

APPENDIX A

NSTAR Electric

RELIABILITY CRITERIA

For

TRANSMISSION

AND

SUBSTATION

FACILITIES

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(Revised to identify most recent NPCC, NERC and ISO-New England standards)

TRANSMISSION PLANNING CRITERIA

Bulk transmission system design must be in conformance with NERC, ISO-NE and NPCC criteria specified in the ISO-NE FERC Form 715 filing. In evaluating the adequacy of the transmission system, NSTAR Electric's internal planning criteria are consistent with ISO-NE, NPCC, and NERC planning criteria. The purpose of the criteria is to assure the highest reliability possible for NSTAR Electric's customers with due regard to economic considerations, operating practices, and system designs.

The ISO-NE criteria are described in the document "Planning Procedure PP3, Reliability Standards for the New England Area Bulk Power Supply System", revised March 5, 2010. The NPCC criteria are described in NPCC Regional Reliability Reference Directory # 1 "Design and Operation of the Bulk Power System", revised December 1, 2009.

The ISO-NE and NPCC documents focus on regional reliability and security and are consistent with the NERC Transmission Planning Standards. The documents include TPL-001-0.1 (approved by the NERC Board in 2008), TPL-002-0b (approved 2009), TPL-003-0a (approved 2008) and TPL-004-0 (approved 2005). All NERC standards are available over the Internet at <http://www.nerc.com/page.php?cid=2%7C20>.

The documents described above specify the types of contingencies to be tested and the required system responses under normal and emergency operating conditions. The goal of these criteria is to ensure the interconnected power system remains secure and reliable. Using these criteria, a disturbance in one portion of the power system will not adversely affect the interconnection.

The planning criteria are comprised of two parts. The first part is a starting assumption used to establish a base case situation to which all contingencies are applied for analysis ("N"). The second part defines the set of contingencies to be applied. Contingencies include conditions whereby one major transmission Element is assumed unavailable ("N-1") or two major transmission Elements are assumed unavailable ("N-1-1").

In the "N" base case, a "90/10" ten year load forecast is assumed. Generation that has cleared the applicable ISO-NE Forward Capacity Auction is assumed to be in-service. The two largest resources in the area being studied are assumed unavailable. The intent is to ensure the system's capability to reliably supply system peak loads during a high use period when resources are unavailable due to planned or unplanned maintenance requirements, fuel availability issues, or dispatch restrictions which could be driven by either system performance constraints, emissions constraints, or any variety of other common challenges.

Contingencies are then evaluated per NERC, NPCC, ISO-NE and NSTAR criteria.

For N-1 conditions, equipment loading must be within normal ratings and normally scheduled voltage levels must be maintained.

For N-1-1 conditions, equipment loading levels must be maintained within the appropriate emergency rating and voltage levels should be maintained within + or - 5% of normal. Consideration of additional resources which can be brought on to the system within 10 minutes of the first contingency is allowable to maintain ratings and voltage levels.

SUBSTATION PLANNING CRITERIA

All Elements in service:

- No customer load shall be un-served
- Voltages at customer service points shall be within +/- 5% of nominal (ANSI A range)
- Distribution bus voltages shall be able to be maintained at their normal scheduled values (typically 3% above normal values; 1.03 pu) using transformer load tap changers
- No Element should exceed its Normal Rating

Loss of an Element:

- No customer load shall be un-served
- Voltages at customer service points shall be within +/- 10% of nominal (ANSI B range)
- Distribution bus voltages shall be able to be maintained at their normal scheduled values (typically 3% above normal values; 1.03 pu), using transformer load tap changers
- Remaining Elements shall not exceed their Long Term Emergency Rating
- Switching necessary to transfer load to adjacent supply stations shall be completed so that any affected customers will generally experience no more than a 15 minute loss of service

When studies of future conditions indicate substations cannot meet the above requirements, the area shall be reviewed for supply system mitigation measures sufficient to serve 100% of the projected peak demands under reasonably foreseeable equipment outage conditions. Supply system mitigation measures include but are not limited to the following alternatives:

- Capacity increases of equipment and facilities through equipment replacement and/or addition of supply system Elements
- Implementation of demand reduction or other capacity relief programs

No protection system Element shall exceed its Short Circuit Interrupting Rating

Appendix A - GLOSSARY

Contingency - An event, usually involving the loss of one or more Elements, which interrupts the flow of power on the power system for an extended period of time.

Element - Any electric device with terminals that may be connected to other electric devices, e.g.; a transformer, circuit, circuit breaker, line, or generator.

Emergency - Any abnormal system condition that requires automatic or manual action to prevent or limit the loss of substations, or distribution that could adversely affect the reliability of the electric system.

Long Term Emergency Rating - The rating based on the operational limit of an Element under a set of specified conditions. The conditions take into account the prior and post contingency load levels and load cycle durations for the Element, the maintenance history and the calculated capacity that is available in the Element based on the life expectancy of the Element.

Load Carrying Capacity - The capacity of a substation based on firm capacity plus available transfer switching capacity from adjacent substations.

Normal Rating - The rating that specifies the level of electrical loading, usually expressed in mega-volt amperes (MVA) or other appropriate units that a system, facility, or Element can support or withstand under continuous loading conditions.

Reserve Capacity Capability - The capacity provided through deployment of standby or mobile equipment. This includes on site system generation, spare transformers, mobile transformers, and mobile generators.

Short Circuit Interrupting Rating - The rating of system protection equipment designed to interrupt service under short circuit conditions. The rating is expressed as the amount of short circuit power or current the device can safely interrupt under fault conditions.