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Load Interconnection Study
System Impact Study (SIS)

Q1536 – White Pine Phase 1 Load Project

Final Report

December 9, 2024, TPAS Recommended
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Revision History		
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0	Original Document	05/28/2024
1	Revision	06/17/2024
2	Updated Voltage Transfer Results and Network Upgrade	09/30/2024
3	Updated Short Circuit Appendices, Incorporated TO Comments	10/17/2024
4	Updated Network Upgrade Design	11/18/2024

EXECUTIVE SUMMARY

The purpose of this Interconnection System Impact Study ("SIS" or "Study") is to evaluate the impact of the proposed interconnection of the White Pine Phase 1 Load Project ("Project"), which is being developed by Micron New York Semiconductor Manufacturing LLC ("Eligible Customer"), on the reliability of the New York State Transmission System ("NYSTS"). The Study was performed in accordance with section 3.9 of the NYISO Open Access Transmission Tariff ("OATT").

The Project will be located in Onondaga County, NY. The proposed Point of Interconnection ("POI") will be at the Clay 345 kV Substation. The Connecting Transmission Owner ("CTO") is Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid"). Rochester Gas & Electric ("RGE"), New York State Electric & Gas ("NYSEG"), New York Power Authority ("NYPA"), LS Power, and New York Transco ("TRANSCO") are identified as potentially Affected Systems.

The Project, as proposed, is a 480 MW load interconnection. The proposed load will utilize 480 MW of power on a continuous basis.

The Project proposes an In-Service Date of June 2026.

The NYISO commissioned Qualus, LLC ("Qualus") to perform the Study based on the approved scope for the SIS. The Study was performed based on NYISO Class Year 2023 ATBA base cases ("Base Cases") that have the 2023 FERC 715 2028 system representation. The Study was conducted using the steady state, stability, and short circuit Base Cases provided by the NYISO, and includes the representation of proposed projects that have been cost allocated, up to and including Class Year 2021 (as listed in Appendix A of the scope).

The Study Area includes transmission facilities rated 115 kV and above portions of the NYSTS in the following NY load zones: Zone B (Genesee), Zone C (Central), and Zone E (Mohawk), and tie lines to neighboring systems. In addition, the Study Area also includes the local and underlying transmission facilities in the electrical vicinity of the POI.

Thermal, voltage, stability and short circuit analyses were conducted to assess the impact of the Project in accordance with the applicable North American Electric Reliability Corporation (NERC), Northeast Power Coordinating Council (NPCC), New York State Reliability Council (NYSRC) and CTO's reliability and design standards, and, in accordance with applicable NYISO, CTO, and Affected System(s) study guidelines, procedures, and practices. Based on the results obtained from these analyses, incremental impacts due to the Project were assessed. Study results which indicated system performance outside of established reliability criteria (e.g., thermal ratings, voltage levels, rotor angle stability, transient voltage etc.), if any, were identified without and with the proposed Project. Pre- and post-Project results were then compared and adverse impacts due to the proposed Project (i.e., incremental), if any, were identified. Based on NYISO's Minimum Interconnection Standards ("MIS"), solutions to mitigate negative impacts of the Project, if any, were also identified and evaluated.

If the Study results indicated that the Project, as proposed, would result in violations of Applicable Reliability Standards, analyses were performed to identify any Network Upgrades that would be required to meet the NYISO Minimum Interconnection Standard.

Study results and conclusions are summarized below:

Steady State Analysis (N-0 & N-1)

Thermal and voltage steady state analyses were conducted for **summer peak, winter peak and light load** conditions, pre-contingency, and relevant Design Criteria Contingencies conditions.

Under N-0 and N-1 conditions, no new or worsened thermal overloads were identified due to the interconnection of the Project.

N-0 and N-1 analysis identified new and worsened voltage violations, however, these violations were resolved by system adjustment using normal operating procedures under the NYISO MIS and applicable transmission owner adjustments.

Steady State Analysis (N-1-1)

Thermal and voltage steady state analyses were conducted for **summer peak** conditions.

N-1-1 analysis did not identify any thermal issues caused due to the interconnection of the Project.

N-1-1 voltage issues were identified, however, these were resolved by system adjustments under the NYISO MIS.

Transfer Assessments

Thermal, voltage and stability transfer analyses were performed for **summer peak** conditions for the West-Central and Volney-East interfaces (opened and closed), and it was observed that the interconnection of the Project degrades the studied interfaces' transfer limits.

Thermal transfer degradations were observed for normal and emergency criteria for both the West Central and Volney East interfaces. Generation redispatch using normal operating procedures under the NYISO MIS was used to mitigate the observed thermal transfer limit degradations.

Voltage transfer degradations were observed on both the West Central and Volney East interfaces, which could not be mitigated using the MIS. Network Upgrades have been identified to mitigate the observed voltage transfer limit degradation of the Volney-East and West-Central interfaces. These include a 125 MVAR capacitor bank at the Oakdale 345kV substation and a 50 MVAR capacitor bank at the New Rochester (Station 255) 345kV substation. Following good utility practice, equivalently sized STATCOMs are recommended to replace these capacitor banks at a future point. Replacement with STATCOMs will alleviate post-contingency voltage and knee point constraints, which cannot be secured using normal operating procedures under the NYISO MIS and are not visible to operators real-time. Furthermore, it will resolve operational limits based on the switching state of the shunt device, and provide rapid and automatic voltage regulation, eliminating switching and flicker constraints.

The tested interfaces are not stability limited.

Stability Analysis

Stability analysis was performed for **summer peak, winter peak** and **light load** conditions, and it was observed that the interconnection of the Project does not have any adverse stability impacts on the system.

Critical clearing time analysis was performed, and the results indicate that the Project does not adversely impact the critical clearing times at the Clay 345 kV station.

Short Circuit Analysis

Short circuit analysis was performed, and the results indicated that the interconnection of the Project does not increase the fault currents at the nearby stations by more than 100 A.

Physical Feasibility Assessment

National Grid evaluated the interconnection of the Project to the POI and found that interconnection is physically feasible via the expansion of the Clay 345 kV substation. The station expansion must be designed in accordance with National Grid design criteria.

Cost Estimates and Time to Construct

National Grid provided a non-binding good faith estimate of the cost to construct the required Network Upgrades to interconnect the Project. The total non-binding good faith estimate for all of the required Network Upgrades is [redacted] The non-binding, good faith estimated total time to complete engineering, design, procurement, and construction of the Network Upgrades is 2-3 years, from completion of the Interconnection Agreement.

The non-binding, good faith estimate of cost responsibility to construct the 125 MVAR switched shunt Network Upgrade at the Oakdale 345kV substation to restore voltage transfer capability of Volney East interface is [redacted] The non-binding good faith time to construct is 18 months. NYSEG was not consulted in the creation of this estimate.

The non-binding, good faith estimate of cost responsibility to construct the 50 MVAR switched shunt Network Upgrade at the New Rochester (Station 255) 345kV substation to restore voltage transfer capability of Volney East interface is [redacted] The non-binding good faith time to construct is 18 months. RGE was not consulted in the creation of this estimate.

Overall Findings

The results presented in this report indicate that the Project, with the required Network Upgrades, will not adversely impact the reliability of the NYSTS.

