse the cost amounts in Headroom Payment to CY21 Q766 & Q987 developer.

Appendices

Appendix A – Study Plan

Appendix B – Interface Definition

Appendix C – Thermal Transfer Analysis

Appendix D – One Line Diagrams

Appendix E – Steady State

Appendix F – Local Stability Plots

Appendix G – Short Circuit

Appendix H – SSTI

Appendix I – A-10 Stability Plots

Appendix J – Bus Flow Analysis

Appendix K– PJM OUF Reports