



Consolidated Edison Company of New York, Inc.

DEVELOPER WELCOME KIT

August 5th, 2021

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1. Introduction

This Developer Welcome Kit has been compiled by the Consolidated Edison Company of New York, Inc (Con Edison) Interconnection Services Group to provide developers of new or modified generator and transmission projects, as well as end-user facilities projects, with general guidelines for connecting proposed facilities to Con Edison's electric power system. The Developer Welcome Kit contains a general schedule and provides key points of information to assist developers in the development of their interconnection plans.

The information contained in the Developer Welcome Kit is not intended to cover all details and aspects of a proposed interconnection plan and is subject to change without notice. This document does not address contractual matters such as property ownership, leasing, easements, scheduling, permitting, and billing. The project developer assumes all costs for the design, construction, inspection, analysis, maintenance, operations, monitoring, permitting, and all associated facilities required to satisfy the technical and regulatory requirements for connection to the Con Edison transmission system. This document is not intended as a design specification or an instruction manual.

The recipients of the Developer Welcome Kit shall retain the information for their sole use.

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2. The NYISO Interconnection Process

Under the NYISO Open Access Transmission Tariff (OATT), a developer proposing to interconnect a new or materially modified generation or transmission project to the New York State Transmission System shall participate in the Interconnection Process governed by New York Independent System Operator (NYISO):

- For projects that are greater than 20 MW, the developer shall follow Attachment X of the OATT.
- For projects equal or lesser than 20 MW, the developer shall follow Attachment Z of the OATT.
- Transmission projects that seek cost of service compensation shall follow Attachment P of the OATT.
- For applicable end-user facilities, the developer shall follow Section 3.9 of the OATT.

Further information on the NYISO Interconnection Process is available at www.NYISO.com

Below are Figure 1 and Figure 2, these figures are two simplified flow charts of the Large Facility Interconnection Process (Attachment X of the NYISO OATT) and the Transmission Interconnection Procedures (Attachment P of the NYISO OATT). They are intended to serve as a general guide to the Interconnection Process only. For more details, developers should consult the most current NYISO Open Access Transmission Tariff.

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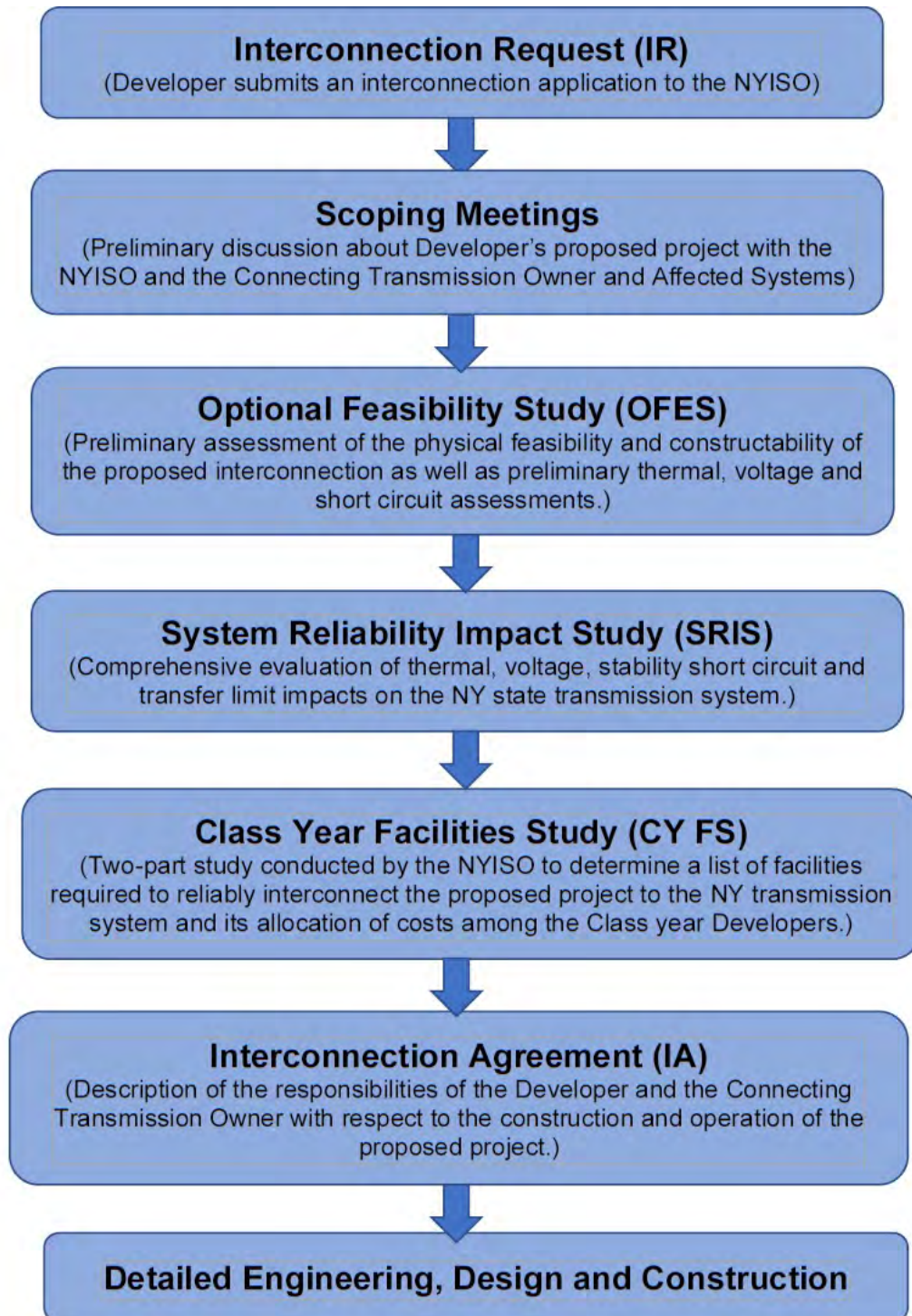


Figure 1 – NYISO's Attachment X Process (high-level flow chart).