Network Upgrades have been proposed to mitigate any violations observed. This conclusion is based on the following understandings and assumptions:

- The Project will be operated in accordance with all NYISO requirements, including all applicable NYISO and Transmission Owner Day ahead and real time operational procedures and limits. The NYISO will operate the Project in a manner that does not negatively impact the NYSTS.
- The Project and associated interconnection facilities will be designed in accordance with all the Applicable Reliability Standards.
- The SIS results and conclusions are based on the studied scenarios and various assumptions related with the study methodologies, system, and project modeling information provided by the Eligible Customer; any project modeling change can result in different results.

Moreover, the findings are based on the conditions of the system as specified in the Scope approved by the Operating Committee and the conceptual design of the proposed interconnection. Future changes to the system or interconnections made at or near the proposed Point of Interconnection can affect the feasibility/constructability of the proposed interconnection for this Project and the findings in this Study. If modifications to the existing transmission system (e.g., Network Upgrades) are necessary to accommodate the proposed interconnection, the Study does not evaluate the feasibility/constructability of the proposed interconnection as it relates to obtaining necessary permits, approvals, and/or land acquisition, which could potentially affect the feasibility/constructability of the conceptual design of the proposed interconnection.

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Introduction

The purpose of this System Impact Study ("SIS" or "Study") is to evaluate the impact of the proposed interconnection of the White Pine Phase 1 Load Project ("Project"), which is being developed by Micron New York Semiconductor Manufacturing LLC ("Eligible Customer") on the reliability of the New York State Transmission System ("NYSTS"). The Study was performed in accordance with section 3.9 of the New York Independent System Operator ("NYISO") Open Access Transmission Tariff ("OATT").

The NYISO commissioned Qualus, LLC ("Qualus") to perform this SIS. This Study assessed the impact of the proposed Project on the transmission system, including potentially affected systems, and provided a list of the facilities required, if any, to facilitate the interconnection. The study was conducted in accordance with the applicable NERC, NPCC, NYSRC, Connecting Transmission Owner's ("CTO") and Affected System(s)' reliability and design standards; and in accordance with applicable NYISO, and Affected System(s) study guidelines, procedures, and practices. This report documents the methods, analyses, and results of the SIS.

The approved scope document is included in Appendix A of this report for reference.

The main objectives of this SIS are to:

- Confirm that the proposed facilities comply with applicable reliability standards,
- Assess the impact of the proposed Project on the reliability of the NYISO transmission system, and
- Evaluate solutions to eliminate adverse reliability impacts, if any, resulting from the proposed interconnection

Project Description

The Project will be located in Onondaga County, NY. The proposed Point of Interconnection ("POI") will be at Clay 345 kV Substation. The Connecting Transmission Owner ("CTO") is Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid"). Rochester Gas & Electric ("RGE"), New York State Electric & Gas ("NYSEG"), New York Power Authority ("NYPA"), LS Power and New York Transco ("TRANSCO") are identified as potentially Affected Systems.

The Project, as proposed, is a 480 MW load interconnection. The proposed load will utilize 480 MW of power on a continuous basis.

The Project proposes an In-Service Date of June 2026.

Figure 1 shows the Project one-line diagram as provided by the Eligible Customer. Figure 2 shows the Project representation in PSS/E®. Figure 3 shows the Project Interconnection Diagram developed by the CTO.

