

ISO NEW ENGLAND PLANNING PROCEDURE NO. 5-5
REQUIREMENTS AND GUIDELINES FOR APPLICATION OF REMEDIAL ACTION
SCHEMES AND AUTOMATIC CONTROL SCHEMES

EFFECTIVE DATE: January 7, 2021

I. INTRODUCTION

As defined by NERC, a Remedial Action Scheme (RAS) is a scheme designed to detect predetermined system conditions and automatically take corrective actions that may include, but are not limited to, adjusting or tripping generation (MW and MVAR), tripping load, or reconfiguring a system(s). The NERC definition also includes a list of control systems and applications that are excluded from being considered a RAS. (RASs are fully defined in the NERC Glossary of Terms.) The term RAS has been adopted by NERC and NPCC in place of the term Special Protection System (SPS).

In existing documentation on individual schemes, and in existing Planning Procedures and other documents, the term “Special Protection System” may continue to be used. The use of this term does not indicate that a scheme is, or is not, classified as a RAS. Most, but not all, schemes whose name includes the term SPS also meet the NERC and NPCC definition of a RAS. NERC standards and NPCC criteria will apply to only those systems that meet the definition of a RAS. Sections III, IV, and V of this procedure apply to all RASs.

An Automatic Control Scheme (ACS) is defined as any scheme that automatically changes system topology and is not classified as a RAS according to NERC and NPCC’s definitions, with the exception of any of the following types of schemes:¹

- Schemes that detect faults and clear faulted elements
- Protection schemes that trip an element operating outside of its capabilities, unless that scheme is intended to allow planning or operation of the system in a state where the element would be loaded beyond its capabilities
- Automatic reclosing schemes that re-energize an entire protection zone after a temporary fault has been cleared
- Controls that automatically switch shunt reactive devices in order to regulate system voltage or dynamic reactive device output
- Automatic under-frequency load shedding programs
- Out-of-step tripping and power swing blocking

Automatic Control Schemes are not RASs, and thus are not subject to NERC PRC-012 or NPCC Directory 7. Any proposed addition, retirement, or functional modification to either a RAS or ACS must meet the requirements of Section I.3.9 of the Transmission,

¹ For example, a scheme that trips a line whenever the loading of that line exceeds its LTE rating with the intent of allowing operation under conditions where the line would otherwise be overloaded post-contingency would be considered an ACS. A scheme that automatically disconnects a portion of a protection zone where a permanent fault is present, and subsequently re-energizes the unfaulted portion of that protection zone (for example, to restore load fed from a transmission line tap), would also be considered an ACS. Overcurrent protection on a transmission line that is not intended to allow operation under conditions where that line would otherwise be overloaded post-contingency is not considered an ACS, and an automatic reclosing scheme that attempts to re-energize an entire protection zone after clearing a temporary fault is also not considered an ACS. Generator/FACTS device controls such as automatic voltage regulators, power system stabilizers, and HVDC voltage and frequency controls are also not considered ACSs, as they do not change system topology.

Markets and Services Tariff and is subject to the Application Guidelines in Section III and Requirements in Section IV of this procedure.²

Criteria for design and operation concerning transmission capability for Northeastern North America, including conditions specific to RASs and ACSs, are established in NERC Standard TPL-001 and the NPCC *Basic Criteria for Design and Operation of Interconnected Power Systems* (Directory 1). Similar design conditions are specified for the New England Area in Planning Procedure 3 “Reliability Standards for the New England Area Pool Transmission Facilities” (the “Reliability Standards”). In addition to providing criteria for the design, testing and operation of RASs, the NPCC *Remedial Action Schemes* (Directory 7) categorizes RASs according to the criteria contingency 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 RASs, generally leading to a determination of need for individual RAS security and reliability. They provide no direction regarding situations in which a RAS or ACS 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 the RAS and ACS application guidelines in this procedure. Additionally, the requirements in this procedure ensure RAS-entities’ and ISO-NE’s compliance with NERC reliability standard PRC-012, which specifies review and approval requirements for RASs.

III. APPLICATION GUIDELINES

Tables I, II and III establish guidelines which constitute generally acceptable conditions for the application of RASs and ACSs in the New England Area, corresponding with the three categories of RASs as defined by NPCC. Each RAS or ACS will be evaluated based on these guidelines and consideration of the potential impacts on system operations and reliability. As such, the range of reasonably anticipated possible operating conditions and system configurations must be considered. 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 a RAS or ACS being judged unacceptable even though it adheres to the guidelines.