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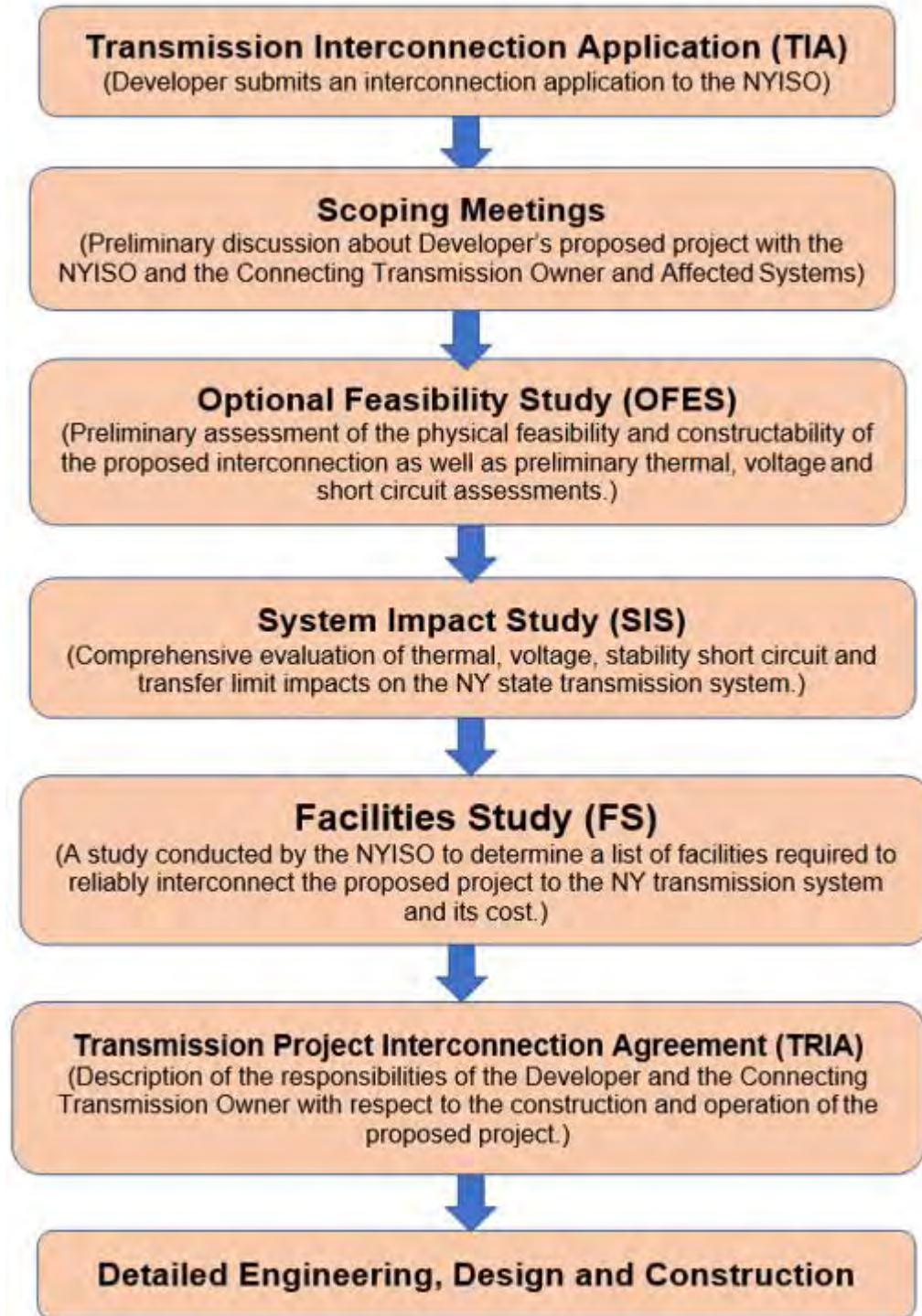


Figure 2 – NYISO's Attachment P Process (high-level flow chart).

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In the Interconnection Process, the NYISO performs several system studies to ensure that the proposed project does not have an adverse impact on the performance of the New York State Transmission System. In cases where an adverse impact is identified, the NYISO determines upgrades needed to mitigate the impact and allocates their cost responsibility to one or multiple developers. Studies performed for previous projects can be obtained from the NYISO. Interconnection of developer's proposed project to the Con Edison Transmission System must meet established reliability, environmental and safety standards. The interconnection plan must conform to NERC, NPCC and NYSRC standards. These standards are publicly available and can be obtained by contacting the relevant organization. All proposed facilities must comply with the latest city, state and federal environmental and safety laws and regulations, as well as all applicable Con Edison standards, procedures, and specifications. The following key Transmission Planning standards of Con Edison are provided as an appendix:

- Con Edison System Design Requirements, TP-7100, "Transmission Planning Criteria";
- Con Edison Performance Requirements, TP-8100, "Performance Requirements for Inverter-Based Generation".