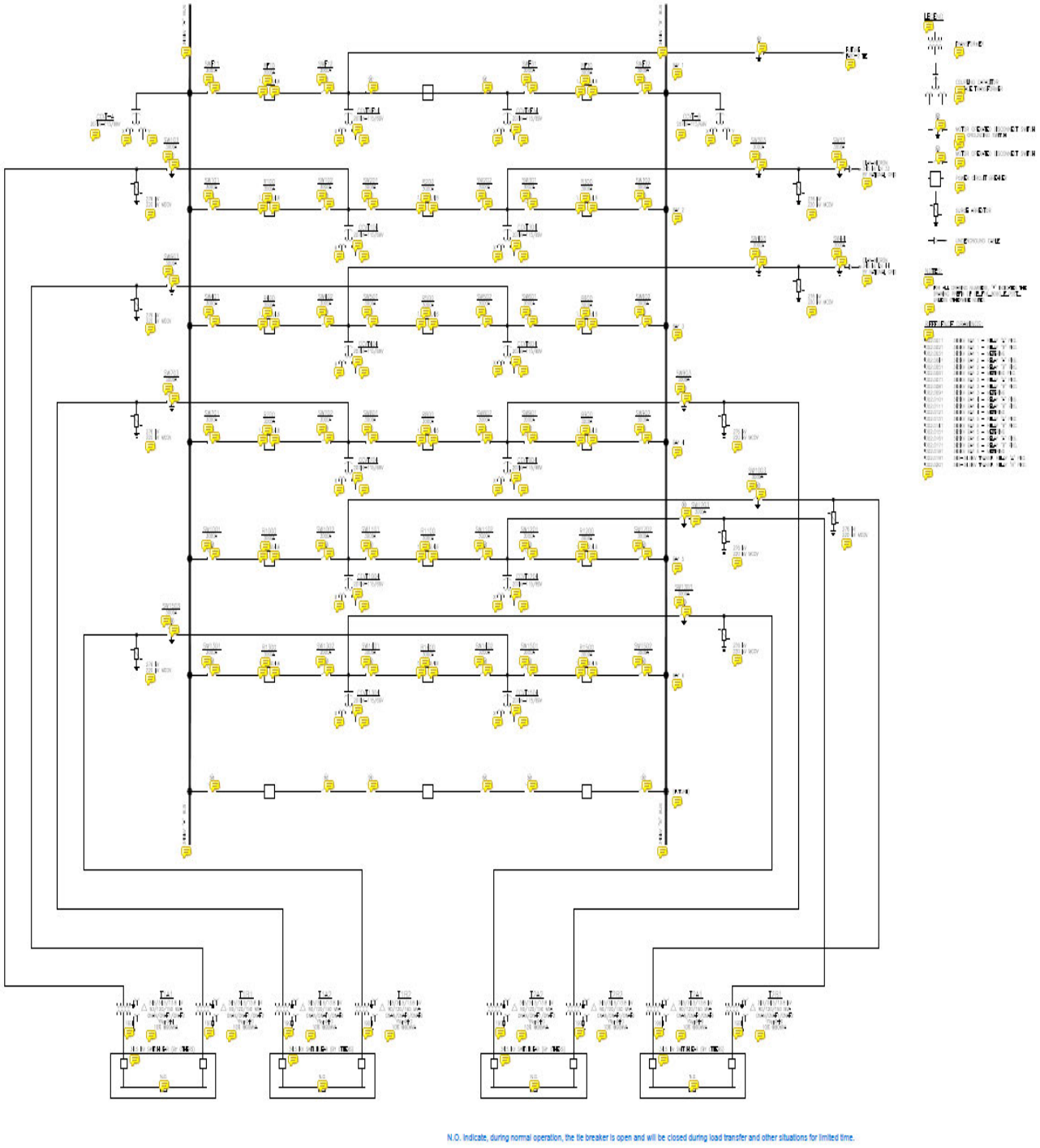
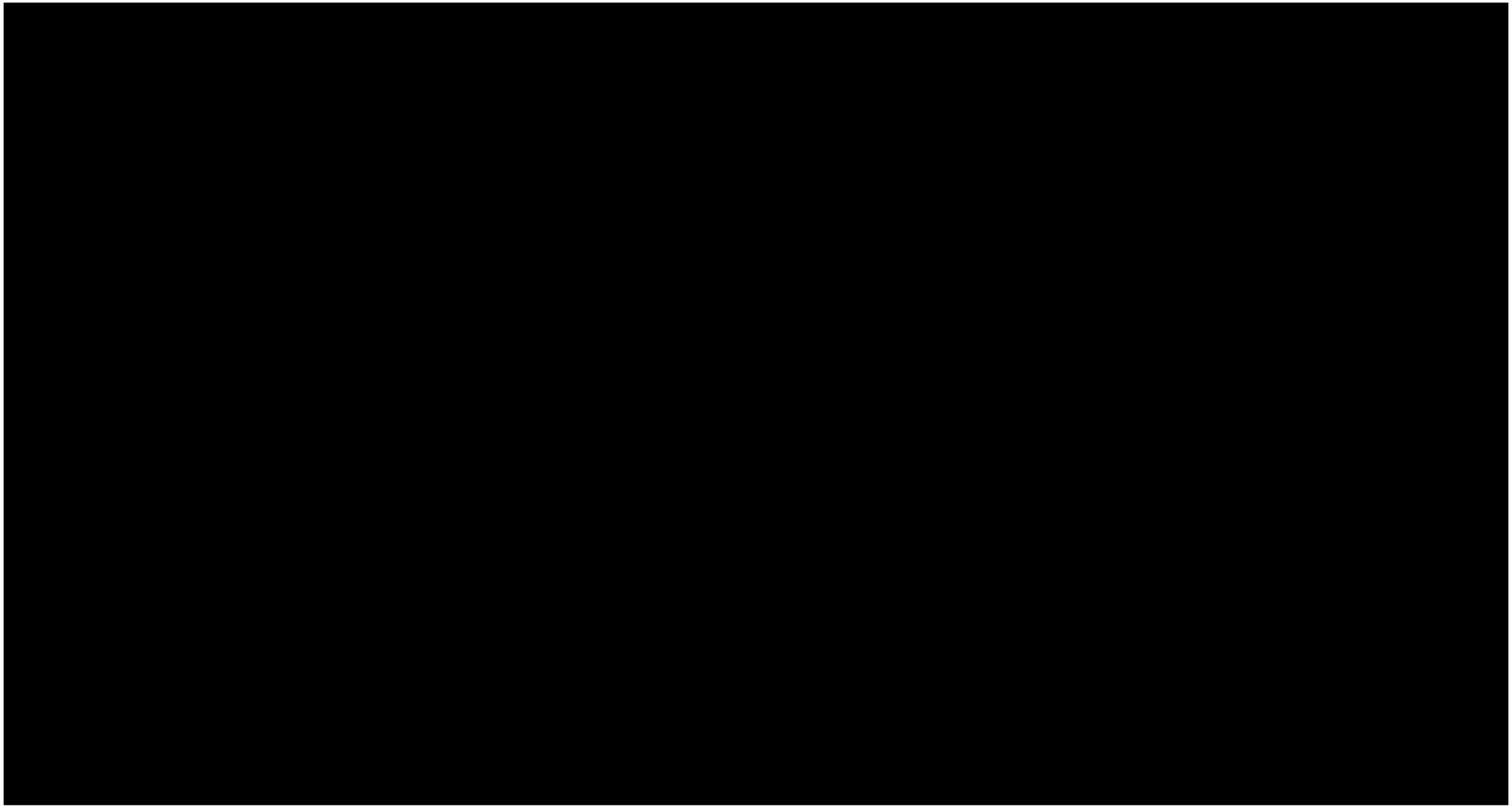
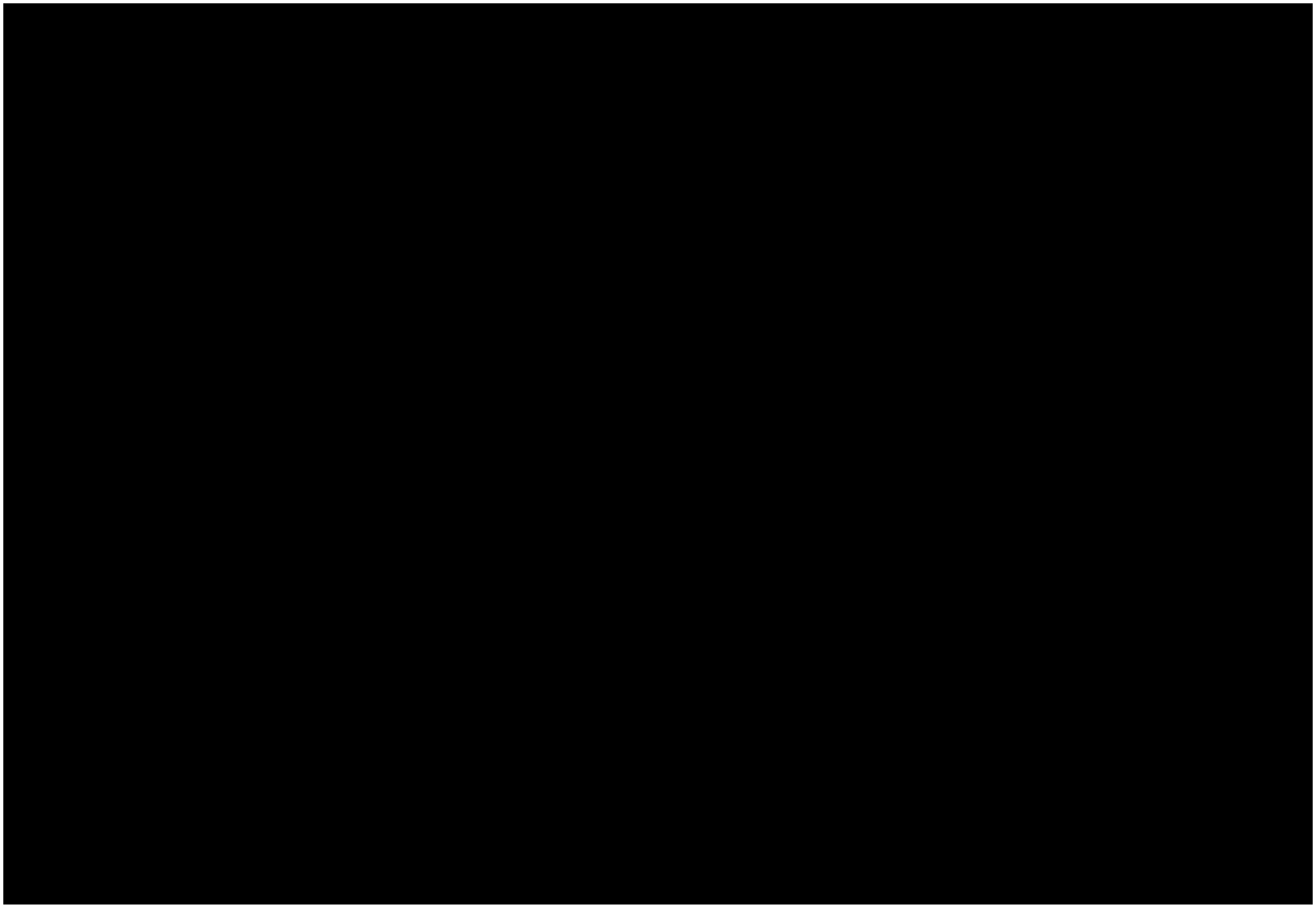


Figure 1: Project One-line diagram as provided by the Eligible Customer





The Project was modeled as an equivalent load connected via a feeder to a main step-up transformer 34.5/345 kV. The main step-up transformer 34.5/345 kV is connected to POI via a 345 kV tie-line. Table 1, Table 2 and Table 3 show the load data, transformer data and the branch circuit data, respectively.

