Title: Design Criteria for Developer Connection to the New York Power Authority Transmission System

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Design Criteria for Developer Connection to the New York Power Authority Transmission System

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2/12/2025	14	• Various clarifications based on stakeholder feedback • Communications details added for IEC61850 systems • Remote end requirement clarified • Details added for sign, grading, Drawing and GIS requirement	Rajesh Kumar Sr Director Engineering
01/29/2024	13	• External Communication detail added • IEC61850 requirement added • Editorial and formatting changes	Rajesh Kumar Director Interconnection and Standards
10/10/2023	12	• Changes to clarify requirement of Major equipment. • Reduced details globally in the design requirement to streamline specific requirement in NYPA standards	Rajesh Kumar Director Interconnection and Standards
08/15/2022	11	- Editorial changes for better clarity - Security system requirement added - Design drawings requirement added and clarified - Point of Change of ownership clarified - OPGW splicing requirement and other communication requirement added to simplify IAs - Turnover Packages requirement & clarifications added	Rajesh Kumar Director Interconnection Design and Standards
06/25/2021	10	Disconnects switches motor requirement, Fire suppression for NYPA developed Battery Projects	Rajesh Kumar Director Transmission

			Planning
04/21/2020	9	Fault current criteria update for grounding. Network architecture,	Rajesh Kumar System Interconnection & Standards Mgr.
-	1-8	Previous Versions Available on request	Various
Refer to last page of document for electronic approvals of latest revision.			

Table of Contents

1 INTRODUCTION

1.1 Intent

1.1.1 The Design Criteria for Developer Connection to the New York Power Authority Transmission System (DCDC) is a guide for Developers proposing an interconnection with the New York Power Authority (NYPA) transmission system or generation facility. A Developer is defined as any interconnecting entity.

1.1.2 No guidelines or standard can anticipate all the specific requirements for a project to be designed and constructed in the future. Requirements change with specific or unique project conditions and as regulatory agencies update rules or regulations, or as NYPA's practice changes. The Developer shall consider requirements in the DCDC, the DS-00100 Substation Design Standard (SDS), the DS-00200 Overhead Transmission Design Standard (OHTDS) and other NYPA documents to be the minimum requirements. Where specific requirements are not indicated within this document or other NYPA documents, the design shall be based on New York State codes and regulations, federal regulations, recognized industry standards and good engineering practice as well as any additional applicable requirements of the local jurisdiction(s).

1.1.3 The detailed requirements for interconnection of generation projects, including Inverter Based Resources (IBRs), are the focus of this document. Transmission expansion or end-user load interconnections may be subject to additional or slightly different requirements, as may be set forth by NYPA for the specific application. In addition, Developer shall use project-specific interaction with NYPA including correspondence, and meetings/meeting notes to prepare the project-specific design for submittal to NYPA. The NYPA accepted design will govern.

1.2 Objective

1.2.1 This document provides the Developer with requirements and guidance for connecting to NYPA's generation facilities or transmission systems as required by North American Electric Reliability Corporation (NERC) FAC-001 – Facility Interconnection Requirements. This document includes the high-level design criteria, and minimum requirements for the basis of the design, the SDS, OHTDS and other NYPA documents shall provide additional and more detailed design criteria, standards and requirements for the final design and installation of equipment to be connected to the

NYPA generation facilities, and the NYPA transmission system at the 115 kV, 138 kV, 230 kV or 345 kV voltage levels. Specific requirements for connection to the 765 kV transmission systems have not been provided. Any connections at the 765 kV transmission system shall require project specific analysis.

1.2.2 In this document, the word “shall” means that provisions are mandatory. The word “should” indicates provisions that are recommended and generally practical. For exceptions to “shall” or “should” provisions, the Developer shall submit specific requests including proposed/recommended resolution and explanation, and obtain NYPA acceptance prior to proceeding. “Or equal” or “or equivalent” means “or NYPA accepted equal/equivalent”; “accepted” means “NYPA accepted”; “including” means “including but not limited to”. “Substation” is used to identify the substation or switchyard which Developer shall provide for NYPA ownership. The entire facility shall be referred to as a substation. The Substation may be a switching substation or a transforming substation.

1.3 General Requirements

1.3.1 The Developer proposing to interconnect with NYPA’s generation facilities or transmission systems shall contact the New York Independent System Operator (NYISO), notify the NYISO of their intention for an interconnection, and follow the NYISO Open Access Transmission Tariff (OATT) Interconnection Process. These processes can be found on the NYISO web site at the following link: NYISO Open Access Transmission Tariff (OATT) Interconnection Process. The specific process to follow depends on the specific attributes of the proposed projects and its related interconnection.

1.3.2 The Developer shall adhere to NYPA applicable processes and policies in execution of the project, including the design, construction, quality assurance, and documentation processes.

1.3.3 NYPA is divided into four major regions: Western (Niagara (NIA)), Northern (St. Lawrence (STL)), Central (Clark Energy Center (CEC) and Blenheim Gilboa (BG), and Southeast New York (SENY). Different regions may have different requirements from those stated in the DCDC due to unique physical or operational conditions of that region. These specific instances shall be incorporated by Developer during detailed design.

1.3.4 The Developer shall coordinate, plan, design, construct, test, and commission interconnection facilities in compliance with criteria set forth by this DCDC document, the Building Code of the State of New York (NYSBC), New York Independent System Operator (NYISO), New York State Reliability Council (NYSRC), Northeast Power Coordinating Council (NPCC), North American Electric Reliability Corporation (NERC), the Federal Energy Regulatory Commission (FERC), and other agencies with jurisdiction.

1.3.5 Items or requirements in this DCDC document do not diminish or supersede requirements of Law, Codes, Regulations, Standards, Good Utility Practice, the Interconnect Agreement (IA), Operations Coordination Agreement, or Developer's obligations. As Developer encounters conflicts or requires clarification, the Developer shall submit a request for information (RFI) to NYPA for resolution. The Developer shall coordinate requirements and resolve issues.

1.3.6 The Developer shall provide a complete, integrated, and coordinated design. The design shall consist of coordinated specifications, calculations, drawings, etc. The intent is that when the project is complete the Developer will have provided a facility that meets contractual, regulatory, and NYPA requirements; including the submission of complete Record Drawings and Turn Over Package documentation that NYPA will use to operate and maintain the facility to regulatory requirements, and NYPA standards and practice.

1.3.7 The Developer's generation infrastructure up to and including the generation step-up transformer(s) shall be external to the NYPA substation.

1.3.8 The Developer shall provide equipment and system designs with adequate provision to perform "Lock-Out-Tag-Out" operations that do not unreasonably affect the operation, availability or reliability of the electric transmission system and are in accordance with OSHA requirements and NYPA's clearance and protection programs.

1.3.9 References in this document to items to be submitted, shall be submitted by Developer to NYPA for NYPA's information, review, or acceptance as applicable. NYPA's review, comments, acceptance, or approval shall not be construed as confirming, endorsing, or providing a warranty as to the design, fitness, safety, durability, or reliability. The Developer shall make such changes as may reasonably be required by NYPA to be in accordance with NYPA requirements and good utility practice, to ensure that the facility is compatible with the NYPA requirements, for operational control, and to satisfy appropriate safety requirements. NYPA shall not, by reason of such review or failure to review, be responsible for compliance with codes, regulations, and/or standards. These responsibilities shall remain the Developer's obligation.

1.3.10 Approval of the connection concept will be evaluated against statutory, contractual, regulatory, and tariff requirements. The connection configuration shall not result in adverse effects on the New York State transmission system, NYPA transmission system, NYPA generation facilities, NYPA customers' equipment, the general public, or adversely impact NYPA's existing contractual rights or obligations.

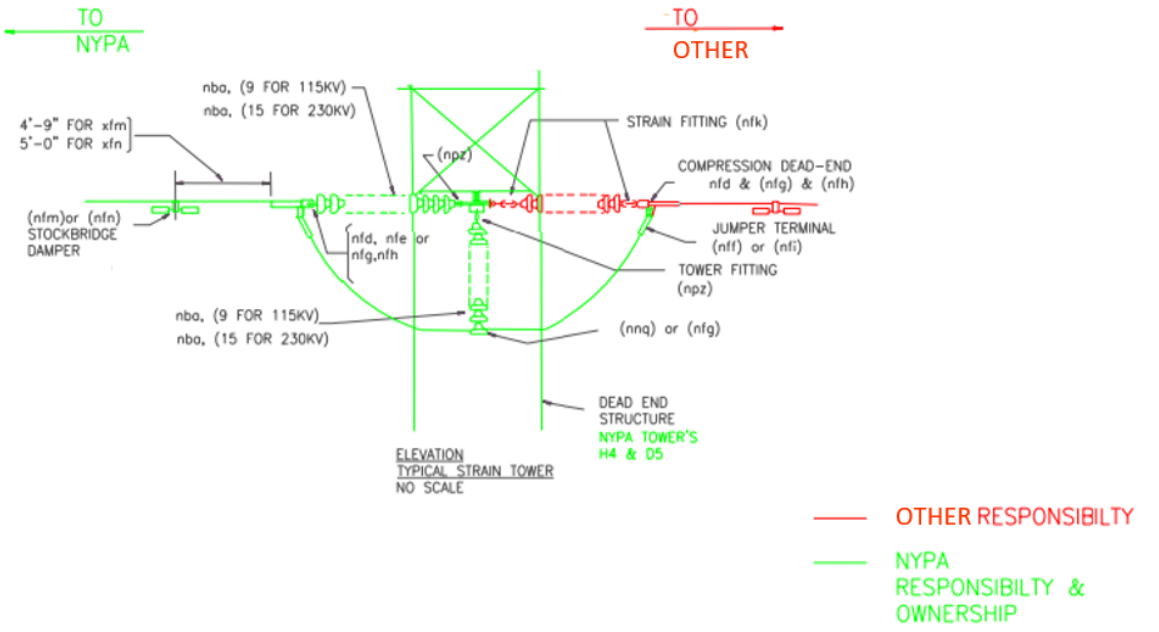
2 SYSTEM REQUIREMENTS

2.1 Cluster Study

All connections to the NYPA transmission system must follow the NYISO Interconnection Process defined in the NYISO Open Access Transmission Tariff (OATT). This process includes filing an Interconnection Request and performing a Cluster Study.

2.2 Point of Interconnection and Change of Ownership

The point of interconnection shall be proposed by a Developer in the Interconnection Request in accordance with NYISO OATT Attachment HH and agreed upon by NYPA during the Customer Engagement Window after the performance of the Physical Infeasibility Screening. The details of interconnection must be developed during Phase 1 Study. The Developer's proposed configuration shall be submitted in the Interconnection Request and evaluated for physical feasibility and conformance with NYPA Design Standards. This configuration shall be shown diagrammatically on one-line diagrams, as well as on physical drawings. All transmission drawings shall clearly identify the Point of Change of Ownership (POCO) demarking NYPA's responsibility for O&M. The POCO shall be at a hardware fitting, preferably at a jumper loop. The exact demarcation of ownership change shall be clearly detailed on the drawings as illustrated in Figures 2-1 and 2-2.



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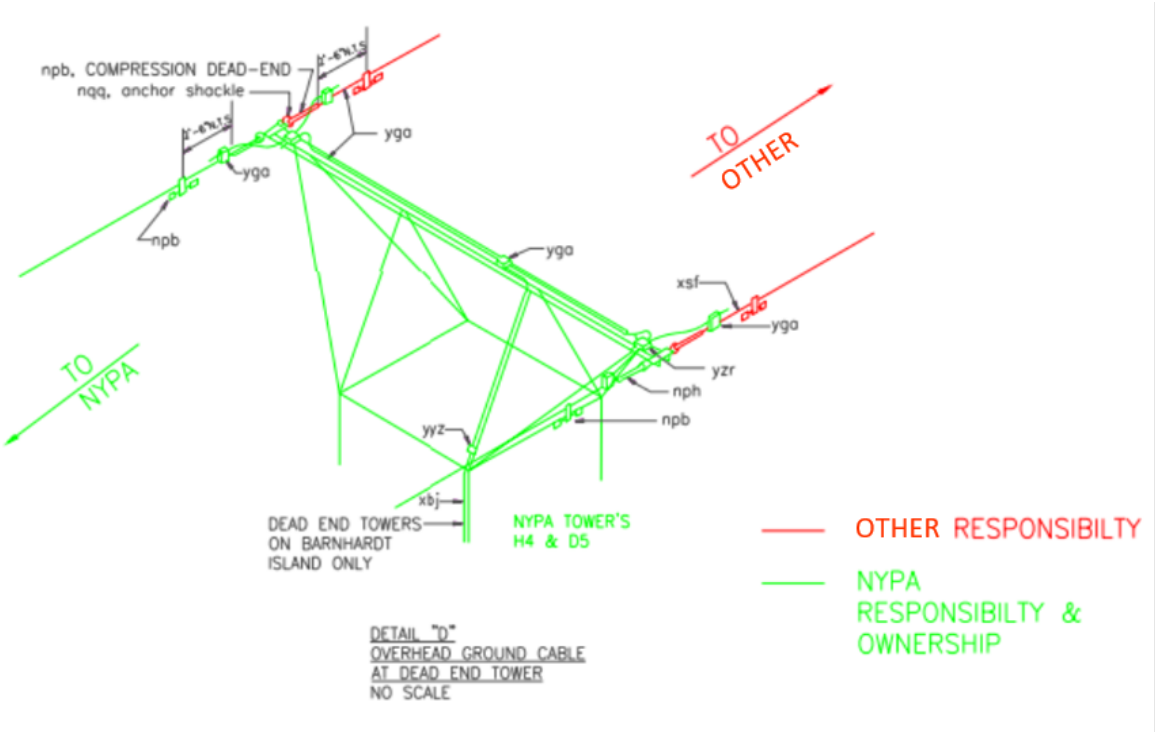


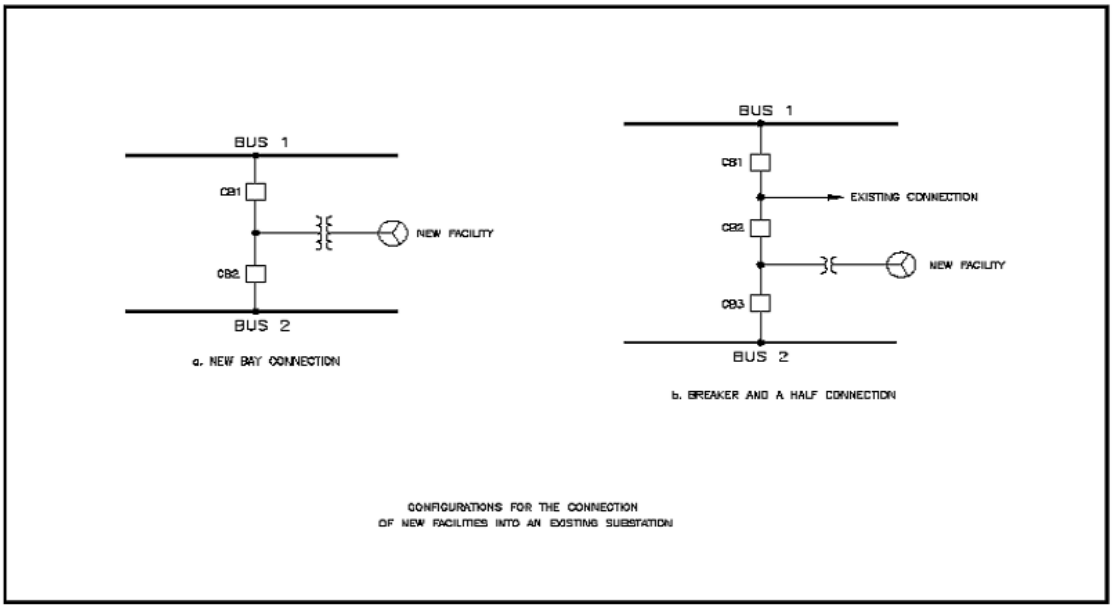
Figure 2

2.3 Connection Configuration

2.3.1 Connections to a NYPA generation facility or to the NYPA transmission system into a substation, generating facility, or transmission line shall be in an acceptable configuration as outlined below:

The substation connection shall be terminated into a switch position as shown in Figure 2-3 and Figure 2-4.