Con Edison System Design Requirements given in TP-7100 "Transmission Planning Criteria" are divided into categories:

1. Fundamental Design Principles;
2. Performance Criteria (Thermal, Voltage, Stability, Transient, Short-Circuit, etc.)

In order to be considered for any Performance Criteria assessment, developer's project must conform with all applicable Fundamental Design Principles first.

Please contact the NYISO on all matters relating to the Interconnection Process and associated Interconnection Studies.

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On issues specific to the Con Edison system (e.g. clarifications of Con Edison's Transmission Planning Criteria), please contact the Con Edison representatives below:

Contacts – Con Edison

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4 Irving Place – Room 13-NW
NY, NY 10003

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NY, NY 10003

Con Edison recognizes the need to provide some preliminary information to developers about the proposed point(s) of interconnection of their project. Accordingly, developers are invited to contact Con Edison with questions concerning existing configuration of the substation(s) or transmission line(s) where the project is proposed to be interconnected. After the NYISO confirms validity of the Interconnection Request or Transmission Project Application, Con Edison will be able to share such preliminary information subject to a fully executed *pro forma* Confidentiality Agreement.

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3. Key Points of Information

3.1. Selection of Point(s) of Interconnection

- It is the developer's responsibility to suggest one or more points of interconnection for evaluation and show them in corresponding one-line diagrams. As a sub-contractor for the NYISO, Con Edison will review the feasibility of the designated points of interconnection. Con Edison can provide system information to assist in the development of the point of interconnection, but Con Edison will not propose a point of interconnection.

3.2. Confidentiality Agreement

- Prior to providing any Confidential Information, Con Edison requires that the developer executes a *pro forma* Confidentiality Agreement. Con Edison's Confidentiality Agreement is a *pro forma* agreement and is not subjected to any changes. Each Confidentiality Agreement will be specific to each individual NYISO Interconnection Request.

3.3. Substation Drawings

- Upon execution of Con Edison's Confidentiality Agreement, Con Edison can provide, upon written request the existing substation high tension one-line diagram and general arrangement drawing for the substations identified in the proposed interconnection request. This information will be provided to assist in developing the project's unique one-line diagram.

3.4. Scoping Meeting

- Once NYISO has determined that the Interconnection Request is valid, NYISO will scheduled a Scoping Meeting with the developer and the Connecting

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Transmission Owner or CTO (also any Affected Transmission Owners, or ATO's will be invited to attend). During the Scoping Meeting, the developer will present its proposed project. NYISO and CTO can discuss relevant and general system information or studies applicable to the developer's project. In order for Con Edison to share any relevant system information, Con Edison requests that an executed Confidentiality Agreement be signed prior to the Scoping Meeting. Any developer's consultant at the Scoping Meeting will also need to execute the Exhibit A Letter Agreement associated with the Confidentiality Agreement. At the conclusion of the Scoping Meeting, the developer will need to decide on which phase of the NYISO process they would like to proceed, i.e., Feasibility or System Reliability Impact Study. The developer will need to coordinate all the activities and its decision with NYISO.

3.5. Study Results

- Any information regarding the interconnect process or progress of the study should be directed to the NYISO. Although Con Edison may share existing interconnection substation configuration information, any questions relating to system studies should be directed to the NYISO.

4. Developing One-line Diagrams

4.1. General Guideline

- One-line diagram(s) provided by the developer should show the Con Edison substation affected by the interconnection, clearly identify the bus section to which the developer's Attachment Facilities (AF's) will be interconnected, and the isolating circuit breakers and disconnect switches. Where extensions or other modifications of an existing substation are proposed, please show the existing equipment in black and the new equipment in red (see Figure 3).