Table 1: Power Flow Model: Load Data

Load Bus Name	Terminal Voltage (kV)	Pload (MW)	Qload (MVar)
Q1536_LOAD	34.5	480	205

Table 2: Power Flow Model: Transformer Data

Equipment	High Side (kV)	Low Side (kV)	Winding Configuration	R1 (pu)	X1 (pu)	Mbase (MVA)
Q1536 Transformer	345	34.5	YnYnd1	0.002127	0.099977	90

Table 3: Power Flow Model: Branch Circuit Data

Bus From	Bus To	R1 (pu)*	X1 (pu)*	B1 (pu)*	Rate A (MVA)	Rate B (MVA)	Rate C (MVA)	Voltage (kV)
Q1536_POI	Q1536_PSU	0.000010	0.000124	0	800	900	900	345

* on 100 MVA base

Study Methodology, Criteria and Assumptions

3.1. Study Methodology

The purpose of the SIS is to determine the impact of the Project on the reliability of the NYSTS. Steady state, dynamic stability, and short circuit analyses are performed without and with the Project in service and the results are compared to evaluate the impacts of the Project. The steady state and transfer thermal and voltage analyses were performed using PowerGem's TARA® program. Dynamic stability simulations were performed using the PSS/E® (v34.9) software. Short circuit calculations were performed using the ASPEN® One-Liner

(v15.6) program. System models and other data necessary for these simulations and calculations were provided by the NYISO.

The study was conducted in accordance with the applicable NERC, NPCC, NYSRC, Connecting Transmission Owner's ("CTO") and Affected System(s)' reliability and design standards; and in accordance with applicable NYISO, and Affected System(s) study guidelines, procedures, and practices.

3.1.1. *Steady State Analysis (N-0 & N-1)*

Thermal and voltage contingency analyses are performed for specific system conditions. This includes contingencies in the local area, along with select, standard contingencies from NYISO database.

For thermal overloads, each branch element (transformer, transmission line, or cable) in the Study Area (Section 3.2) was monitored and electrical flows above the branch rating (Normal or Rate A for base cases; Long-Term Emergency (LTE) or Rate B for contingency cases; and Short-Term Emergency (STE) or Rate C for underground cables in the Con Edison system for contingency cases) are flagged. A change in power flow leading to greater than or equal to one (1) percentage point increase in overload between the pre-Project case and the post-Project case is reported.

For bus voltage violations, pre- and post-contingency limits of 0.95 p.u for low voltage and 1.05 p.u for high voltage are applied. Incremental voltage impacts of 0.005 p.u or more from the pre- to post-Project cases are reported. Specific TO voltage criteria are applied based on the Table below.

[redacted]

* –according to OP1 limit

** - LIPA's post contingency low voltage is 0.92 for extreme contingencies on its 69kV system

1 – applicable below 69 kV

2 – applicable to 69 kV and above

3 – applicable to 115 kV and below

4 – applicable to 230 kV and above

5 – applicable to regulated (TO control) buses

6 – applicable to non-regulated buses (distribution)

7 – applicable to 345 kV

3.1.2. *Steady State Analysis (N-1-1)*

PowerGem's TARA® program is used to perform N-1-1 analysis utilizing the Security Constrained Re-Dispatch (SCRD) module. As part of the N-1-1 analysis, N-1-0 (first-level) contingencies are first simulated by removing a critical generator, transmission circuit, transformer, series or shunt compensating device, from the base case in accordance with NPCC Transmission Design Criteria and NYSRC Reliability Rules. These contingencies are solved by enabling transformer taps, switched shunts, as well as Phase Angle Regulators (PARs).

Second-level contingencies that cover single outages of each line or transformer in the Study Area (Section 3.2), along with several design contingencies including stuck breaker, tower failure, and loss of generation contingencies, are tested on top of the N-1-0 contingencies. N-1-1 contingencies are solved assuming transformer taps, switched shunts and PARs are non-regulating. An iterative automated process is applied on each N-1-0 case to determine a set of preventive actions to mitigate N-1-0 and N-1-1 thermal overloads, to the extent possible. The preventive actions included re-dispatch of existing generation resources and adjustment of phase angle regulators (PARs) to mitigate all potential thermal overloads.

3.1.3. *Transfer Assessments*

Transfer assessments are designed to identify the most constraining facility and the corresponding contingency when there is power transfer across the interface (opened and closed).

Transfer analysis methodology:

1. Monitors transmission facilities above 100 kV, including all New York State BPTF elements under contingency conditions while shifting power across interfaces within NYCA and neighboring systems.
2. Defines source and sink areas on either side of the interface under study. Generation resources in the source and sink areas are adjusted uniformly to allow for equal participation of aggregated generators based on their reserve power ratio (i.e., difference between maximum power capability and power generation output of the unit). Wind, nuclear, and run-of-river hydro units are excluded from generation shifts.
3. Establishes the general direction of power transfer in New York state from the north and west to southeastern New York.

In addition, the analysis is performed in accordance with the NYISO methodology for Assessment of Transfer Capability in the Near-Term Transmission Planning Horizon.

It is determined that a Project degrades the interface transfer limit if the most limiting post-Project transfer limit is lower than the most limiting pre-Project transfer limit by more than 25 MW. The transfer may be limited by any of these – thermal, voltage or stability.

- *Thermal Transfer Limit Analysis:*

  Thermal transfer limit analysis is performed using the PowerGem's TARA® program utilizing the Proportional Scale Transfer module by shifting generation across the interface under evaluation.

For thermal transfer limit analysis, tap settings of PARs and auto-transformers regulate power flow and voltage, respectively, in the pre-contingency solution, but are fixed at their corresponding pre-contingency settings in the post-contingency solution. Similarly, switched shunt capacitors and reactors are switched at pre-determined voltage levels in the pre-contingency solution, but are held at their corresponding pre-contingency position in the post-contingency solution.

The thermal transfer limit is determined to be the interface flow before which a relevant monitored element gets overloaded pre/post-contingency. Normal and emergency thermal limits are evaluated separately.

- *Voltage Transfer Limit Analysis:*

  Voltage transfer limit analysis is performed using the PowerGem's TARA® program utilizing the PV Transfer module by shifting generation across the interface under evaluation considering specific bus voltage limits. The bus voltage limit criteria include specific minimum and maximum voltage limits for pre-contingency and post-contingency conditions.

  A voltage transfer case is created from the relevant summer peak load case. 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 reactive power of generators is regulated, within the capabilities of the units, to maintain a scheduled voltage in both the pre-contingency and post-contingency power flows. Tap settings of PARs and autotransformers regulate power flow and voltage, respectively, in the pre-contingency solution, but are fixed at their corresponding pre-contingency settings in the post-contingency solution. Similarly, switched shunt capacitors and reactors are switched at pre-determined voltage levels in the pre-contingency solution, but are held at their corresponding pre-contingency position in the post-contingency solution. In accordance with the NYISO normal (pre-contingency) operating practice, SVC and FACTS devices are held at or near zero reactive power output in the pre-contingency solution but are allowed to regulate in the post-contingency power flow solution.