Each connection requires two associated circuit breakers to permit operation with one circuit breaker out of service. Thus, a new connection might be terminated into a new substation bay with two new circuit breakers CB1 and CB2 (Figure 2-3, Detail a) or into an expanded existing bay with one additional circuit breaker CB2 or CB3 (Figure 2-3, Detail b).



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2.3.2 Connections to a transmission line shall be terminated in a substation. The substation for a single Developer connection shall be a ring bus configuration. For example, with a three-breaker ring bus configuration, two ends of a segmented transmission line will be connected through circuit breaker CB1 and the facility connected through two circuit breakers, CB2, and CB3 (Figure 2–4, Detail a). In some cases, the addition of a fourth circuit breaker in series with CB1 may be required.

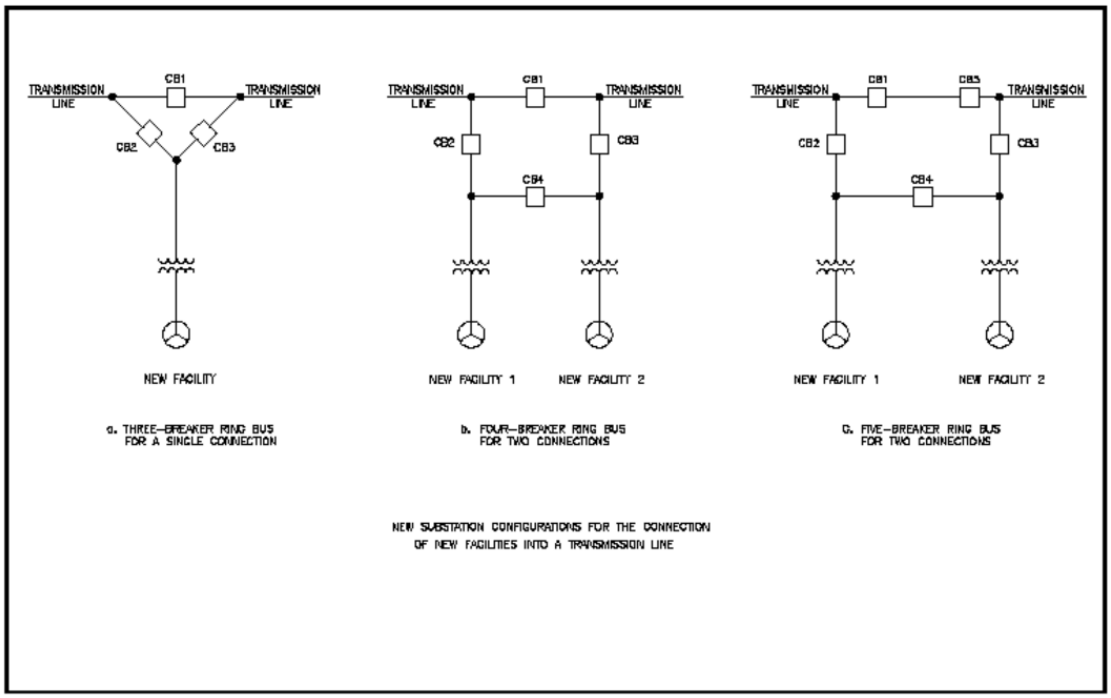


Figure 4

2.3.3 For a substation with two Developer connections, the circuit breaker configuration may be a four-breaker ring bus (Figure 2-4, detail b), similar to the previous case in section 2.3.2. In such a configuration the line terminals are connected at the substation through CB1 while the facilities are connected to the ring bus by CB2 and CB4 (Figure 2-4, detail b, Facility 1) and by CB3 and CB4 (Figure 2-4, detail b, Facility 2). In a four-breaker ring bus configuration with two connecting facilities, only the failure of CB1 (Figure 2-4, Detail b) results in the shutdown of the transmission line and isolation of the connected facilities. Failure of any other circuit breaker in this configuration leads to the opening of two adjacent circuit breakers and keeps one of the facilities connected to a transmission line terminal. The complete isolation of the facilities during CB1 failure in a four-breaker ring bus can be avoided by installing an additional circuit breaker in series with CB1 (Figure 2–4, Detail c).

2.3.4 The minimum substation configuration is a three-breaker ring bus in a two-bay configuration. The Developer's submitted configuration shall be reviewed by NYPA and affected transmission owners during the NYISO Interconnection Process and IA negotiation.

2.4 Connection Characteristics

2.4.1 Developer generation facilities shall interface with the NYPA system by means of a transformer or a transformer bank. The facilities shall not cause a reduction in the quality of service provided to NYPA customers. Voltage limits for Developer's generation sources connected to NYPA transmission facilities or NYPA generation facilities will be determined by NYISO/NYPA. Inverter-Based Resources shall eliminate the use of momentary cessation to the greatest possible extent.

2.4.2 Each transformer from a generation source connected to the NYPA transmission system shall have a wye winding configuration on the high-voltage (NYPA connected) side of the transformer – for ground fault current detection schemes.

2.4.3 Each transformer from a load connected to the NYPA transmission system shall have a delta winding configuration on the high-voltage (NYPA connected) side of the transformer – for ground fault current detection schemes.

2.4.4 The final configuration of the transformer windings shall be determined by the protection schemes analysis and approval by NYPA.

2.4.5 Interconnections with Inverter-Based Resource(s) shall be in compliance with IEEE 2800, "Standard for Interconnection and Interoperability of Inverter-Based Resources (IBRs) Interconnecting with Associated Transmission Electric Power Systems".

2.4.6 The Developer shall provide accurate modelling information, electromagnetic transient (EMT) models for resources >20MW at the time of project Cluster Study. The developer shall also complete IBR NERC compliance Checklist.

2.4.7 The developer shall coordinate with NYPA and NYISO on anti-islanding requirements and implement protection scheme based on the guidance provided by NYPA/NYISO. Furthermore, the developers shall meet the most updated NERC PRC ride-through requirement available at the start of detailed design.

2.4.8 All transmission spans into the substation shall be from a dead-end structure outside the substation. Relaying equipment shall provide automatic separation of the facility from the NYPA system in response to system events in accordance with applicable standards. Each connection shall be provided with switching and control devices capable of interrupting system short circuit currents at the connection location. The facility shall be equipped with an operable means of separation that provides visual confirmation of separation from the NYPA system.

2.4.9 SCADA Remote Terminal Units (RTUs) shall be provided for remote operational control of the station from a remote NYPA control system. The RTUs shall adhere to the NYPA standards detailed in NYPA's Substation Design Standard. The RTUs will provide System Operations personnel control and status monitoring of the circuit breakers, disconnects, station service MODs, real power, reactive power, current, voltage, protective relaying, etc. The RTUs shall also have the capability of transmitting analog quantities and revenue metering data. Unless other arrangements are made, the RTUs will also serve to provide NYISO control values and flags to the interconnecting generation facilities and will pass Interconnecting Facility status and real time data through to the NYISO via the NYPA Control System. Redundant, diverse telemetry circuits shall be provided between the station and the NYPA control station, the NYPA Energy Control Center, and the NYPA Emergency Energy Control Center. Note that any other requirements for separate NYISO telecommunications are the sole responsibility of the developer.

2.4.10 A separate data concentrator will be required to collect maintenance data for equipment owned/turned over to NYPA, such as from real time transformer monitoring data for transmission to the NYPA Integrated System Operations Center (ISOC). Other system monitoring requirements may be required as specific to the station equipment.

2.4.11 Reactive compensating devices shall not be installed without the approval of NYPA / NYISO.

2.4.12 A generating plant shall be able to:

1. Operate continuously within voltage ranges per chart below:

Station	kV	Pre-Contingency		Post-Contingency	
		Low (p.u.)	High (p.u.)	Low (p.u.)	High (p.u.)
General Criteria					
200 kV & above	200 - 999	0.95	1.05	0.95	1.05
100 kV – 200 kV	100 – 200	0.95	1.05	0.90	1.05
Exceptions					
Willis	115	0.95	1.07	0.90	1.10
Moses	115	0.95	1.06	0.90	1.07
Fraser Annex	345	0.95	1.05	0.95	1.10
East Garden City	345	0.96	1.05	0.96	1.10

2. Withstand system voltage disturbances in accordance with the time periods and associated voltage levels summarized in Figure 3 (FERC Order 661).

3. Operate within +/-0.95 power factor at the point of connection to the system.

4. Comply with IEEE 519 “Standard for Harmonic Control in Electrical Power Systems”.

2.5 System Operations

2.5.1 Operating guidelines shall be defined in the Operations Coordination Agreement.

2.5.2 NYISO, in coordination with NYPA, reserves the right to open switching devices without prior notice to Developer for any of the following reasons:

1. System emergency or system conditions leading to a possible system emergency.

2. Inspection of the connecting facilities or protective equipment reveals a hazardous condition.

3. The connecting generating equipment or power transaction interferes with NYPA customers or with operations of the NYISO system.

4. Failure to maintain the connecting facilities in accordance with the IA.

2.5.3 Connection equipment between the facility generators and the point of interconnection with the NYPA system shall be inspected and approved for service by NYPA prior to energization.

2.5.4 The Developer is responsible for generator synchronization to the transmission system. The limits established by the NYISO and NYPA for frequency and voltage shall be observed when connecting or disconnecting the generators or station loads to or from the system.

2.5.5 The Developer shall not be permitted to energize or de-energize NYPA circuits. Energization of the Developer's facility shall be coordinated with NYPA Operations.

2.5.6 The Developer shall schedule and coordinate facility outages with NYPA.

2.5.7 The Developer's facility shall have controls that are compatible with the controls of the NYPA control area.

2.5.8 If Developer's generators remain connected to a de-energized line, Developer’s controls shall automatically open the breakers connecting to NYPA’s system so that the NYPA substation breaker(s) can be reclosed, and the circuit reconnected to the supply bus.

2.5.9 Emergency generator(s) connected to the Developer’s system shall not operate in parallel with the NYPA system. The Developer's facilities shall not create an energized feedback condition when the NYPA system is de-energized. The electric systems with emergency generators connected must be provided with a ‘break before make’ transfer switch or other approved method to prevent emergency generator operation in parallel to the NYPA system.

3 SYSTEM DESIGN CHARACTERISTICS

3.1 Electrical System Service Conditions

Main electrical system typical parameters, and meteorological conditions at the substations are summarized in Tables 3.1.1 - 3.1.2, below. For the electrical clearances at the substations see Chapter 5 “Physical Layout’ of the SDS. Final BIL values are determined after the insulation coordination study is completed.

3.1.1 Electrical System Parameters

Nominal Voltage, kV	**115**	**230**	**345**
Maximum Operating Voltage, Umax, kV	126	242	362
BIL, kV (Clean Insulators)	550	900	1050
BIL, kV (Contaminated Insulators)	550	1050	1300

Transmission system continuous current and short circuit current ratings are site-specific. These ratings will be specified by NYPA.

3.1.2 Meteorological Conditions

Ambient Temperature Range	-40°C to +40°C
Average Ambient Temperature	30°C
Max Bus Temperature Rise	50°C
Altitude	<1000 m
Max Gust Velocity (Tower Design)	100 mph
Keraunic Level	per Keraunic Chart

3.2 Lightning and Switching Overvoltage Protection

3.2.1 Lightning protection shall be accomplished by lightning masts and shields installed within the territory of the substation. The probability of protection shall be 99%. The lightning masts and shields shall be directly connected to the substation ground via a minimum 4/0 AWG soft drawn annealed copper conductor.

3.2.2 All equipment installed in the substation shall be protected from lightning and switching overvoltage by surge arresters whose rating is determined by insulation coordination studies.

3.3 Insulation Coordination

3.3.1 Early in design development Developer shall submit insulation coordination studies including site-specific BIL recommendations. The insulation coordination studies shall consider stresses due to lightning, switching surges, and other transient phenomena which may cause overvoltage.

3.3.2 For systems operating at 230kV and above, two BIL levels are available for each voltage. In each case, the lower BIL level is acceptable for clean environment sites, while the higher BIL level shall be provided at locations where there is a significant potential for insulation contamination.

3.4 Relaying Protection

3.4.1 The Developer shall submit Relaying and Metering single line drawings including transformers, capacitor banks, reactors, arrestors, etc. with ratings and full applied primary and secondary ratio information, and connections to the NYPA system. NYPA shall provide to Developer select standard template drawings to facilitate standardization of the design to NYPA standards. The template drawings include single- and three-line diagrams, typical AC and DC elementary diagrams, and various wiring diagrams for relay panels, termination panels, control panels and similar drawings (See Appendix A, “Referenced NYPA Documents”). The Developer design drawings shall use the NYPA standard template drawings as a basis and supplement them with project specific details and information including major components with specifications and ratings, protective relaying, and instrument transformers with their full and applied tap ratio information used for each protection zone element. Discrete and multi-function protective relays shall be depicted with each activated function and associated input sources and output trip device designations. All wiring diagrams shall be point-to-point type.