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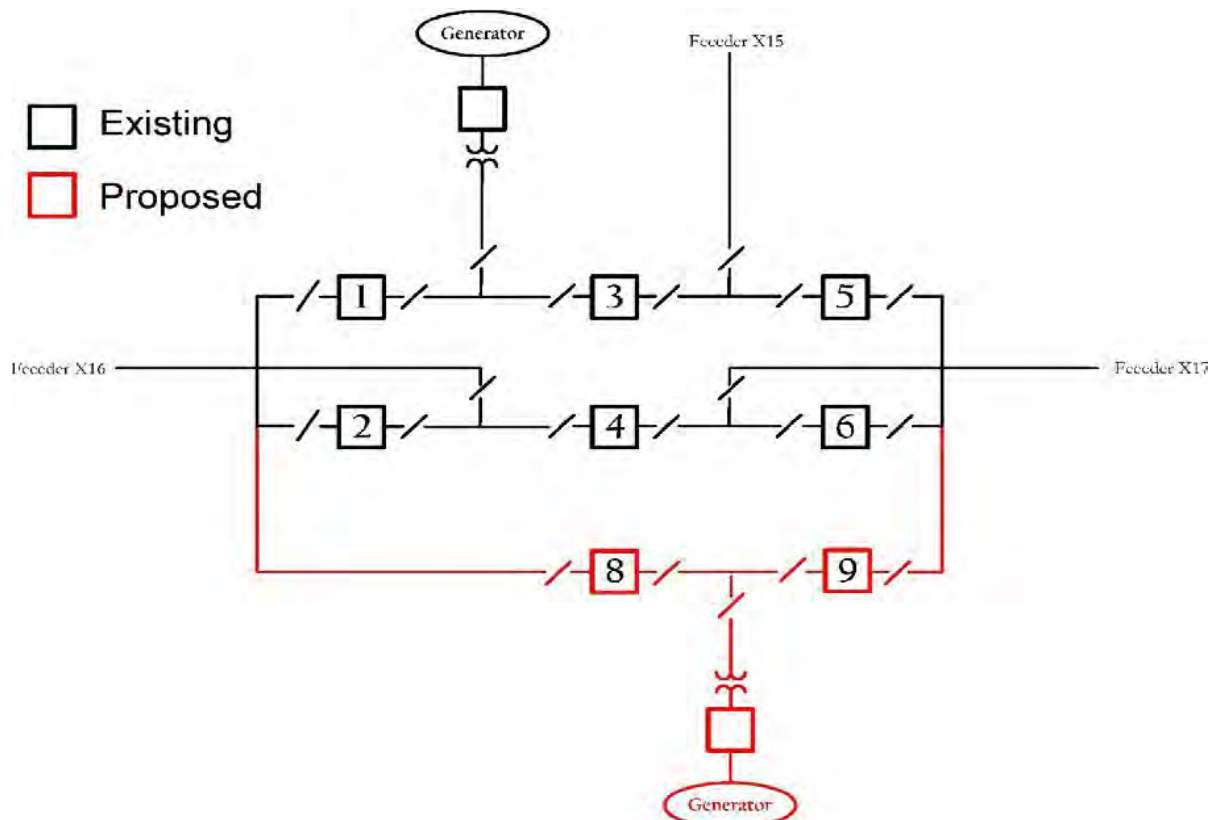


Figure 3 - An example of a conceptual one-line diagram which is acceptable for evaluation.

- There may also be instances when it is not considered prudent or practical to further expand an existing substation. For example, when a ring bus grows beyond a certain size, the probability increases that during multiple system events the substation could become fragmented into multiple pieces thereby losing its level of reliability.
- The final design should consider the possibility that any piece of equipment to be installed may fail. The design and construction of the interconnection and the required equipment should be done so that a failure will disrupt the station to the least possible extent and will not jeopardize either station or system reliability. Particular attention should be given to the space requirements for on-site repair, maintenance of existing and new equipment, and removal of any failed equipment.

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- To help in the creation of a one-line diagram that will be acceptable for evaluation by Con Edison, we have compiled a list of common requirements:
 - Correctly label all equipment at the Con Edison Substation
 - Include all breaker, bus disconnect switches, and feeder disconnect switches
 - Show full detail of the project back to the energy source (e.g., a generator, HVDC converter, and etc.)
 - All new equipment should be shown in red
 - All feeders, generator leads, or transformers at the Con Edison Substation should be labeled
 - The diagram should indicate that the developer's step-up and light and power transformers will have under load tap changing capabilities (see TP-7100, Principle 9)
 - Include a note on the diagram that states all equipment which will comply with reactive power compensation will be located on the developer's projects site

4.2. Some Examples of Design Principles Implementation

To help developers understand some of the Con Edison's Fundamental Design Principles and to show potential ways of complying with these principles, a set of simplified one-line diagrams are provided below. It is important to note, that these are just examples of how to possibly comply the principles, and Con Edison will evaluate any proposed solution a developer may present.

4.2.1. Principle 2

- Interconnection plans for a new generation facilities and transmission lines shall satisfy the need for adequate substation diversity, recognizing that an acceptable configuration may require relocation of existing feeder. See TP-7100, Principle 2.

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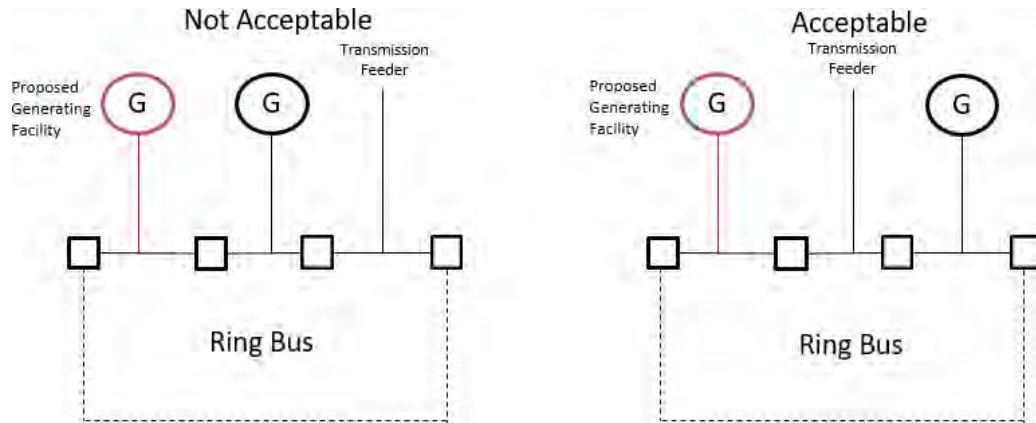


Figure 4 – Example of compliance with principle 2.

4.2.2. Principle 3

- New generation facilities and transmission lines proposing to interconnect to an existing transmission substation shall ensure that a single event (e.g. breaker failure) will not result in the outage of multiple supply sources (generation or transmission) into a Transmission Load Area. See TP-7100, Principle 3.