  PV screening in TARA is utilized to limit the number of contingencies evaluated to the most relevant contingencies. A full PV analysis is then 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.

- *Stability Transfer Limit Analysis:*

  Stability transfer limit analysis is performed using the PSS/E® software. A stability margin case is created from the relevant summer peak load case. Different margin cases may be created for different interfaces if required. In the margin case, the power flow on the affected interfaces is at a value of at least 200 MW or 11% above the more restrictive of the emergency thermal transfer limit or voltage

transfer limit. Planning design criteria stability contingencies that are relevant to the evaluated interfaces are simulated to test the stability of the BPTF.

3.1.4. *Stability Analysis*

Stability simulations are performed using the PSS/E® dynamics program. Contingencies involving normally cleared three-phase faults and single-line-to-ground breaker-failure faults at the POI and various other Design Criteria contingencies in the electrical vicinity are simulated on the pre- and post-Project cases. Synchronous machine rotor angles, bus voltages and output (MW & MVAr) of generating units in the vicinity of the proposed Project are monitored. The output (MW & MVAr) of the proposed Project is also monitored.

Critical clearing time analysis is performed to evaluate the impact of the Project on the critical clearing times of the adjacent stations. In this analysis, fault clearing times are increased until nearby generators become unstable or trip.

3.1.5. *Short Circuit Analysis*

Short-circuit analysis is performed to assess the impact of the proposed Project on fault current levels in the Study Area (see Section 3.2). Pre- and post-Project short-circuit models are provided by the NYISO in ASPEN One-liner™ format. Three-phase, double-line-to-ground, and single-line-to-ground faults are simulated using these short-circuit models and the incremental increases in fault levels due to the Project are computed and reported.

The procedures discussed in "NYISO Guideline for Fault Current Assessment" are employed for short-circuit computations. The calculation assumes the following system conditions:

- All loads, shunts and transformer magnetizing branches are ignored.
- All generating units are assumed in service. Generators are modeled using sub-transient saturated reactance and the internal voltages of all generators are set to 1.00 per unit and no phase displacement due to load (i.e., "Linear Network Solution" pre-fault starting conditions assumed).

The following fault types are studied:

- Three phase to ground
- Double-line-to-ground
- Single-line-to-ground

All faults are assumed with zero-impedance (bolted fault) with no current limiting effect due to the fault itself.

3.2. Study Area

The Study Area includes transmission facilities rated 115 kV and above portions of the NYSTS in the following NY load zones: Zone B (Genesee), Zone C (Central), and Zone E (Mohawk), and tie lines to neighboring systems. In addition, the Study Area also includes the local and underlying transmission facilities in the electrical vicinity of the POI.

3.3. Base Cases

Based on the SIS scope, NYISO provided pre- and post-Project power flow, short-circuit and stability models. These base cases are based on NYISO Class Year 2023 ATBA base cases that have the 2023 FERC 715 2028 system representation.

The following base cases were provided by the NYISO for the analyses:

- Case 1 - Base Case without the Project (Pre-Project Case)
- Case 2 - Case 1 with the Project modeled as in-service at the rated load of 480 MW.

3.4. Assumptions

The following modeling assumptions are used in the analyses.

- Phase angle regulators ("PARs"), switched shunts, and LTC transformers will be modeled as regulating pre-contingency and non-regulating post-contingency. The Study will use PAR schedules established by the NYISO in coordination with the neighboring ISOs through the NERC and NPCC base case development processes. PARs may be adjusted as necessary to relieve pre-contingency overloads.
- SVC and FACTS devices will be set to zero pre-contingency and allowed to operate to full range post-contingency

Steady State Analysis (N-0 & N-1)

The impact of the proposed Project on monitored facilities in the Study Area (see Section 3.2) was evaluated. All relevant single-element (transmission lines and transformers) outages as well as NYISO design criteria contingencies in the Study Area (see Appendix B for full list) were simulated. The following are the results of this analysis.

4.1. Thermal Results – Summer Peak – Cases 1 & 2

Table 4 and Table 5 show relevant N-0 & N-1 thermal analysis results respectively for summer peak case condition. For the full list, please refer to Appendix C.

[redacted]

Above N-0 results show that the Project does not have any adverse thermal impacts on the system during summer peak condition.

[redacted]



Above N-1 results show that the Project does not have any adverse thermal impacts on the system during summer peak condition.

4.2. Thermal Results – Winter Peak – Cases 1 & 2

Table 6 and Table 7 show relevant N-0 & N-1 thermal analysis results respectively for winter peak case condition. For the full list, please refer to Appendix C.



Above N-0 results show that the Project does not have any adverse thermal impacts on the system during winter peak condition.



Above N-1 results show that the Project does not have any adverse thermal impacts on the system during winter peak condition.

4.3. Thermal Results – Light Load – Cases 1 & 2

Table 8 and Table 9 show relevant N-0 & N-1 thermal analysis results respectively for light load conditions. For the full list, please refer to Appendix C.

[redacted]



Above N-0 results show that the Project does not have any adverse thermal impacts on the system during light load condition.

[redacted]



Above N-1 results show that the Project does not have any adverse thermal impacts on the system during light load condition.

4.4. Voltage Results – Summer Peak – Cases 1 & 2

Table 10 shows relevant N-0 & N-1 voltage analysis results for summer peak condition. For the full list, please refer to Appendix C.

[redacted]



Above N-0 & N-1 results show that the Project either causes voltage violations or worsens existing voltage issues on the system when interconnecting during summer peak condition. These voltage violations were mitigated using the following system adjustments.

[redacted]

4.5. Voltage Results – Winter Peak – Cases 1 & 2

Table 12 shows relevant N-0 & N-1 voltage analysis results for winter peak condition. For the full list, please refer to Appendix C.

[redacted]



Above N-0 & N-1 results show that the Project either causes voltage violations or worsens existing voltage issues on the system when interconnecting during winter peak condition. These voltage violations were mitigated using the following system adjustments.

Table 14: System adjustments to mitigate voltage violations observed in N-1 analysis - winter peak condition