3.4.2 The protective relaying system shall be designed to coordinate with other segments of the transmission system based on the analysis of system faults and transient stability of the system for various system conditions to attain the required speed of interruption.

3.4.3 The relay protection system shall be engineered, designed and presented in accordance with NYPA design standards. Special protection systems or remedial schemes shall not be used. Detailed specifications for the interconnection relay protection shall be provided in the project-specific Protections Application Document (PAD). The Developer shall prepare the PAD, after consultation with NYPA, and submit the completed PAD to NYPA for review and acceptance.

3.4.4 The protection systems illustrated on the functional relaying diagram shall include all elements of:

1. Transmission line protection
2. Transformer and reactor protection
3. Bus protection
4. Breaker failure protection
5. Independent primary and secondary systems from diverse manufacturers for each of the above
6. Generator protection
7. Station service transformer protection
8. Synchronizing and synch check relaying
9. Distribution line protection
10. Miscellaneous service protection
11. Reclosing
12. Stub-bus Protection
13. Circuit Breaker Low Gas Pressure Protection

3.4.5 The diagrams shall include:

14. Point of Interconnection to NYPA system
15. Substation equipment and ratings
16. Relay manufacturers

17. Relay models with ANSI device numbers

18. Relaying schemes

19. Zones of protection

20. Associated instrument transformer ratios and accuracy class

21. Auxiliary relays and relay communication equipment

3.4.6 All transmission facilities shall be designed to Bulk Power System (BPS) standard if connected to NYPA's transmission facility. The interconnecting facility's protection system shall comply with Northeast Power Coordinating Council (NPCC) Bulk Power System Directory Criteria and NERC Reliability Standards. For inverter-based resources, the protection system design must adhere to NERC Reliability Standard PRC-024. The material for a TFSP presentation must be developed. The TFSP presentation shall be performed by the Developer with NYPA's consensus prior to energization of the facility if the facility is classified as a BPS facility at the design phase.

The Developer shall design and document the protection systems for all equipment. The protective relay and design for the line, bus, transformer, breaker, and other substation equipment for the interconnecting facility shall be submitted for review by NYPA Protection & Control Engineering (PCE) group.

3.4.7 All protective relay systems shall be fully numerical, microprocessor-based relays with GPS clock time-stamped fault data recovery via sequence of events, waveform capture, and relay watchdog functions.

3.4.8 When the interconnection is to the BPS, or if the interconnection is to a critical NYPA circuit, each high voltage circuit breaker shall be provided with two completely separate breaker failure relaying systems.

3.4.9 Depending on the classification of the particular line system configuration and/or conditions, special protection or additional redundant systems may be required.

3.4.10 Instrument transformers used for protective relaying shall be of C800 accuracy class. High voltage circuit breakers shall have dual independent trip coils.

3.4.11 Developer shall submit relay cabinet and panel layout drawings. Specification for relay panel design for existing conventional substations will be provided by NYPA in the standard EDS-PCE110 “Electrical Design Standard for Indoor Protective Relay Panels/Cabinets and Termination Cabinets for Conventional Substation (Non-Digital 61850)”. The Developer shall provide space and layout for additional relay control panel cabinets in each of the primary room (minimum 4 cabinets) and secondary room (minimum 4 cabinets). See 3.4.23 for Greenfield substations or existing 61850 digital substations.

3.4.12 The power supply for the protective relaying and communication system shall be from a fully redundant 125 VDC system designed to meet all requirements of NERC Directory 4 and in accordance with the Chapter 17, “AC and DC Auxiliary Systems” and other applicable chapters of the SDS and the AC system and DC system One Line template drawings.

3.4.13 Automatic re-closing requirements shall be determined by NYPA based on the location of the interconnecting facility.

3.4.14 Interlocking and/or automatic synchronism checking equipment shall be provided to allow for the remote operation of the substation breakers.

3.4.15 Standalone Sequence of Event Recorder equipment and Digital Fault Recorder equipment or equivalent functionality shall be provided per NYPA specifications. Communications shall be provided for remote access to event and fault records. The Developer shall provide engineering drawings documenting the design, installation, and functional testing (yellow line).

3.4.16 An HMI (Human-Machine Interface) computer including software shall be provided for local status indication, metering, and alarm annunciation/acknowledgment. The HMI shall be capable of providing a status indication, metering, and alarms typically via an interface with the SCADA RTU. The HMI shall be powered from a non-interruptible power source.

3.4.17 All high voltage circuit breakers and motorized disconnect switches shall be provided with local and remote control and status indication. Manual disconnects shall be provided with local and remote position indication.

3.4.18 Relay equipment status, trouble, and failure alarms shall be wired to the SCADA RTU for remote monitoring.

3.4.19 Local control and panel devices (switches, lights, synch scope, etc.) shall be provided.

3.4.20 Phase angle transducers shall be provided to measure the phase angle across high voltage circuit breakers. The transducers shall be connected to the SCADA RTU for monitoring.

3.4.21 Breaker control and relay protection circuits shall be configured with relay and breaker control functions segregated and separately fused. This usually relates to the protection relays that would in some designs be powered by the breaker control fuses in schemes including synch check or reclosing. The Developer shall coordinate this design aspect with NYPA.

3.4.22 IEC61850 shall be the protocol standard for greenfield and existing IEC61850 digital substations, see Chapter 16 – Generation III – Digital Substation Protection and Control/Automation (Greenfield Station) in the Substation Design Standard for detailed requirements.

3.5 Short Circuit Current

3.5.1 NYPA shall provide the site-specific available short circuit current design criteria along with the system X/R ratio. The Developer shall submit short circuit studies with variations and contingencies of fault currents for proper coordination and settings of the protective relay system and for the selection of switching equipment.

3.6 Protective Relay Settings

3.6.1 The Developer shall submit relay setting calculations, justifications, and applied settings for the substation and Developer's substation protective relaying.

3.6.2 The Developer shall be in compliance with PRC-027, a wide area coordination study may be required.

3.6.3 The Developer shall submit preliminary relay setting calculations including the basis used for the calculations and the applied settings.

3.6.4 The Developer shall submit final commissioned in-service relay setting files in a complete report including the basis for calculations.

3.6.5 These submissions shall be in an editable Microsoft Word file (.DOCX file format). The Developer shall apply settings for the transmission line and feeder protective relaying up to and including the adjacent terminals and from POI to the Developer's substation or generator step-up transformers.

3.7 Metering

3.7.1 The Developer shall confirm in writing that new or modified transmission or generating facilities are within the Balancing Authority (NYISO) Area's metered boundaries. Revenue metering shall be at the point of interconnection, e.g. the high-voltage side of the step-up transformer, and shall include the following:

1. **Instrument Transformers:** The specific type, number, connection, and ratios of the instrument transformers will be checked and determined by NYPA PCE and Metering groups based on the expected output and load and the connection to the NYPA system.

2. **Intelligent Electronic Devices (IEDs):** The IEDs for revenue metering MWh, MW, MVAR, and other electrical indications shall be configured and tested by NYPA and mounted in a separate metering cabinet. These devices will be connected to the RTU via RS232, RS485, or Ethernet connection. Ethernet and landline or cellular communications shall be provided by the Developer for redundant communications paths to the IEDs as described in the NYPA standard SCADA RTU substation requirement.

3. **Metering Cabinet:** The metering cabinet(s) shall be a free-standing or wall mount lockable and sealable, located near the SCADA RTU cabinet. AC and DC station power shall be supplied to the metering cabinet(s).

4. **Instrument Transformer Secondary Wiring:** PT and CT secondary wiring shall be routed underground in a dedicated PT conduit and a dedicated CT conduit ("home runs") from the instrument transformers to the meter cabinet. These CT and PT secondary wiring conduits shall not run in the yard common wiring trenches, shall be segregated from all other power cables, and shall be routed at a distance to eliminate the influence from other voltage and current-carrying cables. The Developer shall provide a lockable and sealable CT/PT junction box at the base of the CT/PT structure for shorting and fusing. Only a multi-conductor control cable may be utilized with a minimum 1000V AC insulation level. Minimum 10 AWG stranded copper cable shall be used for the CT wiring and minimum 12 AWG stranded copper shall be used for the PT wiring. Additional control cable requirements, such as shielding and twisted pairs, may be specified.

3.8 Communication Systems and Equipment

3.8.1 Communication systems shall be provided to integrate seamlessly into the existing and planned NYPA communication systems. The systems shall provide for inter-connectivity with the substation and the NYPA SCADA, Sensor Monitoring, Revenue Metering, Security, voice and business systems. The system shall utilize mediums specified by NYPA. The system shall provide continuous communication from the facility to the designated NYPA termination location. Where direct connection to NYPA communications infrastructure is to be provided, NYPA will specify the channel equipment to be provided by the developer. This may include additional channel equipment to be installed by NYPA at the remote location.

3.8.2 The systems shall have the capability to transmit and receive various types of signaling including metering, relay protection, security, CCTV, voice, life safety, alarms, and SCADA equipment.

3.8.3 The Developer shall provide a substation indoor and outdoor audible public address system serving the NYPA Control Building and the outdoor substation. The Developer shall provide local and remote paging from any NYPA location.

3.8.4 NYPA will provide the Developer with high-level communication systems specifications including interconnectivity with existing and planned NYPA systems. The Developer shall design and provide communications systems in accordance with these specifications.

3.8.5 Circuits designated by NYPA as critical shall be supported by two separate communication mediums/pathways. Any diverse transmission medium or other broadband based facilities supplied by common or value-added carrier shall be configured dedicated point to point. Virtual circuits shall not be allowed for protective relay or SCADA circuits.

3.8.6 System security requirements using encryption or other means shall be specified by NYPA.

3.8.7 Certain communications applications, e.g. SCADA, Protective Relaying, shall be provided pathways with enough capacity to meet the minimum requirements for effective, uninterrupted communication. Additional bandwidth shall be supplied for the other applications, plus spare capacity.

3.8.8 The communication system design shall include:

1. The communication system and related equipment shall be provided with redundant power supplies and related equipment.

2. If a standalone building supporting microwave equipment is provided, it shall be provided with a dedicated UPS system, redundant HVAC sources, a standalone DC system and battery bank, and space for future addition of equipment.

3. NYPA will specify communication requirements and will apply for FCC license, FAA filings, etc. NYPA shall be the named licensee for Communications licenses and permits.

4. The public address system shall have a minimum impact on surrounding areas and conform to Federal, State, and local ordinances and regulations. The Developer shall submit supporting calculations.

5. Lightning protection with Master Label per NFPA 780 shall be provided for communication equipment. Bonding and grounding shall conform to the latest edition of the Motorola R56 manual, “Motorola Standards and Guidelines for Communications Sites”, and NFPA Standards.

6. The Developer shall supply two communication services; NYPA’s Business Network and a local PRI, to support reliability.

7. All telephone or T1 facilities, including broadband, entering a substation shall be via buried non-conductive fiber optic cable. Each buried service shall be separated horizontally by five feet.

8. The Developer shall install communication jacks at the following locations within the Substation Control Building:

    a. Break Room (one Business Network port at two locations)

    b. Secondary Relay Room (multiple locations)

        i. Next to exterior door (one Business Network port)

        ii. At each desk (two Operations Network (A and B) and one Business network ports)

        iii. Outside the Secondary Battery Room (one Business Network port)

        iv. Next to Physical Security Cabinet (two Operations Network (A and B) ports)

    c. Primary Relay Room (multiple locations)

        i. Next to exterior door (one Business Network port)

        ii. At each desk (two Operations Network (A and B) and one Business Network ports)

        iii. Outside the Primary Battery Room (one Business Network port)

    d. Breaker cabinet circuit (bridged, jack located in each high voltage circuit breaker cabinet)

9. Handsets for NYPA Business Network shall be provided by NYPA.

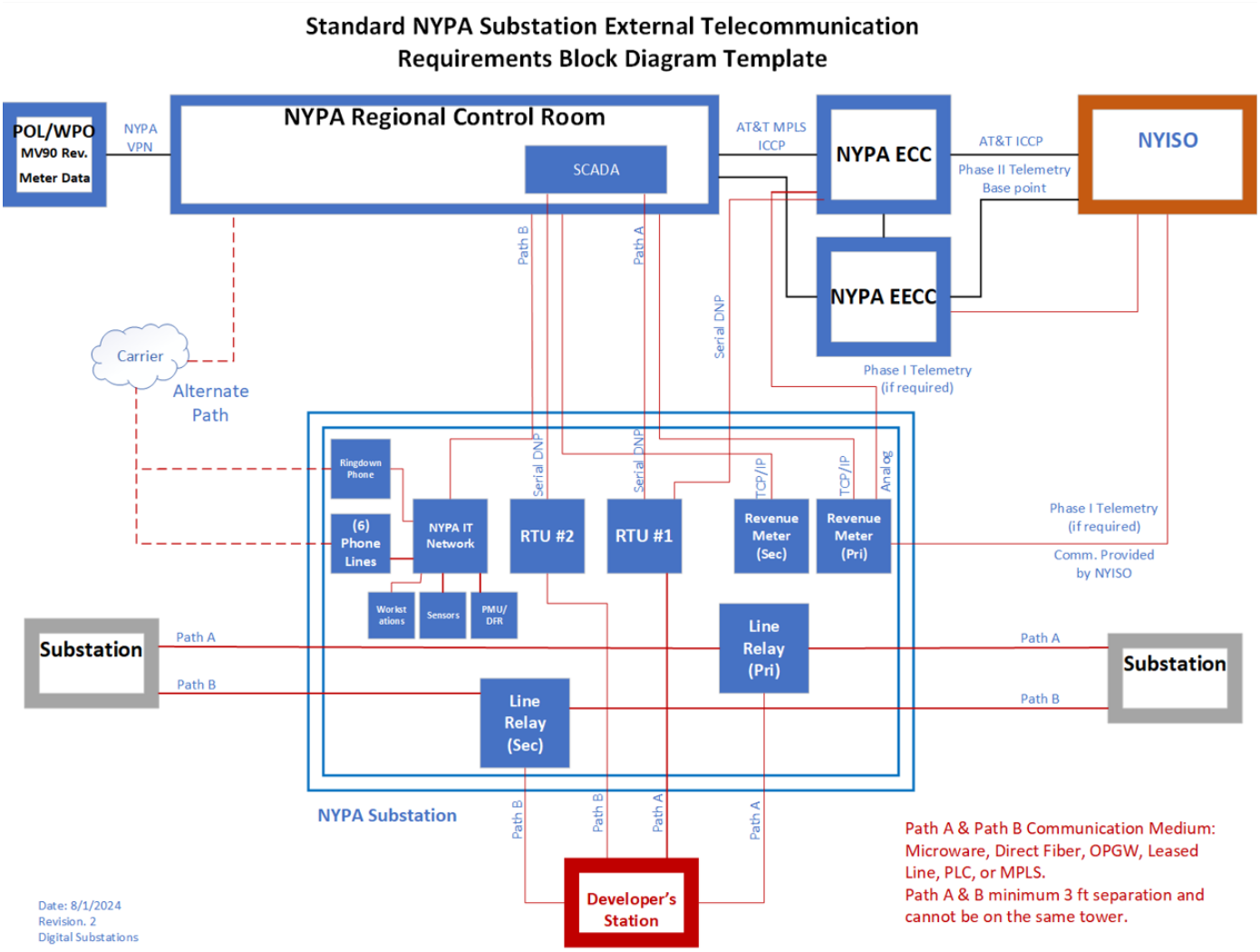
3.8.9 The Developer shall install local area network (LAN) jacks at each desk in the Primary Relay Room (2 total), Secondary Relay Room (2 total), and Control/ Break Room (2 total); submit layout.