NPCC Type I RASs

² Consistent with Section I.3.9 of the Transmission, Markets and Services Tariff, these requirements apply to any RAS or ACS monitoring or acting on facilities rated 69 kV or above subject to control of a Market Participant or Transmission Owner. They also apply to any RAS or ACS monitoring or acting on facilities rated below 69 kV that may have a significant adverse impact on the stability, reliability, or operating characteristics of the Transmission Owner’s transmission facilities, the transmission facilities of another Transmission Owner, or the system of a Market Participant.

- NPCC defines Type I RASs to be those that are associated with conditions resulting from design or operating criteria contingencies for which inadvertent operation or failure to operate has the potential for significant adverse impact outside of the local area. An ACS that addresses conditions resulting from design or operating contingencies whose inadvertent operation or failure to operate has the same potential for adverse impact is considered a Type I ACS.
- In New England, however, it is generally preferred that a Type I RAS or ACS not be used to mitigate the impacts of design or operating criteria 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 may not be wholly within the New England Area, and 3) contingencies with a transmission facility already out of service.
- The conditions of Table I apply to all Type I ACSs and RASs.

NPCC Type II RASs

- NPCC defines Type II RASs to be those that are associated with conditions resulting from extreme contingencies for which inadvertent operation or failure to operate has the potential for significant adverse impact outside of the local area. An ACS that addresses conditions resulting from extreme contingencies whose inadvertent operation or failure to operate has the same potential for adverse impact is considered a Type II ACS.
- In New England, application of a Type II RAS or ACS is considered to be an acceptable mitigating measure, subject to the conditions of Table II.

NPCC Limited Impact RASs

- NERC and NPCC define Limited Impact RASs to be those that do not, by inadvertent operation or failure to operate, cause or contribute to BES cascading, uncontrolled separation, angular instability, voltage instability, voltage collapse, or unacceptably damped oscillations. An ACS that meets these criteria is considered a Limited Impact ACS.
- In New England, application of a Limited Impact RAS or ACS is considered to be an acceptable mitigating measure, subject to the conditions of Table III.
- Limited Impact RASs are reviewed periodically to determine whether, due to system changes, they have become Type I or Type II RASs.

IV. REQUIREMENTS FOR ADDITION, FUNCTIONAL MODIFICATION³, OR RETIREMENT OF RASs OR ACSs

³ As defined in PRC-012-2 Attachment 1, a functional modification to a RAS consists of any of the following:

- Changes to the system conditions or contingencies monitored by the RAS
- Changes to the actions the RAS is designed to initiate
- Changes to RAS hardware beyond in-kind replacement; i.e. match the original functionality of existing components
- Changes to RAS logic beyond correcting existing errors
- Changes to redundancy levels; i.e. addition or removal

A functional modification to an ACS is defined in the same way. A change in the timing of actions taken by an ACS is not considered a functional modification, unless the actions are taken in order to maintain transient stability, including voltage stability.

1. Prior to submitting a Proposed Plan Application for a new or functionally modified (as defined in PRC-012) RAS/ACS or for the retirement of an existing RAS/ACS, each entity that owns all or part of a RAS/ACS shall submit a draft completed Attachment 1 to this procedure to ISO-NE. A final completed Attachment 1 shall be submitted along with the Proposed Plan Application. This information will assist ISO-NE in its required review of the proposed actions, and, for RASs, will ensure that the review is conducted in accordance with PRC-012 and that the RAS database required by NERC PRC-012 is accurate and up to date.
2. Upon receiving feedback from ISO-NE pertaining to a proposed RAS/ACS addition, functional modification, or retirement, each RAS-entity (as defined by NERC PRC-012) or owner of all or part of an ACS shall resolve any identified issues.
3. The System Impact Study (SIS) for a RAS/ACS addition, functional modification, or retirement shall examine the impacts of planned operation of the RAS/ACS, inadvertent operation of the RAS/ACS, failure of the RAS/ACS when intended to operate, and the effects of a single component failure in the RAS/ACS when intended to operate (for a non-limited-impact RAS/ACS). Additionally, the SIS shall evaluate the potential for interactions with other RAS/ACSs, protection systems, and control systems, and identify any other affected Reliability Coordinators. For details of requirements for a RAS/ACS-related SIS, please see Planning Procedure 5-3, section 4.0.
4. New or functionally modified RAS/ACSs shall not be implemented, and existing RAS/ACSs shall not be retired, before ISO-NE has reviewed and approved the information submitted as part of Attachment 1 to this procedure (including any modifications made as part of item IV.2. above), as part of the approval of a Proposed Plan Application for the new or functionally modified RAS/ACS. Additionally, the NPCC process outlined in NPCC Directory 7, if applicable, must be followed before any additions, functional modification, or retirement of a RAS is implemented.

V. REQUIREMENTS FOR EXISTING RASs

Each entity that owns all or part of a RAS that is in service on or before January 7, 2021 shall, within six months following January 7, 2021, submit to ISO-NE a completed Data Collection Form. A blank copy of this form is included as Attachment 1 to this procedure. The information in this form will enable ISO-NE to populate a database of RASs as required by NERC reliability standard PRC-012.