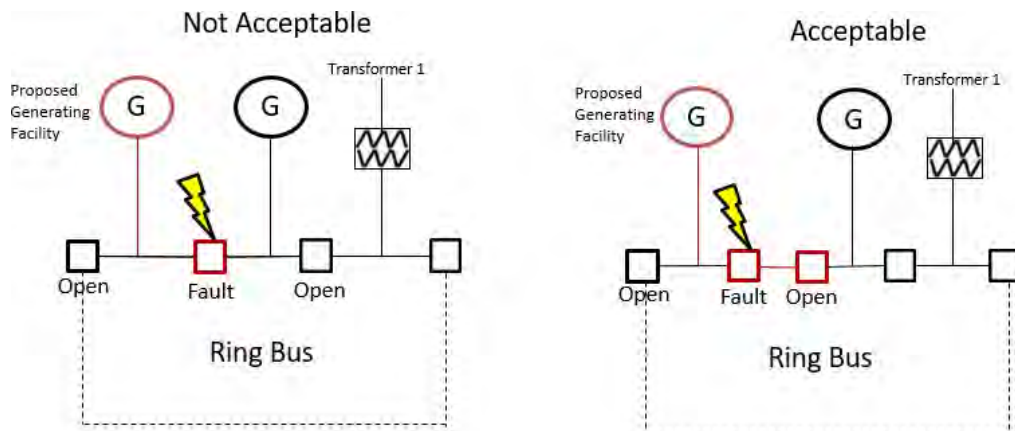


Figure 5 – Example of compliance with principle 3.

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4.2.3. Principle 4

- New generation facilities and transmission lines proposing to interconnect to an existing transmission substation shall ensure that a loss of any single feeder will not result in the outage of multiple bus sections. See TP-7100, Principle 4.

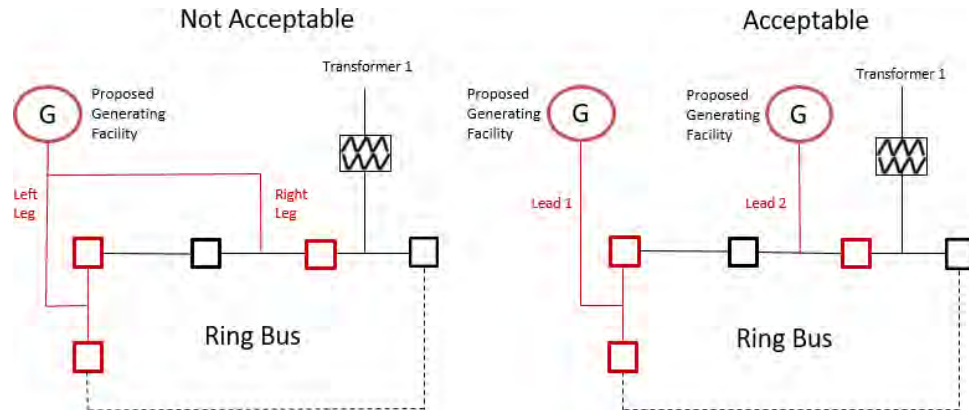


Figure 6 – Example of compliance with principle 4.

4.2.4. Principle 5

- New generation facilities and transmission lines proposing to interconnect to an existing transmission substation shall do so in a manner consistent with the design basis established by Con Edison for that substation. See TP-7100, Principle 5.

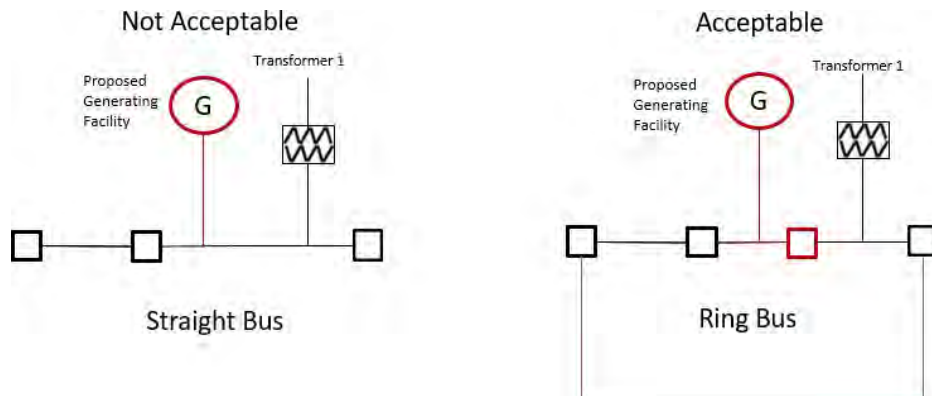


Figure 7 – Example of compliance with principle 5.

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4.2.5. Principle 6

- New generation facilities and transmission lines proposing to interconnect to an existing transmission feeder shall require the construction of a new substation with the appropriate breaker configuration at the Point of Interconnection to maintain system reliability. In the case where the existing transmission feeder is one of multiple feeders with common terminals, then all such transmission feeders shall be incorporated into the design of the new substation to prevent the interconnection from causing an imbalance in the power flow distribution. See TP-7100, Principle 6.