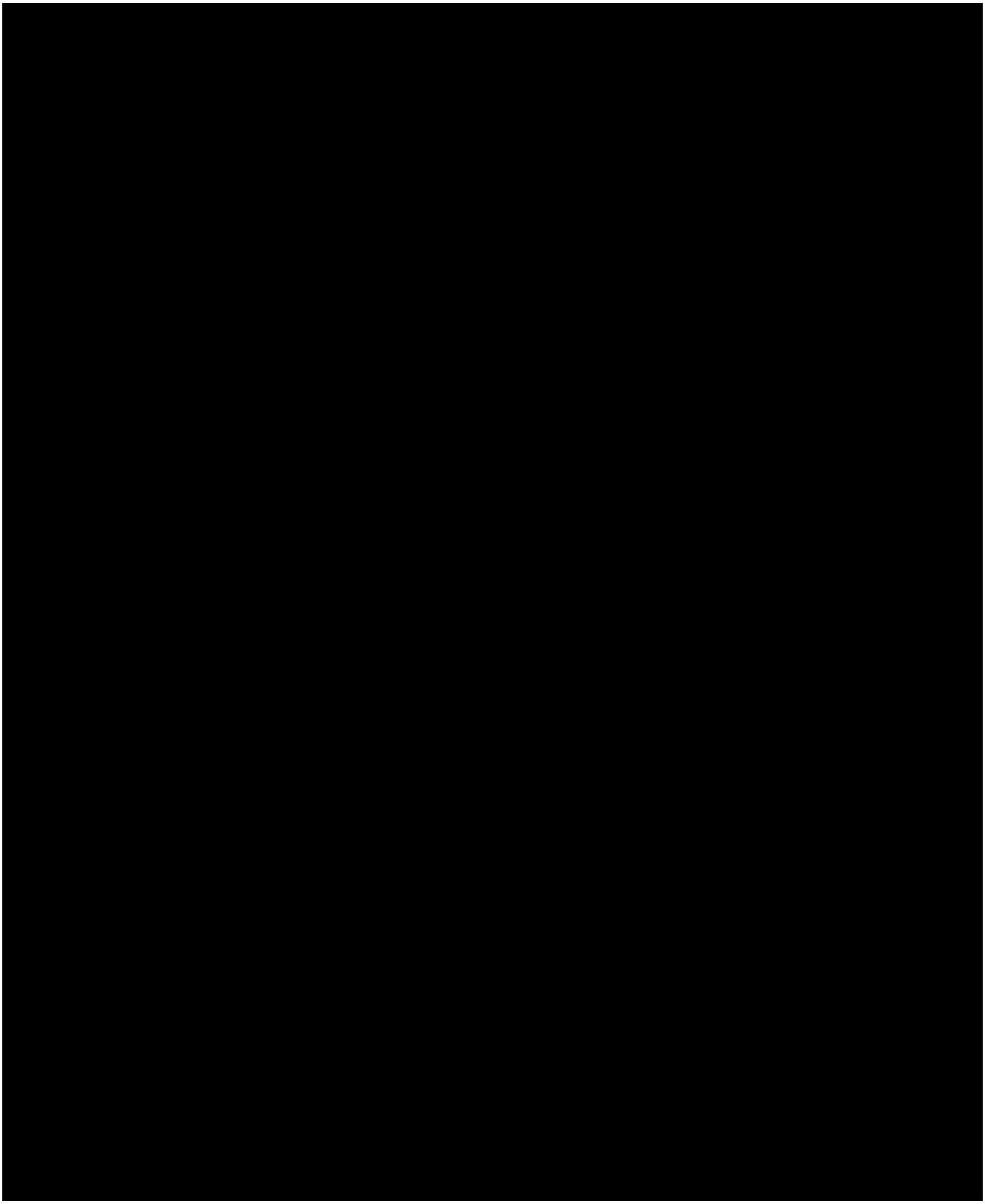
S. No.	Facility adjusted	PSSE representation	Area	Owner	Parameter adjusted	Original value	Modified value	Comments
1	Q531 Generator	146415, 146423, 146426	5	NG	V schedule	1.0 pu	1.02 pu	

4.6. Voltage Results – Light Load – Cases 1 & 2

Table 14 shows relevant N-0 & N-1 voltage analysis results for light load (Cases 1 and 2) condition. For the full list, please refer to Appendix C.









Above N-0 & N-1 results show that the Project either causes voltage violations or worsens existing voltage issues on the system when interconnecting during light load condition. These voltage violations were mitigated using the following system adjustments.



Steady State Analysis (N-1-1)

The impact of the proposed Project on monitored facilities in the Study Area (see Section 3.2) was evaluated. All relevant first-level and second-level contingencies in the Study Area (see Appendix B for full list) were simulated. The following are the results of this analysis.

5.1. Thermal Results

Results of the N-1-1 thermal analyses (see Appendix D) indicated that the Project does not have any adverse thermal impacts on the system operating during summer peak condition.

5.2. Voltage Results

Under summer peak case conditions, results (Table 16) of the voltage analysis show that the Project causes voltage violations or worsens existing voltage issues.

[redacted]

These voltage violations were mitigated using the following system adjustments based on NYISO's MIS.

[redacted]

[redacted]

Transfer Assessment

The impact of the proposed Project on the Moses-South interface was evaluated. Thermal (normal & emergency criteria), voltage and stability transfer limit analyses were performed to identify the most limiting constraints pre-Project and post-Project. The following are the results of this analysis.

6.1. Thermal Transfer Limit Results – Normal Criteria

Table 18 shows the summary of the thermal transfer limit analysis results under normal criteria. The Project degrades the pre-Project normal thermal transfer limits of the studied interfaces by more than 25 MW.



Re-dispatching generation based on NYISO's MIS mitigates the observed transfer limit degradation of the studied interfaces.

6.2. Thermal Transfer Limit Results – Emergency Criteria

Table 19 shows the summary of the thermal transfer limit analysis results under emergency. The Project degrades the pre-Project emergency thermal transfer limits of the studied interfaces by more than 25 MW.



Re-dispatching generation based on NYISO's MIS mitigates the observed transfer limit degradation of the studied interfaces.

6.3. Voltage Transfer Limit Results

Table 20 shows the summary of the voltage transfer limit analysis results. The Project degrades the pre-Project voltage transfer limits of the studied interfaces by more than 25 MW.

[redacted]

[redacted]

Network Upgrades are required to mitigate the voltage transfer degradation of the [redacted] transfer limits are shown in Table 21.

[redacted]

[redacted]		
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Following good utility practice, equivalently sized STATCOMs are recommended to replace these capacitor banks at a future point. Replacement with STATCOMs will alleviate post-contingency voltage and knee point constraints, which cannot be secured using normal operating procedures under the NYISO MIS and are not visible to operators real-time. Furthermore, it will resolve operational limits based on the switching state of the shunt device, and provide rapid and automatic voltage regulation, eliminating switching and flicker constraints.

6.4. Stability Transfer Limit Results

Table 23 shows the summary of the stability transfer limit analysis results. The Project does not adversely affect the stability of the NYSTS when the studied interfaces are stressed to the respective stability transfer margin limits.

Table 23: Summary of stability transfer limit analysis results

Interface	Stability Limit Test (MW)	Results	Contingencies
West Central Open	1882	Stable	CE01AR_AC-SegA_SUM2029, CE01_AC-SegA_SUM2029, CE03_AC-SegA, CE05, CE06, CE07, CE07AR, CE09_AC-SegA_SUM2029, CE12_AC-SegA, CE13_BMcD_Q843, CE14, CE15, CE16, CE20, CE22, CE22AR, CE23, CE23AR, CE32, CE32AR, CE33, CE41_AC-SegA_SUM2029, CE42_AC-SegA_SUM2029, CE99, CE99_BMcD_Q843, SA01_Q556, SA03_Q556, SA04_Q556, SA08_Q556_SUM2023, SA08_Q556_SUM2029, SA10_Q556, SA11_Q556_SUM2029, SA12_Q556_SUM2029, SA13_Q556_SUM2029, SA15_Q556, SA24_Q556_SUM2029, SA25_Q556_SUM2029, SA26_Q556_SUM2029, SA27_Q556_SUM2029, SA32_Q556_SUM2029, SA33_Q556_SUM2029, SA35_Q556_SUM2029, E01_BMcD_Q843, E02_BMcD_Q843, E03, E04_BMcD_Q843, E06SLG_BMcD_Q843, E07, E07_BMcD_Q843, WC07, WC07AR, WC08, WC08AR, WC09, WC09AR, WC10Q339, WC11, WC12Q339
West Central Closed	3328		
[redacted] Open	5198	Stable	
[redacted] Closed	6389		

6.5. Transfer Assessment Summary

Table 24 shows the summary of the most limited transfer levels for both pre-Project and post-Project conditions and it is observed that the Project degrades the overall transfer limit of the studied interfaces. Proposed mitigation solutions when applied restores the pre-Project transfer limit of the studied interfaces.

