

**ISO NEW ENGLAND PLANNING PROCEDURE NO. 5-5**

**SPECIAL PROTECTION SYSTEMS  
APPLICATION GUIDELINES**

EFFECTIVE DATE: April 13, 2007

## I. INTRODUCTION

A Special Protection System (SPS) is defined as a protection system designed to detect abnormal system conditions, and take corrective action other than the isolation of faulted elements. Such action may include changes in load, generation, or system configuration to maintain system stability, acceptable voltages or power flows. Automatic underfrequency load shedding, as defined in the NPCC *Emergency Operation Criteria* (Document A-3), is not considered an SPS. Conventionally switched, locally controlled shunt devices are not SPSs. (Ref. NPCC Document A-7)

Criteria for design and operation concerning transmission capability for Northeastern North America, including conditions specific to SPSs, are established in the NPCC *Basic Criteria for Design and Operation of Interconnected Power Systems* (Document A-2). Similar design conditions are specified for New England Control Area in Planning Procedure 3 "Reliability Standards for the New England Area Bulk Power Supply System" (the "Reliability Standards"). In addition to providing criteria for the design, testing and operation of SPSs, the NPCC *Special Protection System Criteria* (Document A-11) categorizes SPSs according to the criteria fault for which it is designed and the impact its failure would have on the network.

## II. PURPOSE

The above criteria focus on the effects of proper and improper operation of SPSs, generally leading to a determination of need for individual SPS security and reliability. They provide no direction regarding situations in which an SPS might be appropriate or inappropriate in its application or functionality, or if particular design choices might result in unacceptable risk or complexity in operations. Such factors are included in these SPS application guidelines.

## III. GUIDELINES

Tables I, II and III establish guidelines which constitute generally acceptable conditions for the application of SPSs in the New England Control Area, corresponding with the three categories of SPSs as defined by NPCC. Each SPS will be evaluated based on these guidelines and consideration of the potential impacts on system operations and reliability. Exceptions to these guidelines may be permitted in limited circumstances, based on an assessment of such factors as the extent of the deviation from the guidelines and the impact of such deviation on any associated reliability or security risk or the complexity of system operations. Conversely, consideration of such factors and alternatives, including upgrading the transmission system, may result in an SPS being judged unacceptable even though it adheres to the guidelines.

### NPCC Type I SPSs

- NPCC defines Type I SPSs to be those that are associated with conditions resulting from design and operating contingencies for which failure or misoperation has the potential for significant adverse impact outside of the local area<sup>1</sup>.
- In New England, however, it is generally preferred that a Type I SPS not be used to mitigate the impacts of design and operating contingencies except in the following

instances: 1) contingencies involving two adjacent circuits on a multicircuit tower, 2) contingencies whose impacts are confined to a limited local area, even though the area is not wholly within the New England Control Area, and 3) contingencies with a transmission facility already out of service.

- The conditions of Table I apply

#### **NPCC Type II SPSs**

- NPCC defines Type II SPSs to be those that are associated with conditions resulting from extreme contingencies for which failure or misoperation has the potential for significant adverse impact outside of the local area.
- In New England, application of a Type II SPS is considered to be an acceptable mitigating measure, subject to the conditions of Table II.

#### **NPCC Type III SPSs**

- NPCC defines Type III SPSs to be those that have potential for local impacts only.
- In New England, application of a Type III SPS is considered to be an acceptable mitigating measure, subject to the conditions of Table III.
- Type III SPSs are reviewed periodically to determine if, due to system changes, they have become Type I or Type II.

#### **Notes:**

1. For the purpose of these SPS Application Guidelines, “local area” refers to an area comprising no more than 10% of the total New England Control Area load. Other influencing factors to be considered in determining whether or not an event is confined to a “local area” are the size of the geographic area, number of states, and number of customers affected. Load external to the New England Control Area may be treated as if it was within the New England Control Area if the region the other load is within accepts the SPS and its associated risk. For this condition, NPCC design requirements apply for a Type I SPS; however, the Type III conditions for SPS application may apply depending on the nature and extent of the impact.
2. Parallel equipment which require multiple pickups for similar events are not counted as separate events. Parameters monitored must all be located at the same station. For example, acceptable detection triggers could be each breaker within a substation or parallel lines between the same terminals; however, overloads measured at different stations would not be considered a single detection trigger.
3. An action is considered complementary if, once an action is taken by one SPS, that action is no longer needed by another SPS.
4. The design limit for total resources removed from service as part of the contingency in addition to any resource rejection as part of the SPS is 1200 MW, although there may be system conditions for which the operating limit may be higher. In instances where the gross output of a single plant may be greater than 1200 MW, the design limit may be exceeded up to the gross output of the single plant if no other resources are lost either as part of the contingency or as part of the SPS.