3.8.10 Communication equipment shall be installed per industry standards and NYPA practice.

3.8.11 NYPA OPGW splicing and optical transport network equipment is responsibility of the Developer. The equipment shall be specified for each project based on project location and approved by the NYPA network team.

3.8.12 Communication facilities shall be designed assuming they are Critical Assets. The installation shall comply with NERC-CIP, see below Section 3.9.9.

3.8.13 The Developer shall incorporate Figure 3-1, illustrating NYPA's requirements, in the Phase 2 Study and the final system design.



3.9 SCADA and RTU

3.9.1 The Developer shall provide a SCADA RTU (Supervisory Control and Data Acquisition Remote Terminal Unit) per NYPA specification in the substation Control Building. NYPA will specify the network routers, switches, and/or firewalls as appropriate for installation by the Developer. The Developer shall contract with the RTU manufacturer or a system integrator to configure the RTU and integrate the RTU into the substation control system as per SCADA RTU Substation Requirements standard.

3.9.2 The Developer shall notify NYPA and coordinate so NYPA personnel may observe SCADA/RTU system integrator's work. Depending on the extent of the work (e.g., for a completely new station) NYPA may require an integrated factory test of the SCADA and associated networking, IEDs and controls.

3.9.3 The minimum SCADA RTU communication channel is a dedicated, non-virtual, digital point-to-point circuit from the facility to NYPA's existing control center.

3.9.4 The Developer shall install the network routers, switches, and firewalls in a separate, free-standing, lockable cabinet provided with tamper switches wired to the RTU and/or substation security equipment. Equipment (routers, switches, etc.) for SCADA communications and equipment servicing diverse communication pathways shall receive power from both the primary and secondary station 125VDC systems via redundant power supplies.

3.9.5 Each router and switch shall communicate using a standard digital termination facility. In a typical configuration, two (2) independent digital facilities shall be supplied by the Developer as agreed upon by NYPA. The intent is to provide diversity for the substation communication system. Typically, the first digital facility shall be supplied via OPGW-1 or a microwave system. The diverse digital facility will be OPGW-2 or the point-to-point common carrier supplied pathway. The two digital facilities shall not share the same physical or electrical paths.

3.9.6 Hardwired equipment status inputs shall utilize dry contacts only. Hardwired analog inputs shall utilize ungrounded current (± 1mA inputs (nominal) or 4-20mA transducer inputs). The RTU shall also be capable to poll intelligent electronic devices (IEDs) using DNP 3 and MODBUS RTU protocols via serial or Ethernet connections. Connections between the RTU and protective relaying shall be as per the SCADA RTU Substation Requirements Standard for Substation SCADA and shall also include hardwired inputs. Serial connections that extend outside the Control Building shall connect to the RTU via Fiber/RS232 converters. Ethernet connections shall utilize substation qualified Ethernet switches installed no more than 20 feet from the RTU. IEC 61850 is the protocol standard for greenfield digital substations.

3.9.7 The RTU shall be enclosed in a free-standing lockable cabinet provided with tamper switches wired to an RTU input or the station security system. The RTU shall be installed in the Control Building and shall have front and rear access. Cabinets shall provide for top and bottom cable entry compatible with the Control Building design. At a minimum, a NYPA extension handset shall be installed a maximum of 12 feet from the RTU.

3.9.8 The Developer shall provide the HMI computer and software per NYPA specifications.

3.9.9 If the cyber facility is categorized by NYPA as part of the BPS, the RTU and communication cabinet shall be protected both physically and electronically in accordance with NERC CIP requirements, and shall include the following features:

10. Adherence to the NYPA Standard for Control System Cyber Security Requirements, see NYPA document, “General Cyber Security Requirements Exhibit”.

11. Card Key access control with logging of access to the equipment.

12. Video monitoring/Storage/Offsite Communication.

13. Separate secure room (preferred) or “six” wall enclosure, such as a security cage, if the physical area around the device cannot be secured from general access.

14. TCP/IP access should be limited, monitored, and controlled via firewalls, Intrusion Detection.

15. Remote access is prohibited.

3.10 Grounding

3.10.1 A complete system of substation grounding shall be provided. The design shall provide a safe, effective, and reliable grounding system and shall take into account the value of ground resistance, grid resistance, the level of step and touch potential, and the magnitude of fault currents flowing to ground.

3.10.2 The Developer shall provide a complete grounding system study. The study shall substantiate the basis of design and shall include soil test data, design data, and supporting calculations. The scope of study shall include the new construction as well as the impact of new work on the existing grounding facilities.

3.10.3 The substation grounding system shall be designed and installed in accordance with the Substation Design Standard (SDS) - Chapter 10, “Grounding” and other applicable chapters of the SDS for equipment, raceways, power, communication and signal wiring.

16. Provide a lightning shielding assessment that meets the following criteria:

17. Demonstrates that system is effectively shielded from lightning in accordance with NFPA 780. System design shall be in accordance with UL 96A Master Label requirements.

18. Evaluates the current lightning protection system, including determining the likelihood of direct lighting strikes on power systems equipment (transformers, breakers, switchgear, etc.), buswork, buildings, etc.

3.10.4 The grounding system design and lightning shielding design shall include recommendations for improvements from the study.

3.10.5 The grounding system in the Control Building shall include a separate approach, which shall be bonded together with the yard grounding system to form one complex grounding system. The special grounding for the Control Building shall be a high-frequency grounding system. The metallic enclosures and panels shall be connected to a reference ground to minimize high-frequency noise. Equipment connection details shall be indicated on drawings.

3.10.6 The Developer shall submit grounding design drawings including a minimum of three separate layout drawings, one each for the substation, fence grounding, and Control Building grounding designs. The Developer shall provide equipment grounding details and grounding details.

3.10.7 All structures and equipment shall be grounded to a common ground grid. A minimum of 4/0 AWG bare stranded soft drawn annealed copper shall be used for the ground grid as well as for connections to equipment and structures. Approved connections shall be used for below-grade connections. Above-grade connections to equipment and structures shall be bolted or crimped.

3.10.8 Transformers, cooling tanks, circuit breaker tanks, and support structures shall be grounded at two points at diametrically opposed corners. Other equipment shall be grounded at a minimum of one point. High voltage disconnect and ground switch operating handle location(s) shall be provided with an at-grade grounding mat. The grounding mats shall be connected to the grounding grid at two locations. Platforms for access due to the height of the cabinets (e.g., high voltage circuit breaker cabinets) shall be grounded at two opposed locations.

3.10.9 All cable shields, except instrumentation cable shields, including those of the station service transformer feeders, shall be solidly grounded at both ends unless otherwise specified by NYPA. Instrumentation cable shields shall be grounded at the cabinet end; multi-stop wire paths should be grounded at end closest to the control building. The Developer shall provide all equipment grounding conductors. Metallic conduits, whether embedded or exposed, shall be electrically continuous and bonded at both ends. Flexible conduits shall be installed with bonding bushings and external bonding jumpers.

3.10.10 All outdoor equipment cabinets and junction boxes shall have a ground connection to the ground grid.

4 DOCUMENTS

4.1.1 The documentation of the design and installation of the facility shall be performed in compliance with the process details in NYPA's Procedure O-CM-00-001, "Configuration Management Procedure" and other applicable NYPA Engineering procedures.

4.1.2 All drawings, specifications, calculations, studies, reports, data, and materials shall be submitted for review and acceptance by NYPA to ensure compliance with NYPA's requirements and applicable industry standards or regulatory requirements. The design drawings, calculations, studies, reports, data, and specifications shall be submitted in logical packages for each design phase including conceptual, schematic, design, permit, construction and "as-built". The Developer's project schedule shall allow sufficient time intervals for NYPA review/ acceptance, and for submitting additional required or requested information, and for re-submittal of drawings and specifications required thereby.

4.1.3 Drawings, specifications, calculations, studies, reports, and data including dimensions shall be in the English language and in U.S. (Inch-Pound) units.

4.1.4 Engineering Documents including drawings, specifications, calculations, studies, reports, record drawings, as-built drawings etc. shall be signed and sealed by the Engineer of Record (EOR), a licensed Professional Engineer (PE) registered in New York State (NYS), in accordance with NYS Education Department guidelines.

4.1.5 The Developer shall provide the design, drawings, calculations, and specifications complete and coordinated in detail. The Developer shall provide complete detailed design packages in accordance with good utility practice that will be used for construction, operations, maintenance, and clearances under NYPA's clearance and protection programs. Design / Build quality drawings and specifications are not sufficient. The design packages shall include drawings, specifications, and calculations that unambiguously detail the design. The intent is that the construction contractors may construct the design with a minimum of field interpretation and that the As-Built and record documents accurately and unambiguously document the installation and testing, including down to the detailed point-to-point wiring level.

4.1.6 The Developer shall provide extensive labeling of items including panels, panel schedules, equipment, conduits, cables, terminations, etc. Labels shall correlate exactly to the drawings in order to comply with NYPA's clearance and protection programs and to ensure the safety of personnel. The Developer shall coordinate labels with NYPA including equipment, yard equipment, and structures. The Developer shall coordinate with NYPA the cable and termination labeling. The Developer shall coordinate with NYPA to incorporate any non-industry standard labels (e.g. DC label colors for 125V DC terminations). See also Section 5.21, "Electrical Identification" for more detail.

4.1.7 The Developer shall maintain an organized Request for Information (RFI) process and database for RFIs.

4.1.8 The Developer shall provide all electronic project files including all database files, calculation files, AutoCAD drawings files in AutoCAD and PLS CADD files, to NYPA at the conclusion of the Project.

4.1.9 Chapter 4, "Documents", and other applicable chapters of the SDS provided more detailed requirements for the project documentation.

4.2 Drawings

4.2.1 The Developer shall coordinate with NYPA to establish a Drawing Index and drawing numbers, and to detail the drawing and drafting requirements for the interconnection design. The Developer shall coordinate the project's drawings with the requirements of NYPA's Engineering Department Support Document O-ENG-00-SD-005, "Computer Aided Design Requirements for NYPA Drawings". The Developer shall supply NYPA standard ANSI "E" size drawings.

4.2.2 Drawings for existing facilities shall follow the naming, labeling and numbering convention specific to applicable existing facility or site. Drawings for new facilities shall follow the naming, labeling and numbering convention as detailed within NYPA's Standard SDP-00100, "Drawing Numbering, Naming, and Labeling Convention". .

4.2.3 Each drawing category shall include a symbol legend. Plan, elevation, equipment, and associated detail drawings shall be scaled. Drawings shall accurately depict the Work.

4.2.4 Where available drawings and details within the drawings shall be in accordance with NYPA Engineering Standard drawing templates and details.

4.3 Substation Specifications

4.3.1 Where available, specifications shall be in accordance with NYPA Engineering Standard Specifications. Purchase and construction specifications shall be in conformance with the most recent Construction Specification Institute (CSI), or approved format, Purchase and construction specifications shall be detailed and complete. Components of the Work shall be sufficiently specified as to minimize the installation contractor decision process.

4.4 Record Drawings

4.4.1 The Developer and its EOR are responsible for the observation and documentation of construction activities, and the develop of "Record Drawings" representative of the project “as constructed”. These drawings shall be signed and sealed by the EOR and shall accurately and unambiguously reflect the as constructed installation at the completion of the work.

4.4.2 As the construction proceeds, the Developer and its EOR shall maintain detailed Construction Yellow Lines of each drawing; contemporaneously keeping documentation up to date. Using yellow line /confirm that the design matches the as-constructed condition with date and initialing showing a progression of completed components(YELLOW lined, confirming installed as designed); and/or showing changes using **RED** (New/added), **GREEN** (Deleted/removed), and **BLUE** (Construction Notes) notations with the date and initial. Any adjustments to design documents caused by an EOR approved engineering or field change shall be incorporated into the Construction Yellow Lines, including attaching the approved design change or field change document and yellow lining the changes installed, and subsequently incorporated into the Record Drawings. The ”as constructed” components and materials shall be the components and materials installed. The Developer shall submit the Record Drawings , including specifications; BOM; and Cable, and Conduit schedules; etc. (design documents updated to reflect as constructed condition), prior to the energization of the substation by NYPA.

4.4.3 The Developer shall submit Record Drawings. Record Drawings shall be CAD drafted using the Construction Yellow Line drawing information. Record Drawings and specifications shall be signed and sealed by the EOR.

4.4.4 The Developer shall require the EOR /EOR representative to continuously monitor construction or make periodic, sufficient site verification inspections to assure the installation reflects the design and enable EOR to issue Certificate(s) of Completion.

4.4.5 A Developer surveyor shall survey the as constructed locations of items including grading, access roads, structures, manholes, equipment, buildings; underground structures, underground conduit route and elevations, drainage routes and inverts for the purpose of accurately depicting the information on the Record Drawings. All towers shall be surveyed including foundation elevation and tower location.

4.4.6 Arrangement drawings shall reflect to scale, structure, actual equipment installed, locations, and spatial relationships, both in plan and elevation views.

4.4.7 Elementary and wiring diagrams shall be verified to ensure they reflect installed conditions including cable and wire termination labels, and terminal IDs.

