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TRANSMISSION PLANNING CRITERIA

PURPOSE

This specification describes Con Edison's Transmission Planning Criteria for assessing the adequacy of its Bulk Electric Transmission System to withstand design contingency conditions in order to provide reliable supply to all its customers, throughout the planning horizon.

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1.0 Introduction

This specification describes Con Edison's Transmission Planning Criteria for assessing the adequacy of its Bulk Electric Transmission System to withstand design contingency conditions in order to provide reliable supply to all its customers throughout the planning horizon. This specification establishes Fundamental Design Principles and Performance Criteria. These two components complement each other and adherence to both is required by all new projects proposed by the Company and by independent developers.

In addition to this specification, all facilities, generator and transmission, must be designed to conform with and adhere to all applicable NERC, NPCC, NYSRC Reliability Rules including NYSRC Local Reliability Rules, as well as applicable Con Edison specifications, procedures and guidelines.

2.0 Fundamental Design Principles

The Con Edison Bulk Electric Transmission System is planned in accordance with the following fundamental design principles, which are applicable to all new projects proposed by the Company and independent developers. Any exception to these principles must be approved by the Chief Engineers of Transmission Planning and Electrical Engineering.

- 1.1 New generation facilities and transmission lines shall not require the interruption of any transmission path (for example by opening circuit breakers).
- 1.2 Interconnection plans for new generation facilities and transmission lines shall satisfy the need for adequate substation diversity recognizing that an acceptable configuration may require the relocation of existing feeders. For example, this design principle requires alternating supply and load feeders in substation design.
- 1.3 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.
- 1.4 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.
- 1.5 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, i.e., ring bus, double ring bus, or breaker-and-a-half. The new interconnection shall not compromise the basic design concepts inherent in these configurations. For example, transmission feeders shall not be connected to the syn buses of a breaker-and-a-half configuration.

- 1.6** 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. The requirement to construct a new substation does not apply when connecting load, or generation less than 20 MVA for a single unit or result not exceeding 75 MVA in aggregate, to radial transmission feeders. Radial transmission feeders are defined as those that supply power from a common source to substations whose bus voltage is below 100 kV.
- 1.7** Interconnection plans for new generation facilities and transmission lines shall be designed to ensure system reliability, and as such shall comply with basic substation reliability design. For example, interconnection plans will avoid overhead crossings of other feeders and associated substation bus sections, provide adequate separation and when necessary independent routing of underground feeders, and provide separation of control and relay protection wiring.
- 1.8** Con Edison shall not be obligated to supply or absorb reactive power for entities interconnecting transmission systems (new or modified interconnections) with Con Edison's Bulk Electric 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 Bulk Electric 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*.
- 1.9** 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 criteria contingencies described in the NYSRC *Reliability Rules & Compliance Manual for Planning and Operating the New York State Power System*.

- 1.10** All equipment on the Bulk Electric Transmission System, including but not limited to circuit breakers, bus work, disconnect switches, and structural supports, shall withstand the mechanical forces associated with fault currents.
- 1.11** The harmonic voltage or current distortion created by any interconnecting facility must not exceed the fundamental 60 Hz voltage or current waveform limits as identified in IEEE Standard 519.
- 1.12** New or re-powered generating projects seeking to interconnect within the Con Edison Bulk Electric Transmission System in New York City shall incorporate blackstart capability in their initial design stage. Consistent with the annual blackstart analysis that Con Edison performs pursuant to NYSRC requirements, Con Edison will assess whether the project would contribute to the restoration of the Con Edison system. If Con Edison's analysis indicates that the project would provide restoration benefits (e.g., reduce restoration time or enhance flexibility), the project shall incorporate blackstart capabilities in its final design and ensure that such blackstart capability is operational as of the commercial operation date of the project.
- 1.13** New or re-powered generating projects proposing to interconnect to the Con Edison gas transmission system shall be designed, constructed, operated and tested in each Capability Period so that they can automatically switch fuel from natural gas to liquid fuel whenever experiencing low system gas pressure or a loss of gas condition. Automatic switching shall occur at any dispatch level within 45 seconds of experiencing low gas pressure. The generators' shall remain synchronized and return to their pre-gas disturbance dispatch levels in accordance with their ramp-rate. The new generation shall have the equipment required to perform fuel switching. The project shall ensure that such automatic fuel switching capability is operational as of the commercial operation date of the project.

3.0 Performance Criteria

The performance criteria of the Con Edison Bulk Electric Transmission System requires the evaluation of voltage, thermal, stability, transient, and short circuit performance of the system with all facilities in service, as well as under the contingency conditions described in the following sections.

This specification is not intended to provide a guideline for the determination of transfer limits into, nor within, the Con Edison system. The transfer limits assessment is the responsibility of the New York Independent System Operator (NYISO), and it is performed as a critical part of the NYISO process, with the participation of all New York Control Area (NYCA) market participants, including Con Edison.

3.1 Design

Con Edison's Transmission Load Areas are designed as follows:

- Those supplied by the 345 kV Bulk Electric Transmission System are designed for second contingency;
- Specific 138 kV Transmission Load Areas are also designed for second contingency; and
- The remaining 138 kV Transmission Load Areas are designed for single contingency.