Table 24: Overall summary of transfer limit analysis results

Interface	Normal Transfer Limit (MW)					Emergency Transfer Limit (MW)				
	Case 1 (Proj OFF)	Limited by	Case 2 (Proj ON)	Limited by	Delta	Case 1 (Proj OFF)	Limited by	Case 2 (Proj ON)	Limited by	Delta
West Central Open	1842	T	1841	V	-1	1877	V	1841	V	-36
West Central Closed	3206	T	3186	T	-21	3533	T	3528	T	-5
[redacted] Open	4538	V	4260	V	-278	4538	V	4260	V	-278
[redacted] Closed	5342	V	5064	V	-278	5342	V	5064	V	-278

Type Codes
T - Thermal Limited
V - Voltage limited
S - Stability Limited

Thermal transfer limit degradation of the West-Central interface was mitigated using generation redispatch based on NYISO's MIS. Voltage transfer limit degradation of the [redacted] interface was mitigated using the proposed Network Upgrades.

Stability Analysis

Results of the stability analysis are shown in Table 25. It is observed that the interconnection of the Project does not introduce any adverse negative stability impacts on the system. For all plots, please refer to Appendix E.

Table 25: Stability Analysis Results Summary

Contingency Name	Summer Peak		Light Load		Winter Peak	
	Case 1 Proj OFF	Case 2 Proj ON	Case 1 Proj OFF	Case 2 Proj ON	Case 1 Proj OFF	Case 2 Proj ON
CE01AR_AC-SegA_SUM2029	Stable	Stable	Stable	Stable	-	-
CE01AR_AC-SegA_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
CE01_AC-SegA_SUM2029	Stable	Stable	Stable	Stable	-	-
CE01_AC-SegA_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
CE03_AC-SegA	Stable	Stable	Stable	Stable	Stable	Stable
CE05	Stable	Stable	Stable	Stable	Stable	Stable
CE06	Flatrock Wind units trip due to volt relay*	Flatrock Wind units trip due to volt relay*	Flatrock Wind units trip due to volt relay*	Flatrock Wind units trip due to volt relay*	Flatrock Wind units trip due to volt relay*	Flatrock Wind units trip due to volt relay*
CE07	Stable	Stable	Stable	Stable	Stable	Stable
CE07AR	Stable	Stable	Stable	Stable	Stable	Stable
CE09_AC-SegA_SUM2029	Stable	Stable	Stable	Stable	-	-
CE09_AC-SegA_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
CE12_AC-SegA	Stable	Stable	Stable	Stable	Stable	Stable
CE13_BMcD_Q843	Stable	Stable	Stable	Stable	Stable	Stable
CE14	Stable	Stable	Stable	Stable	Stable	Stable
CE15	Stable	Stable	Stable	Stable	Stable	Stable
CE16	Stable	Stable	Stable	Stable	Stable	Stable
CE20	Stable	Stable	Stable	Stable	Stable	Stable
CE22	Stable	Stable	Stable	Stable	Stable	Stable
CE22AR	Stable	Stable	Stable	Stable	Stable	Stable
CE23	Stable	Stable	Stable	Stable	Stable	Stable
CE23AR	Stable	Stable	Stable	Stable	Stable	Stable
CE32	Stable	Stable	Stable	Stable	Stable	Stable
CE32AR	Stable	Stable	Stable	Stable	Stable	Stable

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Contingency Name	Summer Peak		Light Load		Winter Peak	
	Case 1 Proj OFF	Case 2 Proj ON	Case 1 Proj OFF	Case 2 Proj ON	Case 1 Proj OFF	Case 2 Proj ON
CE33	Stable	Stable	Stable	Stable	Stable	Stable
CE41_AC-SegA_SUM2029	Stable	Stable	Stable	Stable	-	-
CE41_AC-SegA_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
CE42_AC-SegA_SUM2029	Stable	Stable	Stable	Stable	-	-
CE42_AC-SegA_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
CE99	Stable	Stable	Stable	Stable	Stable	Stable
CE99_BMcD_Q843	Stable	Stable	Stable	Stable	Stable	Stable
SA01_Q556	Stable	Stable	Flatrock Wind units trip due to volt relay*	Flatrock Wind units trip due to volt relay*	Stable	Stable
SA03_Q556	Stable	Stable	Stable	Stable	Stable	Stable
SA04_Q556	Stable	Stable	Stable	Stable	Stable	Stable
SA08_Q556_SUM2023	Stable	Stable	Stable	Stable	-	-
SA08_Q556_SUM2029	Stable	Stable	Stable	Stable	-	-
SA08_Q556_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
SA10_Q556	Stable	Stable	Stable	Stable	Stable	Stable
SA11_Q556_SUM2029	Stable	Stable	Stable	Stable	-	-
SA11_Q556_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
SA12_Q556_SUM2029	Stable	Stable	Stable	Stable	-	-
SA12_Q556_WIN2023_2024-WIN2028_2029	-	-	-	-		
SA13_Q556_SUM2029	Stable	Stable	Stable	Stable	-	-
SA13_Q556_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
SA15_Q556	Stable	Stable	Stable	Stable	Stable	Stable
SA24_Q556_SUM2029	Stable	Stable	Stable	Stable	-	-
SA24_Q556_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
SA25_Q556_SUM2029	Stable	Stable	Stable	Stable	-	-
SA25_Q556_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable

Contingency Name	Summer Peak		Light Load		Winter Peak	
	Case 1 Proj OFF	Case 2 Proj ON	Case 1 Proj OFF	Case 2 Proj ON	Case 1 Proj OFF	Case 2 Proj ON
SA26_Q556_SUM2029	Stable	Stable	Stable	Stable	-	-
SA26_Q556_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
SA27_Q556_SUM2029	Stable	Stable	Stable	Stable	-	-
SA27_Q556_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
SA32_Q556_SUM2029	Stable	Stable	Stable	Stable	-	-
SA32_Q556_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
SA33_Q556_SUM2029	Stable	Stable	Stable	Stable	-	-
SA33_Q556_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
SA35_Q556_SUM2029	Stable	Stable	Stable	Stable	-	-
SA35_Q556_WIN2023_2024-WIN2028_2029	-	-	-	-	Stable	Stable
VE01_BMcD_Q843	Stable	Stable	Stable	Stable	Stable	Stable
VE02_BMcD_Q843	Stable	Stable	Stable	Stable	Stable	Stable
VE03	Stable	Stable	Stable	Stable	Stable	Stable
VE04_BMcD_Q843	Stable	Stable	Stable	Stable	Stable	Stable
VE06SLG_BMcD_Q843	Stable	Stable	Stable	Stable	Stable	Stable
VE07	Stable	Stable	Stable	Stable	Stable	Stable
VE07_BMcD_Q843	Stable	Stable	Stable	Stable	Stable	Stable
WC07	Stable	Stable	Stable	Stable	Stable	Stable
WC07AR	Stable	Stable	Stable	Stable	Stable	Stable
WC08	Stable	Stable	Stable	Stable	Stable	Stable
WC08AR	Stable	Stable	Stable	Stable	Stable	Stable
WC09	Stable	Stable	Stable	Stable	Stable	Stable
WC09AR	Stable	Stable	Stable	Stable	Stable	Stable
WC10Q339	Stable	Stable	Stable	Stable	Stable	Stable
WC11	Stable	Stable	Stable	Stable	Stable	Stable
WC12Q339	Stable	Stable	Stable	Stable	Stable	Stable