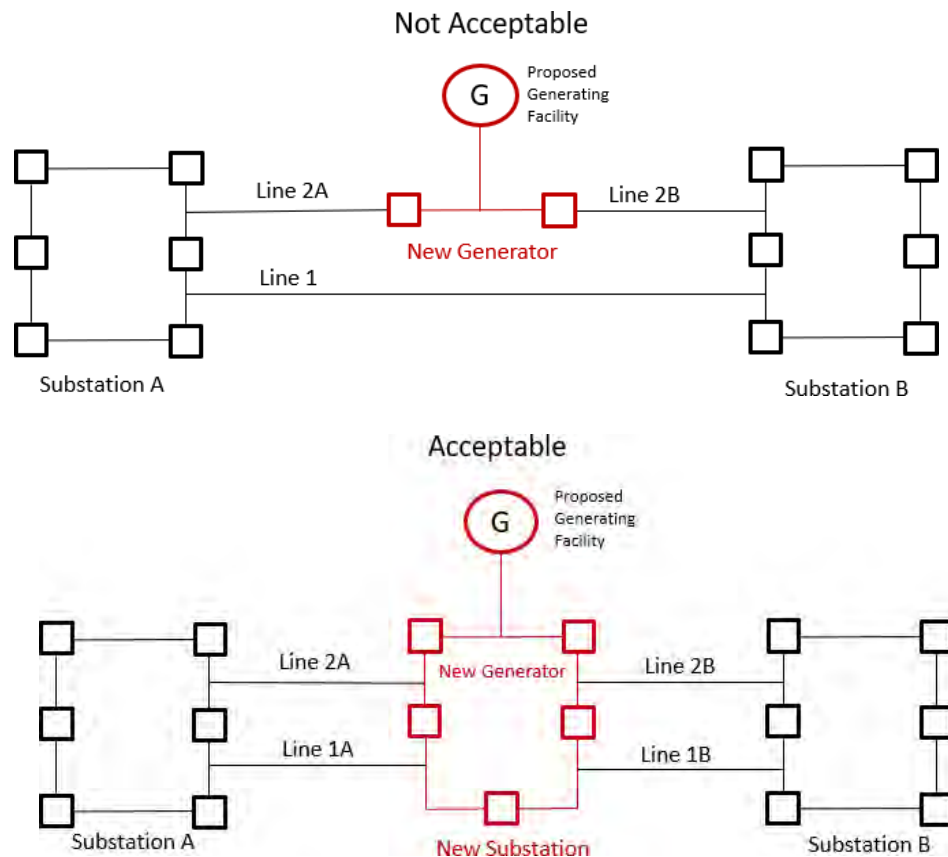


Figure 8 – Example of compliance with principle 6.

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4.2.6. Principle 8

- Con Edison shall not be obligated to supply or absorb reactive power for any entities that are interconnecting (with new or modified interconnections) to the Con Edison transmission system. Such entities shall supply the additional reactive power requirements attributable to such interconnection to ensure reactive power neutrality at the Point of Interconnection to the Con Edison Transmission System. This requirement is applicable under normal system conditions (i.e. when all design facilities are in service), as well as steady-state conditions occurring after design criteria contingencies described in the New York State Reliability Council (NYSRC) Reliability Rules & Compliance Manual for Planning and Operating the New York State Power System. See TP-7100, Principle 8.



Figure 9 – Example of compliance with principle 8.

4.2.7. Principle 9

- New generation facilities shall be designed to provide reactive power 0.85 lagging (reactive power into the Con Edison transmission) to 0.95 leading (reactive power into the generator) at the Point of Interconnection. This requirement is applicable under normal system conditions (i.e. when all design facilities are in service), as well as steady-state conditions occurring after design

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criteria contingencies described in the NYSRC Reliability Rules & Compliance Manual for Planning and Operating the New York State Power System for the voltage range of 0.95 per unit to 1.05 per unit.

Consequently, new generation facilities shall incorporate Under-Load Tap Changing (ULTC) capability on its Generator main power Step-up Transformers and Under-Load Tap Changing (ULTC) capability on the associated Light & Power Transformers. See TP-7100, Principle 9.

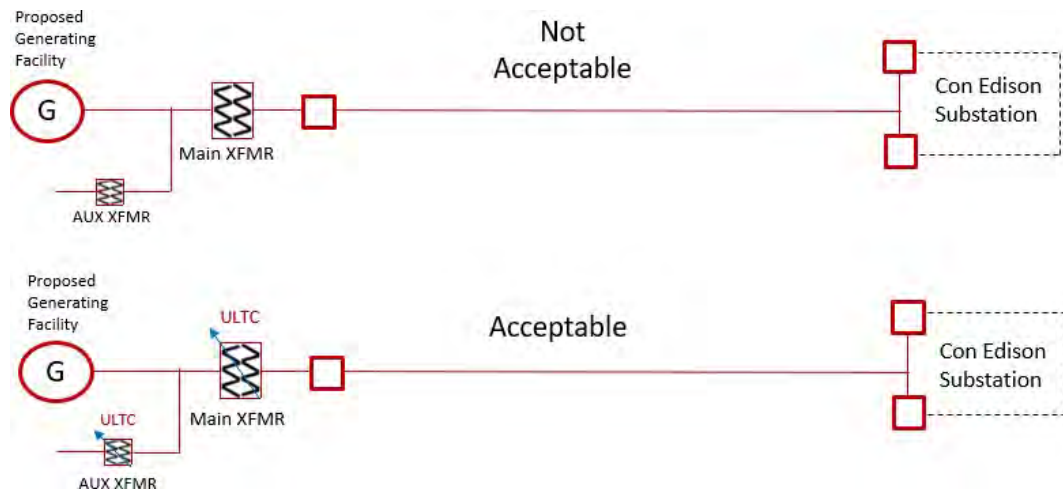


Figure 10 – Example of compliance with principle 9.