4.4.8 The Developer shall remove or finalize interim notes prior to submittal of Record Drawings.

4.4.9 Record Drawings shall meet the following criteria:

19. TYPE I – Drawings originated and drafted by Developer:
    1. Work shall be BLACK color
    2. Clouding, revision triangles, and notes (BLUE) shall be removed
    3. Drawing Revision Block shall indicate Rev 0, “Record Drawing”, be initialed, and dated. Record Drawings shall be signed and sealed with PE stamp by the EOR.
    4. Transmittal of Record Drawings to NYPA:
        a. Electronic copies provided in DWG file format. DWG files shall have an indication in the seal box that the drawing has been sealed, coordinate with NYPA. Drawing file is named the drawing number without revision number added.
        b. “Wet” signed and sealed full-size copy and PDF thereof.

TYPE II – NYPA SK1 drawings supplied to Developer by NYPA

1. Work shall be shown: additions in RED or in BLACK and back circled; deletions GREEN, or in BLACK and back circled.
2. Revision triangles and notes (BLUE) shall be removed
3. Drawing Revision Block shall indicate Rev xa, “Record Drawing”, be initialed, and dated. X in xa references the revision number that was provided to Developer by NYPA; a in xa references the next alphabetic character in the series incremented one from the last alphabetic character used by Developer. Record Drawings shall be signed and sealed with PE Stamp by the EOR.
4. Transmittal of Record Drawings to NYPA:
5. Electronic copies provided in DWG file format. DWG files shall have an indication in the seal box that the drawing has been sealed, coordinate with NYPA. Drawing file is named the drawing number without revision number added.
6. “Wet” signed and sealed full-size copy and PDF thereof.

TYPE III – Drawings that have been produced by NYPA For Construction and provided to Developer for use on the project.

1. Work shall be shown: additions in RED or in BLACK and back circled; deletions GREEN, or in BLACK and back circled.
2. Revision triangles and notes (BLUE) shall be removed.
3. Drawing Revision Block shall increment the alpha character indicating “Record Drawing”, initialed, and dated.
4. Record Drawings shall be signed and sealed with PE Stamp by the EOR.
5. Transmittal of Record Drawings to NYPA:
6. Electronic copies provided in DWG file format. DWG files shall have an indication in the seal box that the drawing has been sealed, coordinate with NYPA. Drawing file is named the drawing number without revision number added.
7. “Wet” signed and sealed full-size copy and PDF thereof.

4.5 Turn Over Packages

4.5.1 Turn over packages (TOPs) include Permit / Construction TOPs (CTOPs) and Equipment TOPs (ETOPs) shall be in accordance with NYPA Procedure O-AMM-20-016, “Project Turnover Procedure”.

4.5.2 The Developer shall transmit the construction turn over and construction QA/QC documentation in the CTOPs; equipment information for NYPA Operations and Maintenance in the ETOPs. The TOPs shall contain all pertinent information. Developer shall provide CTOPs and ETOPs as hard copy, pdf files, and in MS Access database(s) or other approved format. The ETOPs shall be coordinated to the Equipment List and BOM. The database shall allow drawings and documents associated with any particular equipment or BOM item to be easily accessed, retrieved, and printed.

4.5.3 The following lists are indicative of contents. The Developer shall submit content early during the project design phase.

1. CTOP

- All permits, variances, licenses, access roads, rights of way, structures, and allowed usage, all in a form acceptable to NYPA.
- NYPA will require free and clear title to all real estate interests transferred to it. Developer to provide independent title reports evidencing same, brought forward to the date of transfer.
    - Evidence that the real property is free of environmental contamination or conditions, regulatory actions or encumbrances including copies of completed environmental reports, studies, correspondence and regulatory agency acceptance documenting all environmental conditions have been addressed.
    - All Deeds, easements and other real estate transfer documents shall utilize NYPA's standard language for such documents.
    - All Surveys for lands transferred to NYPA shall utilize NYPA's standard format.
- Certificates of Inspections including Electrical, Structural, Fabricator, Fire Alarm, Board of Underwriters.
- Testing Certifications, Soil Compaction, Concrete testing, etc. (compilation of reports)
- Certificates of Special Inspections

2. EOR Certificates of Completion

- Certificate of Occupancy from Authority Having Jurisdiction
- Field Testing documentation
- QA/QC checklists (compilation of reports, CIMP checklists, etc.)
- As-Built Construction Drawing List

- Field Change Request (FCN)/ Field Change Notice (FCN)/ Design Change Notice (DCN) list
- QA/QC Nonconformance List / Documentation of resolutions.

3. ETOP:
   - Equipment Specification
   - Equipment Purchase Order documentation
   - Factory Test documentation, Field Installed (Baseline) Test data.
   - Pictures of Equipment Nameplate showing Model and Serial Numbers and picture of Equipment Label
   - Vendor product documents including drawings, specifications, operation and maintenance manuals, Safety Data Sheets, recommended spare parts lists, Representative and Factory contact information. Vendor Drawings shall be EOR approved and annotated to indicate supplied equipment configuration: e.g., strike though components not supplied; highlight with arrows/ stamps for included components.
   - List of Developer provided spare parts, PO, PO numbers, Part numbers, supplier, and costs.
   - Programming manuals and documentation of as-supplied programming e.g. relay settings data.
   - Asset Onboarding List Template as required by O-AMM-20-016.

4.5.4 Warrantees, maintenance, and/or service agreements, expiration dates, contact information. Developer will provide NYPA with copies of any OEM, supplier, contractor or subcontractor warranties with transfer of assets. NYPA will be named as the recipient and beneficiary of such warranties as a pass-through warranty to which NYPA is entitled and the ultimate beneficiary of.

4.6 GIS Mapping Database

4.6.1 The Developer shall develop a GIS mapping database with all the buried systems and their components, and all the transmission lines and their support structures.

4.6.2 For mapping of new assets at existing facilities, the vertical and horizontal datums shall conform with those used for that facility.

4.6.3 The following datums shall be used in the mapping of the assets at new facilities:

- Vertical – North American Vertical Datum from 1988 (NAVD88)

- Horizontal - State Plane Coordinate System NAD83

4.6.4 The GIS Dataset shall be submitted in an ArcGIS 10.6.1 geodatabase format. All data becomes the property of NYPA.

5 EQUIPMENT AND MATERIALS

All Equipment and materials shall be designed and installed to meet all regulatory requirements and in accordance with Chapter 6, “Major Equipment”; other applicable chapters of the SDS; and applicable NYPA standard equipment and installation specifications.

5.1 Power Circuit Breakers

5.1.1 High voltage circuit breakers shall be dead-tank, SF_6 type. Alternate equipment requires submission and approval by NYPA in advance.

5.1.2 The continuous and short-circuit current rating of the circuit breakers shall be determined by NYPA for each specific project.

5.1.3 The circuit breakers auxiliary contacts, selector switches and control cabinet equipment and accessories shall be as described in the specification.

5.1.4 Power circuit breakers shall comply with NYPA Standard Specifications ES-103-01, “Outdoor Oil-less Power Circuit Breakers (345kV or Greater)” and ES-103-01-2, “Outdoor Oil-Less Power Circuit Breakers (Less than 345kV)” as applicable.

5.2 Disconnect Switches

5.2.1 Motorized Group Operated Line Disconnect Switches and Manual Gang Operated Circuit Breaker Disconnect Switches.

1. All line or feeder disconnects shall be motorized and all breaker disconnects shall be manual.

2. All bus disconnects in breaker and a half configurations shall be motorized. All disconnects shall be motorized for 345kV & 765kV systems.

3. Line disconnect switches shall be provided with manually operated grounding switches.

4. The site-specific continuous and momentary current ratings of disconnect and grounding switches will be specified by NYPA.

5. All disconnect switches shall be provided with external auxiliary limit switches coupled to the vertical operating pipe, and shall be used for position indication and/or relaying purposes. hooting work, without removal of a Line or Bus from service. See SDS for additional detail.

6. Disconnect switch operator shall be located toward the access aisle. Disconnect switches shall be mounted on steel support structures, configured to allow NYPA's currently approved telescopic booms or scissor lifts to maneuver around the base of the support structure and deploy a 3'x 8' lift platform in the space between the switch phases and adjacent structures with access to all components of the switch poles – for maintenance or replacement. Boom lift access and operation around the switch shall meet or exceed electrical safety clearances without necessitating an outage on adjacent energized bus or exposed energized conductors, not connected to the switch circuit. Provide properly rated ground studs on switch pads and ground bars on steel structure for connecting safety ground cables.

7. Disconnect Switches shall comply with NYPA ES-103-02, Disconnect/Ground Switches".

5.3 Potential Transformers

5.3.1 Potential transformers shall be provided for relaying and/or metering.

5.3.2 Both capacitances coupled and magnetically coupled units are acceptable. However, for revenue metering only magnetically coupled potential transformers shall be used.

5.3.3 The PT/CCVT shall comply with NYPA specification, ES-337126-16, "Capacitor Voltage Transformers and Coupling Capacitor Voltage Transformers" and ES-337-126-26 "Voltage Transformer and Combined CT/VT".

5.4 Current Transformers

5.4.1 Current transformers shall be bushing type, window type or free-standing installed for relaying and/or metering.

5.4.2 All type of CTs shall comply with NYPA specification, ES-337126.23, "Current Transformers".

5.5 Surge Arresters

5.5.1 Surge arresters shall be station class, metal oxide, gapless, polymer type. The Surge arrester ratings shall be determined by the Insulation Coordination Studies. Surge arrestors shall be applied to protect equipment and circuit breakers from flashovers due to transient over voltages when circuit breakers are open with disconnects closed/ energization from one or both sides.

5.5.2 Surge arrestors shall comply with NYPA specification SR-101, “Surge Arrestors”.

5.6 Power Transformers

5.6.1 The step-up transformer shall be provided by the Developer and installed outside the perimeter of the NYPA substation.

5.6.2 The step-up transformer shall meet the following criteria:

4. The high voltage nominal rating shall match the NYPA system nominal voltage;

5. There may be specific instances where an on-load tap changer (OLTC) may be required. The Developer shall coordinate with NYPA early in the design.

6. The Developer shall submit the transformer MVA rating and impedance p.u. value.

5.6.3 If the installation is on the property to be owned by NYPA, the power transformer shall meet the following criteria:

1. The transformer shall be mineral oil-filled. The mineral oil shall be certified PCB free. An oil containment system meeting regulatory requirements for oil-filled equipment shall be provided. The oil containment system shall be designed to provide for management of rain, ice, and snow accumulation and proper operation of the containment system. Drainage piping from such containment shall be to “daylight” and shall not be perforated piping.

2. Noise generated by the transformer and accessory fans shall be 2 dba below the smaller of: NEMA/IEEE limits, local laws, and regulatory requirements.
3. In special cases, if the transformer is required with low noise level, the transformer manufacturer shall clarify if the transformer will be provided with a sound enclosure to meet the required sound limits.
4. Power Transformers shall comply with NYPA specification ES-102-01, “Standard Specification Power Transformer Class II”. Section 1.4.2 Equipment and Services Provided by NYPA shall not apply.

5.7 Control Building

5.7.1 Developer shall provide a substation Control Building. The Control Building shall be a single story, steel frame, metal siding building with reinforced concrete foundation. The building layout shall neatly accommodate equipment and accessories, allow access throughout for maintenance and replacement of equipment, and shall contain layout and allocated space for future equipment associated with expansion of the substation. See Chapter 18 “Control Buildings” of NYPA’s design standard DS – 00100, “Substation Design Standard”, and NYPA’s standard drawing template XXXX-E-2A01 “Substation Control Enclosure” for more details.

5.7.2 The Control Building shall be manufactured in accordance with the requirements of New York Department of State (NYDOS), Factory Manufactured Buildings (Modular) and shall bear an NYDOS Insignia. The Control Building design shall be assigned Risk Category IV.

5.7.3 The installation of the Control Building shall be performed in accordance with NYPA Construction Permit Process, see NYPA document O-TC-20-001, “Code Compliance Program: NYPA Permitting Procedure”, and meet the requirements of the New York Uniform Fire Prevention and Building Code in effect at time of submittal of final Signed & Sealed design package. In the event of a conflict between NYPA requirements and the Uniform Code, the more conservative shall prevail.

5.7.4 Physical and electrical separation between primary and secondary relay systems shall be per NPCC Directory 4 and NYPA requirements, the more conservative shall prevail. The control equipment and the power equipment shall be divided into two separate areas of the Control Building for electrical safety purposes.

5.7.5 Cables entering the building from the switchyard shall be routed from the exterior trench up the exterior of the wall and through to the internal overhead cable trays.

5.7.6 HVAC system shall be sized for 150% of the design load for reliability and resilience purposes. HVAC system shall have multiple units (i.e. 2- 75% or 3 50% capacity units) in a lead-lag control arrangement.

5.7.7 Electric space heaters shall be provided to back up the HVAC system.

5.7.8 Adequate space and provisions shall be provided within the Control Building and substation area for the future installation of level II Electric Vehicle (EV) charging stations. Electrical panels and their power supplies shall include adequate provisions and spare capacity for this future installation. See Chapter 18 “Control Buildings” and Chapter 17 “AC DC Auxiliary Systems” of NYPA’s design standard DS – 00100, “Substation Design Standard” for more details.

5.7.9 In the substation layout, just outside the Control Building, a 15-foot by 15-foot space shall be allocated for the installation of a single bathroom with a shower and two lockers in a heated and ventilated, insulated, metal building on a concrete slab with a floor drain. The ground under this location shall be kept clear and shall not be used to route any other piping or conduit. See Chapter 18 “Control Buildings” of NYPA’s design standard DS – 00100, “Substation Design Standard”, and NYPA’s standard drawing template XXXX-E-2A01 “Substation Control Enclosure” for more details.

5.7.10 In the substation layout, just outside the Control Building along the perimeter fence, a 35-foot by 35-foot space shall be allocated for the installation of an emergency generator and fuel supply. The ground under this location shall be kept clear and shall not be used to route any piping or conduit. See section 5.16, “Emergency Power” for more details. See Chapter 18 “Control Buildings” of NYPA’s design standard DS – 00100, “Substation Design Standard”, and NYPA’s standard drawing template XXXX-E-2A01 “Substation Control Enclosure” for more details.