Section 4 identifies Con Edison's Transmission Load Areas with their designation as first or second contingency design.

Second contingency design means that the Con Edison Bulk Electric Transmission System is planned to withstand, at peak design customer demand, the more severe of independent Scenarios A and B, as described below:

- A. The most severe of design criteria contingencies of type "a" through "g", in accordance with Table B-2 of the NYSRC Reliability Rules.
- B. The most severe combination of two non-simultaneous design criteria contingencies of type "a" and "d", in accordance with Table B-2 of the NYSRC Reliability Rules.

For single contingency testing (Scenario A), applicable post-contingency thermal, voltage and stability limits shall not be exceeded. In addition, the system must be able to be returned to within its normal state limits using all available operating reserves and system controls.

For second contingency testing (Scenario B), applicable post-contingency thermal, voltage and stability limits shall not be exceeded. Prior to testing for the second contingency, the system should be able to be returned to its normal state limits utilizing ten-minute operating reserves and system controls. Although transfer levels are not explicitly identified in this Criteria, to the extent that the ten-minute operating reserves within the Con Edison service area are not sufficient, then ten-minute operating reserves from outside the Con Edison service area will be utilized, thereby resulting in an increase of transfer levels. In addition, after the second contingency has occurred, the system must be returned to within its normal state limits using all available operating reserves and system controls.

Second contingency design, as it relates to the transmission system, is implemented upon the Company's due consideration of all applicable critical factors, such as:

- Forecasted changes in load growth and patterns;
- Projected DSM programs;
- Operational margins above and beyond single contingency design;
- Merchant projects; and
- Comprehensive impact of transmission upgrades above and beyond single contingency design.

3.2 Voltage Assessment

Voltages must satisfy both steady-state and post-contingency limits, as follows:

Minimum: 328 kV < Actual 345 kV system < Maximum: 362 kV
Minimum: 131 kV < Actual 138 kV system < Maximum: 145 kV

3.3 Thermal Assessment

3.3.1 The Con Edison thermal planning criteria, expressed in ampere carrying capacity, consider three thermal categories. These are:

- Normal (operating) rating
- Long-Term Emergency (LTE) rating
- Short-Term Emergency (STE) rating

3.3.2 The post-contingency loading of any overhead facility or inter-utility tie must not exceed its LTE rating.

3.3.3 In observance of NYSRC Reliability Rules, the post-contingency loading of any underground cable can exceed its LTE rating, but not its STE rating, following:

- Loss of generation – provided that ten (10) minute operating reserve and/or phase angle regulation is available to reduce the loading to its LTE rating and not cause any other facility to be loaded beyond its LTE rating; and
- Loss of transmission – provided that phase angle regulation is available to reduce the loading to its LTE rating and not cause any other facility to be loaded beyond its LTE rating.

3.4 Stability Assessment

Unit and system stability shall be maintained during and following the more severe of independent scenarios A and B as identified in Section 3.1, with due regard to reclosing (in accordance with NPCC Criteria).

3.5 Transient Assessment

As changes occur in the topography of the Con Edison transmission infrastructure, appropriate analysis shall be conducted to ensure that electrical equipment (e.g. circuit breakers, transformers) are protected against transient overvoltage and harmful resonance conditions caused by switching operations and/or potential contingency events.

3.6 Short Circuit Assessment

The Con Edison Bulk Electric Transmission System shall be planned such that, when all generation and all transmission lines are in service, fault duty levels do not exceed the rated interrupting capability of breakers at 69 kV, 138 kV, and 345 kV substations. Determination of fault duty levels shall be made with due regard to fault current limiting series reactor operating protocols.

3.7 Extreme Contingency Assessment

Extreme contingency assessment recognizes that the Bulk Electric Transmission System can be subjected to events that exceed, in severity, the normal planning criteria. This assessment is conducted to determine the nature and potential extent of widespread system disturbances from such events and to identify measures that will be utilized, where appropriate, to reduce the frequency of occurrence of such events, or to mitigate the consequences that are indicated as a result of testing for such contingencies. Analytical studies shall be performed to determine the effect of the Extreme Contingencies in accordance with the Table B-3 and Table B-4 of the NYSRC Reliability Rules.

4.0 Transmission Load Areas

<u>Transmission Load Area</u>	<u>Design Contingency</u>
New York City 345/138 kV	Second
West 49th Street 345 kV	Second
New York City 138 kV	Second
Astoria 138 kV	Second
East 13th Street 138 kV	Second
Astoria East/Corona 138 kV	Second
Astoria West/Queensbridge 138 kV	Second
Vernon 138 kV	Second
East River 138 kV	Second
Greenwood/Staten Island 138 kV	First
Corona/Jamaica 138 kV	First
The Bronx 138 kV	First
Eastview 138 kV	First
Staten Island 138 kV	First
Dunwoodie North/Sherman Creek 138 kV	First
Dunwoodie South 138 kV	First
Millwood/Buchanan 138 kV	First