5. Substation Visit Information

- Once the NYISO has determined that the developer has submitted a valid Interconnection Request, Con Edison will allow the developer, upon the developer's request and subject to executing the required agreements with Con Edison, access to the proposed interconnecting substation for the purpose of a site visit and technical evaluation. The two required agreements between Con Edison and the project's developer that must be executed prior to the substation visit are:

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- The Confidentiality Agreement and Exhibit A Letter Agreements, if any; and
- License Agreement.

Both agreements are *pro forma* documents and may not be altered in any way.

- As part of the License Agreement, the developer will also need to provide a Certificate of Liability Insurance to Con Edison. In general, the insurance policy will need to cover liability of not less than \$7,500,000. The specific requirements are contained in the License Agreement.
- Once License Agreement has been signed and Certificate of Liability Insurance has been provided, Con Edison requests that the developer give Con Edison a two-week advance notice prior to the planned date for the substation visit. This is needed to appropriately coordinate the availability of personnel from different organization such as Engineering, Substation, EH&S and Planning. Con Edison will not allow substation visits during any system emergency. For the substation visit, the developer and its consultant are required to have the appropriate Personal Protective Equipment (PPE). At a minimum, the PPE required will be hard hat (non-white color), safety shoes, cotton clothing and safety glasses.
- During a substation visit, the developer may be allowed to take photographs of certain substation equipment associated with the proposed Point of Interconnection. At the end of the substation visit, Con Edison personnel will review the photographs and assure that those images are acceptable for developer retention. These photographs constitute confidential information and are subjected to the provisions of the Confidentiality Agreement.

6. Design Specific Examples

Con Edison's Central Engineering specification CE-ES-2002 provides the following checklist for Transmission Substation Design:

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- Primary and secondary voltage to be used
- System studies
- Substation capacity, current and future
- Future expansion needs
- BIL rating of equipment
- Number of transmission feeder positions, initial and final
- Size and layout of station property
- Air insulated versus SF6 bus (Momentary rating of bus)
- Maintenance requirements including equipment testing
- Electrical clearances
- Light and power requirements including Standby Diesel Generator and Mobile Generator Quick Connect requirements
- Grounding design
- Control room layout
- 125 VDC system requirements
- Cable and trench layout
- Metering scheme
- Roadway layout
- Primary and secondary voltage relaying schemes
- Aesthetic appearance of station
- Type of primary transmission cables
- One-line high tension drawing
- Accuracies of current transformers
- Lighting design
- Security protection
- Type of structure
- Number and location of shunt/series reactors
- Environmental aspects, Oil Water Separator sizing and location
- Type of circuit switchers and interrupters (Interrupting rating)
- Type of metal clad switchgear Transformer MVA rating and % impedance

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- Circuit breaker ratings (Continuous and short circuit)
- Phase angle regulators
- Bus configuration (Ring or breaker and half
- Automation / SCADA / HMI, Alarms requirements
- Communications / IR requirements
- Spare parts inventory assessment
- Lightning / Surge protection
- Corporate Security, Cyber Security

While the NYISO's Large Facility Interconnection procedures do not specifically address these, Con Edison requires all tasks above to be completed before the substation configuration can be accepted as final.

7. Cost Estimates

- Con Edison provides its cost estimates only at the Facilities Study stage of the interconnection process. These cost estimates are based on Con Edison's engineering assessment. Any other estimates provided in earlier studies by third parties are not recognized by Con Edison.
- The designation of, and the costs for, System Upgrade Facilities (SUF's) and Attachment Facilities (AF's) for merchant generation and transmission projects seeking interconnection pursuant to Attachment X of the OATT are determined during the NYISO Class Year Interconnection Facilities Study consistent with NYISO tariff.
- As a component of Part 1 of the Class Year Interconnection Facilities Study, Con Edison provides a cost estimate for required local SUF and Connecting Transmission Owner Attachment Facilities (CTO-AF).
- As a component of Part 2 of the Class Year Interconnection Facilities Study, Con

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Edison provides a cost estimate for required other SUF.

- As part of detailed System Deliverability Upgrade Study, Con Edison provides a cost estimate for required System Deliverability Upgrades (SDU).
- The designation of, and the costs for, Network Upgrade Facilities (NUFs) for Transmission Projects seeking interconnection pursuant to Attachment P of the OATT are determined during the Transmission Project Facilities Study consistent with NYISO Tariff. Con Edison provides a cost estimate for required NUFs.

8. Additional Interconnection Requirements

8.1. Dual Fuel

- New York State Reliability Rules require certain gas-fired units in New York City to burn oil at a minimum level on high load days. Consequently, new gas-fired facilities to be located in New York City must have dual fuel capability. Additionally, new or re-powered generating projects interconnecting to the Con Edison gas transmission system must have automatic fuel switching capability to allow a switch over to liquid fuel when required due to certain gas system contingencies.

8.2. Black Start

- New generators connecting to Con Edison's transmission system will be required to possess black start capability if Con Edison's analysis indicates that the new project would provide system restoration benefits.

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Appendices

1. Con Edison System Design Criteria, TP-7100, “Transmission Planning Criteria”.
2. Con Edison Performance Requirements, TP-8100, “Performance Requirements for Inverter-Based Generation”
3. Con Edison Drawing #303032, Typical One Line Diagram of a Breaker- and-a-Half Design.
4. Con Edison Drawing #303033, Typical One Line Diagram of a Ring Bus Design.