5.8 GIS Equipment Building

5.8.1 Where applicable, the Developer shall provide a Gas-Insulated-Substation (GIS) Equipment Building.

5.8.2 In lieu of providing a separate Control Building, the GIS Equipment Building shall incorporate all the attributes and requirements of the Control Building in Section 5.7, “Control Building”, in addition to the attributes and requirements of this section. See also Chapter 18 “Control Buildings” and Chapter 25 “Gas Insulated Substations" of NYPA’s design standard DS – 00100, “Substation Design Standard”, and NYPA’s standard drawing template XXXX-E-2A01 “Substation Control Enclosure” for more details.

5.8.3 The building layout shall neatly accommodate equipment and accessories, allow access throughout for maintenance, testing, and replacement of equipment, and shall contain allocated space for the storage of service and testing equipment. High-potential testing capabilities shall be incorporated into the building design and the required testing accessories (test bushing, bus extension, etc.) shall be included with the project's deliverables.

5.8.4 The GIS Equipment Building's exterior shall be similar in architectural appearance as other structures in the vicinity of the installation.

5.8.5 The GIS Equipment Building floor slab shall be flat and level as required for the proper installation of the GIS equipment.

5.8.6 The GIS Equipment Building shall include an overhead bridge crane for GIS equipment service and replacement.

5.8.7 The GIS Equipment Building exterior shall have roll-up door that is appropriately sized for the access, removal, and replacement of the GIS equipment and GIS service equipment.

5.8.8 The GIS Equipment Building shall incorporate a SF_6 Gas monitoring and detection system. This system shall be wired to the RTU and alarm locally and remotely on detection of SF_6.

5.8.9 All GIS equipment shall include equipment sensors to monitor the gas pressure for detection of SF_6 leaks. These sensors shall be wired to the RTU.

5.9 Power Cables

5.9.1 Cables shall be suitable for both underground and above ground use in both wet and dry service conditions.

5.9.2 The supply cable ratings to the station service transformers shall be determined based on recognized standards and good engineering practice. Medium and high voltage cable insulation systems shall be designed for 133% insulation level. Low voltage cables shall be rated at 1000VAC for both AC power circuits 600V and below and DC power circuits 125V DC and below.

5.9.3 Medium Voltage Power Cable shall comply with NYPA specification ES-105-00, "5KV – 35KV Power Cable".

5.9.4 Low Voltage Power Cable shall comply with NYPA specification ES-106-00, "Low Voltage (1000V) Power & Control Cable".

5.10 Control and Instrumentation Cables

5.10.1 All multiple conductor cables for AC and DC service shall be rated minimum 1000V AC .

5.10.2 In addition to 5.10.1., Control and instrumentation cables installed in high voltage substations (115kV and above) shall be shielded with 5 mil helically wrapped tinned copper tape, no less than 25% overlap, with #16 or #18 drain wire.

5.10.3 Terminations shall be nylon insulated (no PVC) compression ring type, UL listed.

5.10.4 Instrumentation Cable shall comply with NYPA specification ES-106-01, “Instrumentation and Control Cable”.

5.11 Cable Trenches, Conduits, and Trays

5.11.1 Underground raceways should be the primary means to run power and control cables to yard equipment. The raceway system should be comprised of direct buried conduits from equipment to a cable trench system containing cable trays leading to the Control Building.

5.11.2 Acceptable construction for the cable trench systems shall be either cast-in-place concrete construction or precast concrete trench.

5.11.3 Cable trenches shall be arranged such that the routing follows the basic coordinates of the substation. Provision for storm water drainage, e.g., French drains, shall be provided. Segregation barriers shall be provided where it is necessary to run cables of different signal levels in the same tray or trench. HS-20 rated trench covers shall be provided. Minimum trench inside clear dimensions shall be as required by substation cabling fill requirements plus 25% spare capacity.

5.11.4 Functional separation criteria for conduit runs are that power, control, primary relaying, and secondary relaying cable classes shall be routed in dedicated conduits until they reach the trench or pertinent cable trays, as described below. Power cables above 600V shall be run entirely in direct-buried conduit outside the cable trenches.

5.11.5 Aluminum ladder type cable trays shall be installed for cable placement. The cable segregation criteria in a tray shall be as follows:

1. Station Service conductors;

2. All other 600 V power cables (operating at 480/277V, 120/208 V, 120-240 V);

3. 120 VAC control, PT, and CT wiring.

4. 125 VDC (or less) power and control (less than 20 amperes).

5. Instrumentation, low voltage (24VDC or less) discrete inputs, analog signals (4-20mA); Communications, telephone, fiber, ethernet, etc..

5.11.6 All cables associated with fire detection, alarm, and suppression systems shall occupy a dedicated raceway.

5.11.7 In addition, cables shall be separated as required by NPCC, NEC, IEEE, and other applicable codes and standards.

5.11.8 Cable trays shall have bonding jumpers to maintain continuity of the ground path.

5.11.9 Underground conduits in the substation shall be buried at least 24 inches below finished grade. Conduits shall be PVC with rigid galvanized steel 90° elbows and stub-ups, or rigid galvanized steel.

5.11.10 Conduit exposed in the substation shall be rigid galvanized steel. Indoor and outdoor conduits shall be labeled per the Conduit Schedule, see Section 5.21.4. Watertight conduit fittings shall be used at outdoor junction boxes and terminal cabinets.

5.11.11 Where liquid-tight flexible conduit is used, provide bonding bushings and external bonding jumpers.

5.11.12 Pull boxes or manholes shall be spaced so that allowed cable pulling tension and sidewall pressure are not exceeded. Conduit elbows, pull-box dimensions, and manhole openings shall be such that the minimum cable bending radius is not violated. The following parameters shall be determined based on pertinent standards and manufacturer's recommendations:

1. Allowable pulling tension

2. Allowable sidewall pressure

3. Minimum bending radius

5.11.13 Cables shall be continuous runs. Pull boxes, cable trays, trenches, conduit bodies, etc. shall not be used for locating splices, even if listed for such service. The Developer shall submit specific proposed exceptions to this requirement. Conduit runs shall be sloped to provide drainage into hand holes or cable trenches.

5.11.14 Provide spare conduits with pull cords:

1. At each high voltage circuit breaker, transformer, other major equipment – one 2-inch conduit to each of primary, secondary trench. At each MOD – one 2" conduit to trench.

2. One 1-1/2-inch conduit from gate phone location to Control Building telephone board.

5.12 Lighting

5.12.1 Interior lighting shall be LED and controlled by occupancy sensors. Exterior wall pack and substation lighting shall be timer/photocell controlled with manual override, LED. Lighting shall be high efficiency with low harmonic distortion. Outdoor lighting shall be dark-sky compliant.

5.12.2 Design drawings and calculations shall be submitted showing illumination levels for each area, calculation methods (not on drawing itself), design and installation details, and bill of materials.

5.12.3 Lighting shall fulfill the following functions:

7. Outdoor general lighting

8. Indoor general lighting

9. Local lighting

10. Emergency lighting

11. Security lighting

5.12.4 The substation shall be illuminated by general lighting and security lighting. The Control Building shall be illuminated by general, emergency, and local lighting. All lighting shall be designed and installed to meet all regulatory requirements and in accordance with Chapter 11 “Physical Security”; Chapter 18, “Control Building”; other applicable chapters of the SDS; and applicable NYPA standard equipment and installation specifications

5.12.5 UL 924 compliant exit and directional signage shall be provided with battery back-up (UL listed, minimum 90-minute capacity), or powered from the UPS panel – in accordance with NYSBC.

5.12.6 UL 914 compliant emergency lighting shall be provided in Control Building illuminated spaces. Emergency lighting shall be provided at the primary and secondary relay cabinet faces. The emergency lighting fixtures shall be UL listed with battery back-up for a minimum 90-minute capacity or powered from the UPS panel - in accordance with NYSBC. Emergency lighting shall also be provided on the exterior of the building at each of the personnel exits.

5.12.7 Lighting illuminance levels shall be calculated in accordance with accepted standards. General lighting illuminance shall be calculated by the “zonal cavity” method. Local lighting illuminance shall be calculated by the “point-by-point” method. Substation lighting illuminance shall be calculated by the “graphical” method.”

5.12.8 Lamps shall have a color rendering index (CRI) of at least 85 and have a color temperature between 3500K and 4000K. Battery room fixtures shall be explosion-proof.

5.13 AC Station Service Power

5.13.1 The Developer shall design a complete Station Service power system for the facility and equipment in accordance with the requirements of Chapter 17 of the SDS. The AC station service power shall be metered with revenue metering grade CTs, PTs, and meters.

5.13.2 The AC station service shall be configured for reliability.

12. Primary power shall be Developer-supplied power derived from Developer’s high or medium voltage bus via a transformer (or from a transformer in the substation).

5.13.3 AC distribution panel boards shall be equipped with a main circuit breaker and configured with Critical and Non-Critical circuits in separate panels (Red Dot and Green Dot per NYPA CPP-1). Coordinate with NYPA.

5.13.4 A UL 924 battery backup UPS system and panel board shall be provided for AC loads sensitive to switching transients including fire alarm system, HMI, security system, site computers (provide labeled outlet receptacles at various locations), SER and DFR computers, emergency lighting (if included in design), and loads that do not tolerate break before make transfer (e.g., radios, other computer equipment). The Developer shall provide 8 hours, plus 40% load margin in the UPS system backup load supply capability. The UPS shall comply with NYPA specification SR-106, “Uninterruptible Power Systems”. If desired, the Developer may power the UPS from the primary/secondary 125V DC system and include the UPS load in the DC sizing calculation.

5.13.5 As part of the design, the developer shall provide load study, a short circuit study, a protective device coordination study, an arc flash incident energy analysis, and an electrical safety review for the station service system.

1. Short circuit Study and Arc Flash Incident Energy Analysis shall be performed via electrical system modeling. Arc flash calculation methodology shall be per IEEE-1584, IEEE-1584.1 and NFPA 70E latest version requirements. For more detailed requirements refer to NYPA’s specification Design Standard, “Arc Flash Analysis/Arc Flash Mitigation and Supporting Technical Studies Short-Circuit Study/Protective Device Coordination Study/Arc Flash Analysis/Arc Flash Mitigation”.

    - Mitigation of incident energy levels above 8 cal/cm2 shall be provided where practicable. The 30% submissions shall include these studies and include design adjustments to meet this goal.
    - Where incident energy levels exceed 8 cal/cm2, provide:
        - Remote operation and remote racking provisions
        - IR windows for external IR scanning during operation
        - Absence of voltage test stations, safely externally usable without opening equipment covers.

2. Protective devices shall be set per the final coordination study.

3. Arc Flash warning labels per NYPA standard format, shall be provided for electrical equipment per the NYPA Electrical Safety Procedure document.

5.13.6 The engineer of record shall provide an electrical safety review report which includes a detailed review of the project and equipment design for compliance with OSHA, NESC, NFPA, and NYPA Electrical Safety Procedure requirements.

13. The electrical safety review report shall include evaluation of electric and magnetic field induction effects on personnel safety. Provide calculation of results and ensure design is well below safe limits established OSHA, IEEE and NESC including impacts of portable equipment and vehicles likely to be utilized in substation and ROW.

14. The electrical safety review shall consider the operation and maintenance to ensure the design and provided equipment meets with the referenced standards.

15. The Developer shall provide a written step-by-step procedure which includes all steps necessary to put equipment into an electrically safe condition to operate, or to perform work.

    - The Developer shall provide additional disconnecting switch points for medium and low voltage equipment to allow for isolation of equipment from sources without the need to take outages on transmission, sub-transmission, or distribution level components.

16. Where the equipment voltage requires temporary protective grounds (TPG) to establish electrically safe condition, the Developer shall provide:

    I. Calculation of TPG requirements, ratings, and equipment sizes (OSHA, IEEE-1048, IEEE-1246, ASTM F885 and ASTM F2249).

    II. All equipment shall have provisions for grounding attachment studs, TPG cables, clamps, etc.

    III. TPGs shall be single conductor where possible. Multiple conductors shall be evaluated as required by standards and manufacturer requirements for application.

The Developer shall prepare and submit a new electrical safety review report prior to each stage of submission as the design advances – the design shall be adjusted prior to submission to incorporate findings of the report.

5.14 DC Station Service Power

5.14.1 The Developer shall design a complete Station Battery power system for the facility and equipment in accordance with the requirements of Chapter 17 of the NYPA Substation Design Standard. A primary and a secondary battery bank and a tertiary swing charger shall be provided.

5.14.2 As part of the design, the developer shall provide Load Study, Short Circuit Study, Protective Device Coordination Study, Arc Flash Incident Energy Analysis, and Electrical Safety Review for station service system. Requirements are similar for AC system identified above.

5.15 Emergency Power

5.15.1 The Developer shall provide diesel fueled emergency generator with an appropriately sized load bank and fuel supply. This generator shall be sized in accordance with the requirements of Chapter 17 “AC and DC Auxiliary Systems” and Chapter 18 “Control Building” of the NYPA Substation Design Standard. Generator operation, Fire Suppression System, etc. trouble and failure alarms shall be monitored via the RTU.

5.15.2 The generator shall be a packaged unit with a weather-proof enclosure for exterior installation. Critical exhaust silencer and a sound attenuating enclosure shall be provided.

5.15.3 Developer shall perform an ambient noise study to demonstrate compliance with New York State Public Service Law – Article VII and building code requirements for noise control.

5.15.4 A starting battery system, including a charger capable of supplying the generator auxiliary DC load and recharging the battery, shall be provided.

5.15.5 The Developer shall provide for periodic testing of the emergency generator. Periodic testing shall be able to be performed by onsite personnel, programmable automatic timer, or by NYPA via supervisory control signals from the RTU. The Developer shall provide controls for automatic testing and an integrated stepped load bank sized for generator rated load. They system shall include local and remote emergency stop controls.

5.15.6 The total available fuel supply shall be sized for at least 3 days of continuous operation at the generator rated load.

5.15.7 For diesel engines, an integral onboard double walled diesel fuel tank shall be provided. If an additional fuel oil storage tank is required for the fuel supply, the storage tank shall be a Underwriters Laboratory (UL) labeled, double walled, above ground tank that meets or exceeds the requirements of UL-2085. The fuel oil storage tank shall be installed on a dedicated foundation. The tank(s) and fuel transfer lines shall be in accordance with all applicable regulations, monitored for leakage both locally and remotely, and wired to the RTU.

5.15.8 The Developer shall provide proper access and accessories to fill and inspect the fuel storage tank(s).

5.15.9 For diesel fuel oil systems, the Developer shall provide a heating system to ensure reliable fuel supply and engine operation during low temperature conditions.