Contingency Name	Summer Peak		Light Load		Winter Peak	
	Case 1 Proj OFF	Case 2 Proj ON	Case 1 Proj OFF	Case 2 Proj ON	Case 1 Proj OFF	Case 2 Proj ON
Q1536_NC01	Stable	Stable	Stable	Stable	Stable	Stable
Q1536_NC02	Stable	Stable	Stable	Stable	Stable	Stable
Q1536_SLG01	Stable	Stable	Stable	Stable	Stable	Stable
Q1536_SLG02	Stable	Stable	Stable	Stable	Stable	Stable
Q1536_SLG03	Stable	Stable	Stable	Stable	Stable	Stable
Q1536_SLG04	Stable	Stable	Stable	Stable	Stable	Stable
* Known issue – not caused by the Project						

Critical Clearing Time (CCT) analysis was performed at the POI. Results of this analysis are shown in Table 26. It is observed that the interconnection of the Project does not change the critical clearing times of the POI station. Plots for the CCT analysis are available in Appendix G.

Table 26: Critical Clearing Time Analysis Results

Bus	Critical Clearing Time, Cycles					
	Summer		Light Load		Winter Peak	
	Case_1	Case_2	Case_1	Case_2	Case_1	Case_2
[redacted]	10 (1)	10 (1)	12 (1)	12 (1)	11 (1)	11 (1)
[redacted]						

Short Circuit Analysis

It is observed that the Project does not increase the fault current levels at the nearby stations by more than 100 A as shown in Table 27. Full short circuit results are provided in Appendix H1.

Table 27: Short-Circuit Analysis Results Summary

[redacted]

Physical Feasibility Assessment

National Grid evaluated the interconnection of the Project to the POI and found that interconnection is physically feasible via the expansion of the Clay 345 kV substation. The station expansion must be designed in accordance with National Grid design criteria. The full report is provided in Appendix I.

A. Cost estimates and time to construct – CTO Estimates

National Grid provided a non-binding good faith estimate of cost responsibility for the Network Upgrades required to interconnect the Project. The non-binding good faith estimate is [redacted] The non-binding, good faith estimated time to complete engineering, design, procurement and construction is 2-3 years, from completion of the Interconnection Agreement. The full estimate is provided in Appendix I.

B. Voltage Transfer Network Upgrade Estimates

The non-binding, good faith estimate of cost responsibility to construct the 125 MVAR switched shunt at the Oakdale 345kV substation is [redacted] The non-binding good faith time to construct is 18 months. NYSEG was not consulted in the creation of this estimate.

The non-binding, good faith estimate of cost responsibility to construct the 50 MVAR switched shunt at the New Rochester (Station 255) 345kV substation is [redacted] The non-binding good faith time to construct is 18 months. RGE was not consulted in the creation of this estimate.

The above estimates exclude the following:

- Taxes
- Cost of land acquisition and station expansion, if required
- Legal and Permitting fees
- Access Roads
- Telecommunications
- Environmental costs and ground work, if required

Conclusions

Steady state N-0 and N-1 analyses were performed pre- and post-Project for summer peak, winter peak and light load cases. The Project did not cause any thermal violations in the studied scenarios. Voltage violations caused by the Project were mitigated using system adjustments.

N-1-1 contingency analysis was performed for summer peak load cases. Voltage violations caused by the Project were observed which was mitigated using system adjustments under the NYISO MIS. The Project did not cause any N-1-1 thermal violations.

Results of the stability analysis show that the Project does not affect the stability of the NYSTS. Furthermore, the Project does not reduce the critical clearing times at the POI substation.

Results of the transfer analysis show that the Project degrades the transfer limit of the West-Central and [redacted] interfaces. Network Upgrades are proposed to mitigate the transfer limit degradation of the West Central and [redacted] interfaces.

Short circuit analysis results indicated that the interconnection of the Project does not increase the fault currents at the nearby stations by more than 100 A.

The results presented in this report indicate that the Project will adversely impact the reliability of the NYSTS. Network Upgrades are proposed to mitigate any negative impacts of the Project. This conclusion is based on the following understandings and assumptions:

The Project will be operated in accordance with all NYISO requirements, including all applicable NYISO and Transmission Owner Day ahead and real time operational procedures and limits. The NYISO will operate the Project in a manner that does not negatively impact the NYSTS.

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

The SIS results and conclusions are based on the studied scenarios and various assumptions related with the study methodologies, system, and project modeling information provided by the Eligible Customer; any project modeling change can result in different results.

Moreover, the findings are based on the conditions of the system as specified in the Scope approved by the NYISO Operating Committee and are limited to reviewing the project based on the conceptual design of the proposed interconnection. Future changes to the system or interconnections made at or near the proposed Point of Interconnection, among other things, can affect the feasibility/constructability of the proposed interconnection for this Project. Additionally, if modifications to the existing transmission system (e.g., Network Upgrades) are necessary to accommodate the proposed interconnection, the Study does not evaluate the feasibility/constructability of the proposed interconnection as it relates to obtaining necessary permits, approvals, and/or land acquisition, which could potentially affect the feasibility/constructability of the conceptual design of the proposed interconnection.

Appendix A. Scope of Study

Appendix B. Steady State Analysis – Study Files

Appendix B.1 (N-0) & (N-1)

Appendix B.2 (N-1-1)

Appendix C. Steady State Analysis – (N-0) & (N-1) Results

Appendix C.1 Thermal Analysis Results for Summer Peak Condition

Appendix C.2 Voltage Analysis Results for Summer Peak Condition

Appendix C.3 Thermal Analysis Results for Winter Peak Condition

Appendix C.4 Voltage Analysis Results for Winter Peak Condition

Appendix C.5 Thermal Analysis Results for Light Load Condition

Appendix C.6 Voltage Analysis Results for Light Load Condition

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Appendix D. Steady State Analysis – (N-1-1) Results

Appendix D.1 Thermal Analysis Results for Summer Peak Condition

Appendix D.2 Voltage Analysis Results for Summer Peak Condition

Appendix E. Transfer Assessments

Appendix E.1 Thermal Transfer Limit Analysis – Normal Criteria

Appendix E.2 Thermal Transfer Limit Analysis – Emergency Criteria

Appendix E.3 Voltage Transfer Limit Analysis

Appendix E.4 Stability Transfer Limit Analysis - Plots

Appendix F. Stability Analysis Plots

Appendix F.1 Case 1 (Pre-Project)

Appendix F.2 Case 2 (Post-Project)

Appendix G. Critical Clearing Time Analysis Plots

Appendix G.1 Case 1 (Pre-Project)

Appendix G.2 Case 2 (Post-Project)

Appendix H. Short Circuit Analysis Results

Appendix I. Physical Feasibility and CTO Cost Estimates