Specification Request Form

Developer:

Project Name:

NYISO Interconnection Queue Number:

Request Date:

Below is a list of Con Edison specifications (CE-ES-2002, Standard Engineering Design Guidelines for Area Substations, Transmission Substations and PURS Facilities) that project developers may wish to consult in performing their preliminary design and analyses of interconnection plans. Upon the submission of a valid Interconnection Request to the NYISO, a copy of these specifications can be obtained by forwarding the list, with required specifications checked, to Con Edison, along with an executed copy of the confidentiality agreement included in this Developer Welcome Kit. These specifications do not constitute the complete list of Con Edison specifications that may be pertinent to a particular interconnection design.

<u>Specification Number</u>	<u>Specification Title</u>	<u>Check (X)</u>
CE – ES – 2002 – I	General Requirements	
CE – ES – 2002 – 1	CONTROL AND INSTRUMENTATION	
CE – ES – 2002 – 2	RELAY PROTECTION	
CE – ES – 2002 – 3	COMMUNICATION FACILITIES	
CE – ES – 2002 – 4	DC POWER SUPPLY SYSTEMS	
CE – ES – 2002 – 5	CABLE AND RACEWAY SYSTEMS	
CE – ES – 2002 – 6	120/208 VOLT AC LIGHT AND POWER SUPPLY	
CE – ES – 2002 – 7	STANDBY GENERATOR LIGHT AND POWER SUPPLY	
CE – ES – 2002 – 8	SUBSTATION LIGHTING SYSTEMS & RECEPTACLES	
CE – ES – 2002 – 9	KEY INTERLOCK SYSTEMS	
CE – ES – 2002 – 10	SUBSTATION GROUNDING	
CE – ES – 2002 – 11	INTER UTILITY METERING	
CE – ES – 2002 – 12	CAPACITOR BANKS	
CE – ES – 2002 – 14	DESIGN OF METAL CLAD SF6 SWITCHGEAR	
CE – ES – 2002 – 15	DESIGN OF 69, 138 AND 345 kV CIRCUIT BREAKERS	
CE – ES – 2002 – 16	INDOOR AND OUTDOOR PANELS AND CUBICLES	
CE – ES – 2002 – 17	13/27/33 KV SWITCHGEAR	
CE – ES – 2002 – 18	POWER TRANSFORMERS, PHASE ANGLE REGULATORS, SERIES REACTORS	
CE – ES – 2002 – 19	FACILITY LAYOUT	
CE – ES – 2002 – 20	DESIGN OF 69, 138 AND 345 kV CABLE SYSTEMS	
CE – ES – 2002 – 21	FIRE PROTECTION	

<u>Specification Number</u>	<u>Specification Title</u>	<u>Check (X)</u>
CE – ES – 2002 – 22	POTENTIAL TRANSFORMERS	
CE – ES – 2002 – 23	LIGHTNING PROTECTION	
CE – ES – 2002 – 24	STATION SECURITY	
CE – ES – 2002 – 26	SF6 GAS SYSTEMS AND PIPING	
CE – ES – 2002 – 27	COGENERATION INTERCONNECTION REQUIREMENTS	
CE – ES – 2002 – 28	SIGNS AND NAMEPLATES	
CE – ES – 2002 – 30	CIRCUIT SWITCHERS AND CIRCUIT INTERRUPTERS	
CE – ES – 2002 – 31	DISCONNECT SWITCHES, GROUND SWITCHES AND HIGH VOLTAGE BUS	
CE – ES – 2002 – 32	CURRENT TRANSFORMERS	
CE – ES – 2002 – 33	COUPLING CAPACITOR POTENTIAL DEVICES AND COUPLING CAPACITOR VOLTAGE TRANSFORMERS	
CE – ES – 2002 – 34	ALARM SYSTEMS	
CE – ES – 2002 – 35	OIL/WATER SEPARATORS	
CE – ES – 2002 – 36	REMOTE NETWORK MONITORING	
CE – ES – 2002 – 37	LOAD MANAGEMENT SYSTEM	
CE – ES – 2002 – 38	FOUNDATIONS	
CE – ES – 2002 – 39	MAJOR DRAWINGS	
CE – ES – 2002 – 40	LOW VOLTAGE SWITCHGEAR AND MOTOR CONTROL CENTERS,	
CE – ES – 2002 – 41	SUBSTATION AUTOMATION	
CE – ES – 2002 – 42	SITE DEVELOPMENT	
CE – ES – 2002 – 43	PAINTING AND COATINGS	
CE – ES – 2002 – 44	DIELECTRIC FLUID PRESSURIZATION AND COOLING PLANTS	
CE – ES – 2002 – 45	START UP/SHUT DOWN PANELS	
CE – ES – 2002 – 46	FIRE ALARM SYSTEMS	
CE – ES – 2002 – 47	THIRD GENERATION 3G STATION ARRANGEMENT AND LAYOUT	
CE – ES – 2002 – 48	SUBSTATION CYBER SECURITY	
CE – ES – 2002 – 49	HUMAN MACHINE INTERFACES	
CE – ES – 2002 – 51	REAL TIME METERING	
CE – ES – 2002 – 52	FACILITY SECURITY UPGRADES FOR CENTRAL OPERATIONS	