5.15.10 The generator and any fuel oil storage tanks shall be located outside the Control Building on a separate foundation provided minimum 10 feet from the control building exterior wall in a dedicated fenced area along the perimeter fence. This installation shall have a minimum 4’ maintenance clearance on all sides around the generator enclosure. The fenced area shall have a two, single swing gate. A monitored key-locked swing gate from the unprotected side and a swing gate from the substation (protected side) with card access entry. All fence and gates shall meet the requirements of the perimeter fence and gates. Both gates shall be operable from both sides, and provide for emergency egress from the yard.

5.15.11 Provide a dry agent Fire Suppression System for any fuel oil generator systems.

5.15.12 Provide proper access for complete inspection, maintenance, and repair of the emergency generator system.

5.16 Bus and Bus Support

5.16.1 The aerial bus shall be rigid, high strength ANSI Schedule 80, Alloy 6063-T6 or equivalent.

5.16.2 Strain bus extensions may be installed to relieve stresses on potheads and equipment terminals. The strain bus shall be All Aluminum Conductor (AAC) or All Aluminum Alloy Conductor (AAAC) and shall be of compatible size. Strain bus design shall include electrical calculations and civil structural calculations.

5.16.3 Bus size shall be determined considering the continuous current rating of the project and other parameters including short circuit current, ambient temperature, and maximum temperature rise, in accordance with IEEE standards. The minimum bus size shall be 4 inches".

5.16.4 The Developer shall calculate the number of supports based on factors such as fiber stress, deflection, cantilever strength, wind-induced vibrations, etc. in accordance with IEEE standards.

5.16.5 Provisions shall be made for thermal expansion of bus. For each length of the rigid bus, the Developer shall show the type of fitting at each bus support (fixed-bus or slip-fit) and the location and type of bus couplers.

5.16.6 All horizontal bus runs shall have damping cables placed inside. Drilled weep holes are not permissible.

5.16.7 The maximum length of any continuous bus shall be 100 feet.

5.16.8 The Developer shall submit bus and connections calculations for both electrical and structural design aspects.

5.17 Insulators

5.17.1 Insulators shall be of high strength porcelain or toughened glass. Extra-high strength insulators shall be used if site specific conditions warrant their use. Coordinate with NYPA.

5.17.2 Insulators shall be in unit stacks in accordance with NEMA. Stacks of different cantilever strengths shall be identified.

5.17.3 Station post insulators shall have a minimum of two stacks. All stacks shall be of the same cantilever strength.

5.17.4 Post-type insulators shall not be used with strain bus, except as stand-off insulators, and only with prior approval from NYPA.

5.17.5 Strain type insulators shall be used to terminate the incoming overhead lines.

5.17.6 Suspension type insulators shall be used where necessary with strain bus for under-hung installation.

5.17.7 Polymer insulators shall not be used for transmission line connections, or bus supports, unless specifically approved by NYPA in writing.

5.17.8 All toughened-glass suspension type insulators shall comply with NYPA specification, O-TRA-STD-302, “Toughened-Glass Suspension Type Insulators”.

5.18 Corona Control

5.18.1 The design and construction of the substation shall take into consideration means to minimize the audible noise and power loss induced by corona discharge. Corona-free hardware shall be used. Sharp corners on the bus conductors shall be avoided and bolts shall be kept short.

5.18.2 All 345 kV substation hardware shall be rated for the EHV application.

5.18.3 The substation bus in a 345kV substation shall be fitted with grounding studs for corona control.

5.19 Surge Counters

5.19.1 Surge counters shall be provided on all surge arresters.

5.20 Acoustics

5.20.1 The Developer shall ensure by design that the noise generated by all equipment (e.g., transformers, conductors (corona), and generators) meets local and national standards.

5.21 Electrical Identification

5.21.1 The Developer shall install identification on items including structures, equipment, cable trays, conduit, cable and wire. Identification shall be in strict coordination with the drawings. The Developer shall coordinate requirements with NYPA. Electrical equipment, relays, conduits, cables, and conductor terminations shall be labeled and identified as to function and designation. Sample labels of each type shall be submitted.

5.21.2 Equipment Labels

1. Equipment and device nameplates shall be engraved laminated phenol resin, black background with white lettering. Equipment shall be labeled with equipment number and identification. Items including relays, instruments, and control switches shall be labeled to show device designation and function Cable Identification.

Each single- or multi- conductor cable shall be labeled at both ends. Cables shall be tagged within the termination enclosures using approved cable tags with lettering minimum 3/16” tall. Cable tags shall be located near the end of the jacket, at a safe distance from terminations, attached using plastic wire tie, and not be concealed. In addition to cable tags, termination labeling is required, see below.

5.21.3 Conductor Identification – Termination Labels

1. Conductor terminations, regardless of use, shall be identified. Each termination shall have a sleeve identifying the terminal point of the conductor. Conductor identification sleeve material shall be approved. Lettering for conductor marker sleeves shall be 1/8” tall.

5.21.4 Conduit Identification

1. The Developer shall label each end of conduits with engraved laminated phenol resin, black background with white lettering affixed by stainless steel wire ties. Tags shall be 1.50” diameter with 3/16” diameter top hole. The Conduit number shall be stamped with 3/16” tall letters.

6 CIVIL, STRUCTURAL, AND MECHANICAL

Site selection and development is critical to the design of the substation. The Developer shall consult and coordinate with NYPA concerning site selection. The Developer selected site shall be suitable for the intended purpose. Plot, layout, and availability of real estate (future purchase) shall take into account that available plot area for future expansion (additional bay of high voltage circuit breakers) is required. The substation shall not be “boxed in”. Sites requiring extensive cut and fill should be avoided.

See Chapter 2 “Sitting and General Design Consideration”, Chapter 8 “Structures”, and Chapter 9 “Foundations” of NYPA’s design standard DS – 00100, “Substation Design Standard” for more details.

6.1 High Voltage Circuit Breaker Platforms

6.1.1 The Developer shall provide platforms at each high voltage circuit breaker cabinet for access and maintenance. Platforms shall be steel construction with Grip Strut or equal safety grating, concrete pad, stairs, removable handrails, and appropriate footers.

7 ENVIRONMENTAL AND FLOOD HAZARDS

7.1.1 All construction must be undertaken in accordance with Federal, State, and local regulatory requirements and the contents of the Substation Design Standard, specifically Chapter 3, “Environmental and Permitting”.

7.1.2 The substation or substation property and access roads shall be free of contamination and meet the appropriate NYSDEC criteria for land use. The property shall not be the subject of any NYSDEC or USEPA regulatory cleanup or Brownfield program, open spill, or other required action due to environmental conditions, and be free of any encumbrances, deed restrictions or engineering controls.

7.1.3 Phase I and II Environmental Site Assessments in accordance with latest ASTM 2247 and ASTM E1527 published standards shall be perform by the Developer prior to final site selection. Where the Authority is not selecting the site, the Authority shall have the right of refusal and will perform its own due diligence, including the performance of its own Phase I and II Environmental Site Assessments, as appropriate, prior to purchasing property for a substation. Environmental design criteria include that the site is environmentally “clean”, free of environmental contamination or conditions, regulatory encumbrances and does not have open spills, or agency actions pending etc. The Developer shall submit all associated documentation including copies of completed environmental reports, studies, correspondence and regulatory agency acceptance documenting all environmental conditions have been addressed.

7.1.4 The Developer shall submit to Agency and NYPA any applicable permit or approval detailed in DS-00100_Substation Design Standard_Chapter-3, “Environmental and Permitting”.

7.1.5 The Developer shall perform environmental conditions assessment and studies required to develop the property (including soil, groundwater, water, wetlands, cultural resources, and rare, threatened and endangered species), and to determine environmental impacts from Interconnection Project Development as required by the State Environmental Quality Review Act (SEQRA). The Authority will have the right of refusal and will perform its own due diligence including Phase I and II Environmental Site Assessments in accordance with latest ASTM 2247 and ASTM E1527 published standards, as appropriate, prior to accepting the property and operation of the substation.

7.1.6 The Developer shall ensure that environmental considerations are identified and addressed in the design process.

7.1.7 Substation equipment and materials that are free from hazardous substances (e.g., PCBs, PFAS/PFOA, mercury, lead, and asbestos) shall be selected for use. Alternatives to the use of petroleum or hazardous substances in equipment and siting and design mitigation measures to prevent release and potential impacts to environmental media shall be considered and provided in the Developer design submittals. Design shall consider and include controls to prevent release and to contain and capture substances from causing a release to air, water, or land as best practice.

7.1.8 The Developer shall identify and submit Environment, Health & Safety (EH&S) operational documents and plans, and all turnover documents. This is inclusive of permits, final Notice of Termination and long-term O&M for permanent stormwater controls, SDSs and technical data sheets for equipment and articles (e.g., di-electric oil, batteries, SF6, fuel), and asset onboarding information.

7.1.9 The Developer shall arrange for disposal of excavated soil and other waste materials utilizing approved disposal rules and procedures including requirements of NYPA's Division 1 specifications and EH&S Requirements for Construction.

7.1.10 Surfacing material such as crushed stone shall be well graded and washed with no fine materials which would cause dust. Crushed stone shall be granite type, shaped flat, to provide low hazard walking surfaces.

7.1.11 The Developer shall provide freeze protection of control, relaying, and instrumentation components installed outdoors.

7.1.12 The Developer's substation and NYPA substation shall be designed to contain potential oil spills in accordance with the SPCC rule of section 40 CFR 112, Part 613 of 6NYCRR, NFPA 30, and ANSI/IEEE 980-1984 (R2001) Guide for Containment and Control of Oil Spills in Substations.

7.1.13 Secondary containment shall be provided for all equipment with an oil containing capacity greater than 275 gallons in accordance with DS-00100_Substation Design Standard_Chapter-3, "Environmental and Permitting"

7.1.14 Any discharge from the oil containment area shall either be captured and held for disposal or shall be treated for discharge to SPDES limits. The use of perforated pipes or percolation pits for flows from oil containment is prohibited.

7.1.15 The Developer shall provide a flood study/siting survey of location. All substation critical equipment that could be affected by flood waters and all building floor slabs shall be at or above the level for the higher of FEMA 100-year BFE plus three feet, DFE or the 500-year BFE. In coastal areas exposed to wave action, facilities shall be protected from wave effects along the effected shoreline to an elevation of the FEMA 100-year storm (VE) plus three feet. Vertical datum reference shall be clearly defined on any drawings with elevation information.

8 SECURITY

8.1.1 The substation site (control buildings and switchyard) shall be planned as an unmanned facility and provided with complete security systems networked back to a NYPA designated manned facility for 24/7 monitoring. The security system components shall include security fence, intruder detection system, card access control at all entries to the substation and control building, video intercom on unprotected side of the slide gate, PTZ thermal cameras, fixed cameras on all card access entries, video analytics, 60-day on site video storage, video management system, UPS back up power, centralized access reporting to a NYPA's designated manned location, access control verification and appropriate security lighting . All network hardware shall be included to support the latest NERC CIP standards.

8.1.2 The security systems shall include:

8.1.2.1 Perimeter fencing system with the protected area accessible through a motorized slide gate, and manual single and double swing gates.

8.1.2.1.1 The yard shall be graded so that the fence bottom rail to ground gap is maximum 2".

8.1.2.1.2 The bottom gap at the motorized slide gate and all swing gates shall be maximum 5" and 2" respectively.

8.1.2.2 Intrusion detection systems on the entire perimeter fence system including all swing gates. The motorized slide gate shall have a dedicated volumetric intrusion detection system in leu of a fence mounted detection system.

8.1.2.3 Card access system shall be on all access points to the substation and substation control building except for the outer swing gate to the generator enclosure and vehicle double swing gate , which shall be key locked.

8.1.2.3.1 The motorized slide gate operator is to be controlled by the card access system with a free exit loop detector.

8.1.2.3.2 Best lock and key system with card access entry control for the substation control building doors with fail-closed door hardware.

8.1.2.3.3 All other occupiable enclosure doors shall have automatic closing device, and key lock.

8.1.2.3.4 All entrance card readers shall be JCI Pegasus 2000 / Software House CCURE compatible system equipment, to be maintained compatibility with NYPA central monitoring system and spares program.

8.1.2.4 A completely integrated video surveillance system for all access points to the control building, and substation, the entire protected area and the fence line with the immediate external perimeter area.

8.1.2.4.1 Thermal/Daytime pan tilt zoom (PTZ) cameras with analytics detection system with preset positions to provide pre-alarms (digital zoom thermal camera capability, quantity required based on size/layout of substation). Cameras shall be tied into a video management system locally and at the manned monitoring site.

8.1.2.4.2 The thermal/daytime PTZ cameras shall be installed to capture the substation perimeter areas and the entire interior area of the substation. Perimeter lighting for nighttime recording shall be even and low.

8.1.2.4.3 The PTZ cameras shall be controlled by the intrusion system and remotely from the manned location.

8.1.2.4.4 Wherever possible, the PTZ cameras shall be installed within the protected area. For installations that must be on the unprotected side of the fence, the PTZ camara tower design shall incorporate provisions to prevent unauthorized climbing of the tower and access to the cameras.

8.1.2.4.5 Fixed IP megapixel cameras with video analytics detection system shall be provided for all card access doors to the control building and all gates to the substation. These shall be tied into a video management system locally and viewable at the manned monitoring site.

8.1.2.5 Provide local security monitoring rack/console including CCTV viewing with fence detection map, card access monitoring, UPS, server equipment, POE network switches and T1 communication tie via network interface to NYPA's LAN/OPS Network system for monitoring back to the manned monitoring site.

8.1.2.6 All security system component power, including CCTV cameras, video management and storage, monitors, intrusion detection and alarm devices and panels, shall be provided with UPS and battery-backed up for 12 hours.

8.1.3 All equipment and systems shall be designed and installed to meet all regulatory requirements and in accordance with Chapter 10, “Physical Security”; other applicable chapters of the SDS; and applicable NYPA standard equipment and installation specifications. The provided security system shall be conformed to the site layout and the equipment model numbers/specifications/requirements shall be in strict compliance with indicated specific standards for NYPA security systems – no substitutions are allowed.

8.1.4 The developer shall provide a free-standing five foot by two foot sign on each vehicle access road to the facility, identifying the NYPA Facility n (including 911 information). The sign shall be no closer than 10 feet from the perimeter fence. The developer shall also provide three fence mounted notification signage every fifty feet around the perimeter, and four fence mounted, informational sign at each access point to the facility.