**Document History**<sup>1</sup>

Rev. 0 App.: RTPC, 6/8/99  
Rev. 1 Eff.: 2/1/05  
Rev. 2 Rec.: RC - 04/04/07; Rec.: PC – 04/13/07; Eff. 04/13/07

---

<sup>1</sup> This Document History documents action taken on the equivalent NEPOOL Procedure prior to the RTO Operations Date as well as revisions to the ISO New England Procedure subsequent to the RTO Operations Date.

TABLE I

**Acceptable Conditions for Type I SPS Application**

Number of detection triggers for SPS	1 detection trigger per SPS <sup>2</sup>
Number of actions triggered by an SPS	Limited actions within one station
Number of SPS's per action	1 SPS per action unless complementary actions within one station <sup>3</sup>
Location of monitoring	Local. Remote monitoring is permissible when used to determine if a remote terminal of a line has been opened.
Location of action relative to SPS	Local or radial connection
Security & dependability	Per NPCC Document A-11, Special Protection System Criteria
Selectivity of triggers	Fixed response with no selectivity by operators. An SPS must not operate for contingencies for which it is not intended to operate.
Arming	Manual with alarms when conditions exist for selection or arming, otherwise automatic
Potential for interaction with other SPS's	Unacceptable except for intentional interaction with a Type III which results in no inter-Area impact. No unintentional interaction is acceptable.
SPS required for dynamic, voltage, or thermal response	Speed of response is adequate to protect against the need
Actions Taken	
- Dynamic	- Insertion of stabilizing devices, load rejection, or generation and/or import rejection <sup>4</sup>
- Voltage	- Load rejection, generation and/or import rejection <sup>4</sup>
- Thermal	- Load rejection, generation and/or import rejection <sup>4</sup> , or operation of transmission device
Exposure to operation	Continuous is acceptable
Permissible life of the SPS	Life of the associated project or until system changes make it unacceptable or unnecessary.
System Operation	An SPS actuation may not result in an unacceptable operating condition or in the increase in the amount of required operating reserve.

All notes are located on page 3.

TABLE II

**Acceptable Conditions for Type II SPS Application**

Number of detection triggers for SPS	1 detection trigger per SPS <sup>2</sup>
Number of actions triggered by an SPS	Limited actions within one station
Number of SPS's per action	1 SPS per action unless complementary actions within one station <sup>3</sup>
Location of monitoring	Local
Location of action relative to SPS	Local or radial connection
Security & dependability	Per NPCC Document A-11, Special Protection System Criteria
Selectivity of triggers	Fixed response with no selectivity by operators. An SPS must not operate for contingencies for which it is not intended to operate.
Arming	Manual with alarms when conditions exist for selection or arming, otherwise automatic
Potential for interaction with other SPS's	Unacceptable except for intentional interaction with a Type III which results in no inter-Area impact. No unintentional interaction is acceptable.
SPS required for dynamic, voltage, or thermal response	Speed of response is adequate to protect against the need
Actions Taken	<ul style="list-style-type: none"> <li>- Insertion of stabilizing devices, load rejection, or generation and/or import rejection<sup>4</sup></li> <li>- Load rejection, generation and/or import rejection<sup>4</sup></li> <li>- Load rejection, generation and/or import rejection<sup>4</sup>, or operation of transmission device</li> </ul>
Exposure to operation	Continuous is acceptable
Permissible life of the SPS	Life of the associated project or until system changes make it unacceptable or unnecessary.
System Operation	An SPS actuation may not result in an unacceptable operating condition or in the increase in the amount of required operating reserve.

All notes are located on page 3.

TABLE III

**Acceptable Conditions for Type III SPS Application**

Number of detection triggers for SPS	1 detection trigger per SPS <sup>2</sup>
Number of actions triggered by an SPS	Limited actions within one station
Number of SPS's per action	2 SPS's per action unless complementary actions within one station <sup>3</sup>
Location of monitoring	Local or remote
Location of action relative to SPS	Local or remote
Security & dependability	Per NPCC Document A-11, Special Protection System Criteria.
Selectivity of triggers	Selectivity may be reasonably adjusted by operators. An SPS must not operate for contingencies for which it is not intended to operate.
Arming	Manual with alarms when conditions exist for selection or arming, otherwise automatic
Potential for interaction with other SPS's	May interact with another Type III which results in no inter-Area impact. Type III should not cause Type I or Type II to operate.
SPS required for dynamic, voltage, or thermal response	Speed of response is adequate to protect against the need
Actions Taken	
- Dynamic	- Insertion of stabilizing devices, load rejection, or generation and/or import rejection <sup>4</sup>
- Voltage	- Load rejection, generation and/or import rejection <sup>4</sup>
- Thermal	- Load rejection, generation and/or import rejection <sup>4</sup> , or operation of transmission device
Exposure to operation	Continuous is acceptable
Permissible life of the SPS	Life of the associated project or until system changes make it unacceptable or unnecessary.
System Operation	An SPS actuation may not result in an unacceptable operating condition or in the increase in the amount of required operating reserve.

All notes are located on page 3.