Notes for Tables I, II, and III on the following pages:

1. 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.
2. An action is considered complementary if, once an action is taken by one RAS or ACS, that action is no longer needed by another RAS or ACS.
3. The design limit for total resources removed from service as part of the contingency in addition to any resource rejection as part of the RAS or ACS 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 resource may be greater than 1200 MW, the design limit may be exceeded up to the gross output of the single resource if no other resources are lost either as part of the contingency or as part of the RAS or ACS.

Document History⁴

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
Rev. 3	Rec.: RC – 06/16/09; Rec.: PC – 06/22/09; Eff. 06/22/09
Rev. 4	Rec.: RC – 12/15/20; Rec.: PC – 01/07/21; Eff. 01/07/21

⁴ 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 RAS or ACS Application

Number of detection triggers for a RAS or ACS	1 detection trigger per RAS or ACS ¹
Number of actions triggered by a RAS or ACS	Limited actions within one station
Number of RASs or ACSs per action	1 RAS or ACS per action unless complementary actions within one station ²
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 RAS or ACS	Local or radial connection
Security & dependability	Per Section 5 of NPCC Directory 7, Remedial Action Schemes
Selectivity of triggers	Fixed response with no selectivity by operators. A RAS or ACS 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 RASs or ACSs	Unacceptable except for intentional interaction with a Limited Impact RAS or ACS which results in no inter-Area impact. No unintentional interaction is acceptable.
RAS or ACS required for dynamic, voltage, or thermal response	Speed of response is adequate to protect against the need
Actions Taken - Dynamic - Voltage - Thermal	- Insertion of stabilizing devices, load rejection, or generation and/or import rejection ³ - Load rejection, generation and/or import rejection ³ - Load rejection, generation and/or import rejection ³ , or operation of transmission device
Exposure to operation	Continuous is acceptable
Permissible life of the RAS or ACS	Life of the associated project or until system changes make it unacceptable or unnecessary.
System Operation	A RAS or ACS 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 6.

TABLE II

Acceptable Conditions for Type II RAS or ACS Application

Number of detection triggers for a RAS or ACS	1 detection trigger per RAS or ACS ¹
Number of actions triggered by a RAS or ACS	Limited actions within one station
Number of RASs or ACSs per action	1 RAS or ACS per action unless complementary actions within one station ²
Location of monitoring	Local
Location of action relative to RAS or ACS	Local or radial connection
Security & dependability	Per Section 5 of NPCC Directory 7, Remedial Action Schemes
Selectivity of triggers	Fixed response with no selectivity by operators. An RAS or ACS 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 RASs or ACSs	Unacceptable except for intentional interaction with a Limited Impact RAS or ACS which results in no inter-Area impact. No unintentional interaction is acceptable.
RAS or ACS required for dynamic, voltage, or thermal response	Speed of response is adequate to protect against the need
Actions Taken - Dynamic - Voltage - Thermal	- Insertion of stabilizing devices, load rejection, or generation and/or import rejection ³ - Load rejection, generation and/or import rejection ³ - Load rejection, generation and/or import rejection ³ , or operation of transmission device
Exposure to operation	Continuous is acceptable
Permissible life of the RAS or ACS	Life of the associated project or until system changes make it unacceptable or unnecessary.
System Operation	A RAS or ACS 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 6.

TABLE III

Acceptable Conditions for Limited Impact RAS or ACS Application

Number of detection triggers for RAS or ACS	1 detection trigger per RAS or ACS ¹
Number of actions triggered by an RAS or ACS	Limited actions within one station
Number of RASs or ACS per action	2 RASs or ACS per action unless complementary actions within one station ²
Location of monitoring	Local or remote
Location of action relative to RAS or ACS	Local or remote
Selectivity of triggers	Selectivity may be reasonably adjusted by operators. An RAS or ACS 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 RASs or ACSs	May interact with another Limited Impact RAS or ACS which results in no inter-Area impact. A Limited Impact RAS or ACS should not cause a Type I or Type II RAS or ACS to operate.
RAS or ACS required for dynamic, voltage, or thermal response	Speed of response is adequate to protect against the need
Actions Taken - Dynamic - Voltage - Thermal	- Insertion of stabilizing devices, load rejection, or generation and/or import rejection ³ - Load rejection, generation and/or import rejection ³ - Load rejection, generation and/or import rejection ³ , or operation of transmission device
Exposure to operation	Continuous is acceptable
Permissible life of the RAS or ACS	Life of the associated project or until system changes make it unacceptable or unnecessary.
System Operation	A RAS or ACS 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 6.