8.1.5 At the perimeter of the control building the Developer shall take measures for animal deterrence such as physical barriers and other methods.

8.1.6 Additional site-specific security requirements may be applicable. The Developer shall coordinate with NYPA.

8.1.7 For more details and specific requirements for the substation security systems see the Substation Design Standard Chapter 10, “Physical Security”.

9 FIRE PROTECTION, EQUIPMENT, AND PERSONNEL SAFETY

9.1.1 Substation fire protection shall be designed in accordance with the latest edition of IEEE Std 979, “Guide for Substation Fire Protection.” The Developer shall provide fire protection components including:

9.1.2 Control and power cables used in the Control Building shall be constructed of a material that does not readily propagate fire and shall be qualified by the flame test parameters specified in the latest edition of IEEE Std 383, “Qualifying Class 1E Cables and Field Splices for Nuclear Power Generating Stations”.

9.1.3 Arrangement of control panels and electrical equipment shall be designed to meet the flame-retardant specifications as prescribed by the latest edition of IEEE Std 420, “Design and Qualification of Class 1E Control Boards, Panels, and Racks Used in Nuclear Power Generating Stations”.

9.1.4 The Control Building shall have at least two exits located at opposite ends of the building. The arrangement of control panels and electrical equipment inside the Control Building shall be designed to allow personnel to exit the building from either side. The doors shall be adequately marked with illuminated exit signs and the doors shall open in the direction of egress. Doors shall be equipped with panic hardware that will override any exterior lock on the doors.

9.1.5 Emergency lighting - see section 5.12.

9.1.6 Surge arresters shall be located as close as possible to the equipment they are protecting yet minimize the possibility of damaging nearby equipment. Surge arresters installed inside the Control Building shall be enclosed or located a safe distance away from passageways and combustibles to minimize the possibility of an equipment fire initiated from surges. Arresters shall be rigidly supported and properly grounded. Arrester arrangement shall conform to the guidance in the latest editions of IEEE. Arrestor discharge vent direction shall be indicated on the drawings.

9.1.7 All floor and wall openings in the Control Building shall be sealed to maintain the fire rating of the floor or wall, as directed by NYSBC Chapter 7, “Fire Resistance Rated Construction”. Conduits shall be sealed at ceiling, floor, and wall penetrations to prevent the propagation of flame, smoke, and other gases/vapors from one area to another. Floor and wall openings shall be sealed in accord with a UL listed penetration detail to maintain the fire rating of the floor or wall.

9.1.8 Portable fire extinguishers shall be located in the substation and in the Control Building, including adjacent to normal entrance/exit doors. Only portable fire extinguishers having a nonconductive extinguishing agent, such as dry chemical agent or clean agent types, shall be supplied. Carbon dioxide fire extinguishers equipped with metal horns are not permitted. Carbon Dioxide type fire extinguishers shall not be used for battery room locations. Only portable dry chemical extinguishers shall be provided for the substation. The type, size, distribution, and installation of portable fire extinguishers shall be per the requirements of the latest edition of ANSI/NFPA 10.

9.1.9 All extinguishing agents shall be non-conductive.

9.1.10 Specific fire safety measures for the Control Building are described in Section 5.7, “Control Building”.

9.1.11 SF_6 is a nonflammable gas that may generate by-products as a direct or indirect result of a fire. Protection against SF_6 concentrations inside any enclosure housing equipment shall be considered in building/enclosure ventilation design. Precautions regarding the harmful effects of SF_6 gas and SF_6 gas by-products can be found in IEEE Std C37.122, “Standard for High-Voltage Gas-Insulated Substations Rated Above 52kV”.

9.1.12 Battery Energy Storage Projects (BESP) shall have a clean agent suppression system and an automatic water-based fire suppression system with an adequate water supply, per the latest addition of the NYSBC and NFPA standards. A secondary containment is required for the fire suppression water discharge and liquid substances with potential to discharge. Deviations from this require NYPA engineering approval.

9.1.13 Except as stated above for BESP, the Developer should consider alternate methods of fire protection other than a water-based fire suppression system:

1. Physical separation of equipment
2. Fire barriers
3. Minimize the spread of flammable oil by containment
4. Filling containments around oil filled equipment with stone to help prevent, control or extinguish an oil fire

5. Portable Fire Extinguishers
6. Dry Chemical Systems
7. Clean Agent Systems

10 REGULATIONS, STANDARDS, AND CODES

10.1.1 Developers design and construction Work shall comply with regulations, standards, and codes including those listed below. The most recent edition of the listed documents in effect at the time of the construction shall apply. Where construction is subject to the requirements of the NYS Building Code, then the edition of the standard referenced in the NYS Building Code shall be used. Any proposed variances to the NYS Building Code shall be submitted for review by NYPA Code Compliance. Any conflict between the standards or codes or regulations and the DCDC shall be submitted with an explanation and proposed resolution to NYPA. In general, the more stringent requirement shall apply. Where an organization is listed, include without limitation all codes, guides, and standards of that organization.

10.1.2 The design and construction of control building wiring shall meet the National Electrical Code (NEC; NFPA 70), NFPA 70E, NYSBC, and local Authority Having Jurisdiction (AHJ) requirements including lighting, receptacles, fire alarm detection, and protection, security, and HVAC.

10.1.3 Any activity by developer or its contractors on land owned or controlled by NYPA (including Right of Way) requires a work permit and is subject to NYPA permitting requirements. If Developer or its contractors are carrying out activities on NYPA owned or controlled property, all such parties shall provide indemnification and insurance, in form and amount acceptable to NYPA. As appropriate, NYPA Code Compliance shall issue Building Permits for Work on NYPA owned or controlled property (including Right of Way). The Developer shall follow NYPA procedures relating thereto. In addition, where there is construction on land that is not owned or controlled by NYPA, then developer shall notify NYPA at the onset of the project. NYPA Code Compliance will discuss with the local AHJ relinquishing AHJ responsibilities to NYPA Code Compliance. If so, the Construction Permit Process for the substation will be turned over to NYPA and the Developer shall implement NYPA Code Compliance department requirements. Otherwise, the Developer shall work with the local AHJ and their Construction Permit Process throughout the Project. Codes and Standards:

Appendix A REFERENCED NYPA DOCUMENTS

Document Number	Document Title	Section Referenced
DS - 00100	Substation Design Standard	1.1.2 and Throughout
DS - 00200	Overhead Transmission Design Standard	1.1.2
XXXX - E - 13E001	ELECTRICAL DC ELEMENTARY DIAGRAM ### KV SWITCHYARD, BAY ### $TP# MVA, TRANSFORMER NO. $TX# PRIMARY RELAYING	3.4.1
XXXX - E - 13E001A	ELECTRICAL DC ELEMENTARY DIAGRAM ### KV SWITCHYARD, BAY ### $TP# MVA, TRANSFORMER NO. $TX# BUS PRIMARY RELAYING	3.4.1
XXXX - E - 13E002	ELECTRICAL DC ELEMENTARY DIAGRAM ### KV SWITCHYARD, BAY ### $TP# MVA, TRANSFORMER NO. $TX# SECONDARY RELAYING	3.4.1
XXXX - E - 14E001	ELECTRICAL DC ELEMENTARY DIAGRAM ### KV SWITCHYARD, BAY ### BUS NO. $B# PRIMARY DIFFERENTIAL RELAYING	3.4.1
XXXX - E - 14E002	ELECTRICAL DC ELEMENTARY DIAGRAM ### KV SWITCHYARD, BAY ### BUS NO. $B# SECONDARY DIFFERENTIAL RELAYING	3.4.1
XXXX - E - 16E001	ELECTRICAL DC ELEMENTARY DIAGRAM ### KV SWITCHYARD, BAY ### PCB $BR#XX PRIMARY BREAKER FAILURE	3.4.1
XXXX - E - 16E002	ELECTRICAL DC ELEMENTARY DIAGRAM ### KV SWITCHYARD, BAY ### PCB $BR#XX SECONDARY BREAKER FAILURE	3.4.1
XXXX - E - 16E003	ELECTRICAL DC ELEMENTARY DIAGRAM ### KV SWITCHYARD, BAY ### PCB $BR#YY	3.4.1

Document Number	Document Title	Section Referenced
	SECONDARY BREAKER FAILURE	
XXXX - E - 16E004	ELECTRICAL DC ELEMENTARY DIAGRAM ### KV SWITCHYARD, BAY ### PCB $BR#YY SECONDARY BREAKER FAILURE	3.4.1
XXXX - E - 6W001	ELECTRICAL WIRING TRANSFORMER NO. $TX# PRIMARY RELAY PANEL RELAY PANEL $P# CABINET LAYOUT	3.4.1
XXXX - E - 6W002	ELECTRICAL WIRING TRANSFORMER NO. $TX# SECONDARY RELAY PANEL RELAY PANEL $P# CABINET LAYOUT	3.4.1
XXXX - E - 6W003	ELECTRICAL WIRING BUS $B# PRIMARY PANEL RELAY PANEL $P# CABINET LAYOUT	3.4.1
XXXX - E - 6W004	ELECTRICAL WIRING BUS $B# SECONDARY PANEL RELAY PANEL $P# CABINET LAYOUT	3.4.1
XXXX - E - 6W005	ELECTRICAL WIRING BF PRIMARY RELAY PANEL RELAY PANEL $P# CABINET LAYOUT	3.4.1
XXXX - E - 6W006	ELECTRICAL WIRING BF SECONDARY RELAY PANEL RELAY PANEL $P# CABINET LAYOUT	3.4.1
XXXX - E - 6W001A	ELECTRICAL WIRING DIAGRAM TRANSFORMER NO. $TX# RELAYING RELAY PANEL $P# REAR VIEW	3.4.1
XXXX - E - 6W001B	ELECTRICAL WIRING DIAGRAM TRANSFORMER NO. $TX# PRIMARY RELAYING RELAY PANEL $P#	3.4.1

Document Number	Document Title	Section Referenced
	LEFT & RIGHT SIDE PANELS	
XXXX - E - 6W002A	ELECTRICAL WIRING DIAGRAM TRANSFORMER NO. $TX# SECONDARY RELAYING RELAY PANEL $P# REAR VIEW	3.4.1
XXXX - E - 6W002B	ELECTRICAL WIRING DIAGRAM TRANSFORMER NO. $TX# SECONDARY RELAYING RELAY PANEL $P# LEFT & RIGHT SIDE PANELS	3.4.1
XXXX - E - 6W003A	ELECTRICAL WIRING DIAGRAM PRIMARY DIFF. RELAYING - BUS $B# RELAY PANEL $P# REAR VIEW	3.4.1
XXXX - E - 6W003B	ELECTRICAL WIRING DIAGRAM PRIMARY DIFF. RELAYING - BUS $B# RELAY PANEL $P# LEFT & RIGHT SIDE PANELS	3.4.1
XXXX - E - 6W004A	ELECTRICAL WIRING DIAGRAM SECONDARY DIFF. RELAYING - BUS $B# RELAY PANEL $P# REAR VIEW	3.4.1
XXXX - E - 6W004B	ELECTRICAL WIRING DIAGRAM SECONDARY DIFF. RELAYING - BUS $B# RELAY PANEL $P# LEFT & RIGHT SIDE PANELS	3.4.1
XXXX - E - 6W0005A	ELECTRICAL WIRING DIAGRAM PRI. BKR. FAILURE RELAYING RELAY PANEL $P# REAR VIEW	3.4.1
XXXX - E - 6W0005B	ELECTRICAL WIRING DIAGRAM PRI. BKR. FAILURE RELAYING RELAY PANEL $P# LEFT & RIGHT SIDE PANELS	3.4.1
XXXX - E - 6W006A	ELECTRICAL WIRING DIAGRAM SEC. BKR. FAILURE RELAYING RELAY PANEL $P#	3.4.1

Document Number	Document Title	Section Referenced
	REAR VIEW	
XXXX - E - 6W006B	ELECTRICAL WIRING DIAGRAM SEC. BKR. FAILURE RELAYING RELAY PANEL $P# LEFT & RIGHT SIDE PANELS	3.4.1
EDS-PCE110	Electrical Design Standard for Indoor Protective Relay Panel/Cabinets and Terminal Cabinets	3.4.1
---NA---	General Cyber Security Requirements Exhibit	3.9.9
Multiple	Engineering Procedures	4.1.1
O-CM-00-001	Configuration Management Procedure	4.1.1
O-ENG-00-SD-005	Computer Aided Design Requirements for NYPA Drawings	4.2.1
SDP-00100	Drawing Numbering, Naming, and Labeling Convention	4.2.2
O-AMM-20-016	Project Turnover Procedure	4.5.1
ES-103-01	Standard Specification for Outdoor Oil-less Power Circuit Breakers(345kV or Greater)	5.1 4
ES-103-01-2	Standard Specification for Outdoor Oil-less Power Circuit Breakers (Less than 345kV)	5.1.4
ES-103-02	Standard Specification for Disconnect/Ground Switches	5.2 7
ES-337126.16	Capacitor Voltage Transformers and Coupling Capacitor Voltage Transformers	5.3.3
ES-337126.26	Voltage Transformers & Combined CT/VT	5.3.3
ES-337126.23	Current Transformers	5.4.2
SR-101	Standard Requirement for Surge Arrestors	5.5.2
ES-102-01	Standard Specification for Standard Specification Power Transformer Class II	5.6.3.4.
XXXX-E-2A01	Substation Control Enclosure	5.7.1/ .8/ .9/ 5.8.2
O-TC-20-001	Code Compliance Program: NYPA Permitting Procedure	5.7.3
ES-105-00	Standard Specification for 5KV – 35KV Power Cable	5.9.3
ES-106-00	Standard Specification for Low Voltage (1000V) Power & Control Cable	5.9.4
ES-106-01	Standard Specification for Instrumentation and Control Cable	5.10.4
CPP-1	Clearance and Protection Procedure for the Northern, Central & Western Regions CPP1	5.13.3
SR-106	Standard Requirement for Uninterruptible Power Systems	5.13.4
	Arc Flash Analysis/Arc Flash Mitigation and Supporting Technical Studies Short-Circuit Study/Protective Device Coordination Study/Arc	5.13.5

Document Number	Document Title	Section Referenced
	Flash Analysis/Arc Flash Mitigation	
OTRA-STD-302	Toughened Glass Suspension Type Insulators	5.17.8
Division 1	Division 1 Specification	7..1.9

E-Signature Approval History

Role	Name	Approved Date
Addditional Approver	Spagnolo, Salvatore	2/12/2025
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