Standard Development Roadmap

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed:

1. Standards Committee approves SAR for posting on June 5, 2007.
2. The SAR was posted for comment from June 11, 2007–July 10, 2007.
3. The SC approves development of the standard on August 13, 2007.
4. First posting of revised standard on July 24, 2009.
5. Second posting of revised standard on June 11, 2010
6. Third posting of revised standard on November 17, 2010
7. Fourth posting of revised standard on April 13, 2011

Description of Current Draft:
This is the fifth draft of the Standard. This standard merges previous standards PRC-005-1, PRC-008-0, PRC-011-0, and PRC-017-0. It also addresses FERC comments from Order 693, and addresses observations from the NERC System Protection and Control Task Force, as presented in *NERC SPCTF Assessment of Standards: PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing, PRC-008-0 — Underfrequency Load Shedding Equipment Maintenance Programs, PRC-011-0 — UVLS System Maintenance and Testing, PRC-017-0 — Special Protection System Maintenance and Testing.*

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Post for combined 30-day comment and ballot.	July 5 – August 4, 2011
2. Conduct successive ballot	July 26 – August 4, 2011
3. Drafting Team Responds to Comments	August 4 – September 6, 2011

Definitions of Terms Used in Standard

This section includes all newly defined or revised terms used in the proposed standard. Terms already defined in the Reliability Standards Glossary of Terms are not repeated here. New or revised definitions listed below become approved when the proposed standard is approved. When the standard becomes effective, these defined terms will be removed from the individual standard and added to the Glossary.

Protection System Maintenance Program (PSMP) — An ongoing program by which Protection System components are kept in working order and proper operation of malfunctioning components is restored. A maintenance program for a specific component includes one or more of the following activities:

- Verify — Determine that the component is functioning correctly.
- Monitor — Observe the routine in-service operation of the component.
- Test — Apply signals to a component to observe functional performance or output behavior, or to diagnose problems.
- Inspect — Detect visible signs of component failure, reduced performance and degradation.
- Calibrate — Adjust the operating threshold or measurement accuracy of a measuring element to meet the intended performance requirement.

Protection System (NERC Board of Trustees Approved Definition)

- Protective relays which respond to electrical quantities,
- communications systems necessary for correct operation of protective functions,
- voltage and current sensing devices providing inputs to protective relays,
- station dc supply associated with protective functions (including station batteries, battery chargers, and non-battery-based dc supply), and
- control circuitry associated with protective functions through the trip coil(s) of the circuit breakers or other interrupting devices.

The following terms are defined for use only within PRC-005-2, and should remain with the standard upon approval rather than being moved to the Glossary of Terms.

Maintenance Correctable Issue – Failure of a component to operate within design parameters such that the deficiency cannot be corrected during the performance of the maintenance activity. Therefore this issue requires follow-up corrective action.

Segment – Protection Systems or components of a consistent design standard, or a particular model or type from a single manufacturer that typically share other common elements. Consistent performance is expected across the entire population of a segment. A segment must contain at least sixty (60) individual components.

Component Type - Any one of the five specific elements of the Protection System definition.

Component – A component is any individual discrete piece of equipment included in a Protection System, including but not limited to a protective relay or current sensing device. The designation of what constitutes a control circuit component is very dependent upon how an entity performs and tracks the testing of the control circuitry. Some entities test their control circuits on a breaker basis whereas others test their circuitry on a local zone of protection basis. Thus, entities are allowed the latitude to designate

their own definitions of control circuit components. Another example of where the entity has some discretion on determining what constitutes a single component is the voltage and current sensing devices, where the entity may choose either to designate a full three-phase set of such devices or a single device as a single component.

Countable Event – A component which has failed and requires repair or replacement, any condition discovered during the maintenance activities in Tables 1-1 through 1-5 which requires corrective action, or a Misoperation attributed to hardware failure or calibration failure. Misoperations due to product design errors, software errors, relay settings different from specified settings, Protection System component configuration errors, or Protection System application errors are not included in Countable Events.

A. Introduction

1. Title: **Protection System Maintenance**

2. Number: PRC-005-2

3. Purpose: To document and implement programs for the maintenance of all Protection Systems affecting the reliability of the Bulk Electric System (BES) so that these Protection Systems are kept in working order.

4. Applicability:

4.1. Functional Entities:

4.1.1 Transmission Owners

4.1.2 Generator Owners

4.1.3 Distribution Providers

4.2. Facilities:

4.2.1 Protection Systems that are installed for the purpose of detecting faults on BES Elements (lines, buses, transformers, etc.)

4.2.2 Protection Systems used for underfrequency load-shedding systems installed per ERO underfrequency load-shedding requirements.

4.2.3 Protection Systems used for undervoltage load-shedding systems installed to prevent system voltage collapse or voltage instability for BES reliability.

4.2.4 Protection Systems installed as a Special Protection System (SPS) for BES reliability.

4.2.5 Protection Systems for generator Facilities that are part of the BES, including:

4.2.5.1 Protection Systems that act to trip the generator either directly or via generator lockout or auxiliary tripping relays.

4.2.5.2 Protection Systems for generator step-up transformers for generators that are part of the BES.

4.2.5.3 Protection Systems for transformers connecting aggregated generation, where the aggregated generation is part of the BES (e.g., transformers connecting facilities such as wind-farms to the BES).

4.2.5.4 Protection Systems for generator-connected station service transformers for generators that are part of the BES.

5. Effective Date: See Implementation Plan

B. Requirements

R1. Each Transmission Owner, Generator Owner, and Distribution Provider shall establish a Protection System Maintenance Program (PSMP) for its Protection Systems identified in Section 4.2. *Violation Risk Factor: Medium] [Time Horizon: Long Term Planning]*

The PSMP shall:

1.1. Address all Protection System **component types.**

1.2. Identify which maintenance method (time-based,

Component Type *- Any one of the five specific elements of the Protection System definition.*

performance-based (per PRC-005 Attachment A), or a combination) is used to address each Protection System component type. All batteries associated with the station dc supply component type of a Protection System shall be included in a time-based program as described in Table 1-4.

1.3. Identify the associated maintenance intervals for time-based programs, to be no less frequent than the intervals established in Table 1-1 through 1-5 and Table 2.

1.4. Include all applicable monitoring attributes and related maintenance activities applied to each Protection System component type consistent with the maintenance intervals specified in Tables 1-1 through 1-5 and Table 2.

Maintenance Correctable Issue - *Failure of a component to operate within design parameters* such that the deficiency cannot be corrected during the performance of the maintenance activity. *Therefore this issue requires follow-up corrective action.*

R2. Each Transmission Owner, Generator Owner, and Distribution Provider that uses performance-based maintenance intervals in its PSMP shall follow the procedure established in PRC-005 Attachment A to establish and maintain its performance-based intervals. *[Violation Risk Factor: Medium] [Time Horizon: Operations Planning]*

R3. Each Transmission Owner, Generator Owner, and Distribution Provider shall implement and follow its PSMP and initiate resolution of any identified **maintenance correctable issues**. *[Violation Risk Factor: High] [Time Horizon: Operations Planning]*

C. Measures

M1. Each Transmission Owner, Generator Owner and Distribution Provider shall have a current documented Protection System Maintenance Program that addresses all component types of its Protection Systems, as required by Requirement R1. For each Protection System component type, the documentation shall include the type of maintenance program applied (time-based, performance-based, or a combination of these maintenance methods), maintenance activities, maintenance intervals, and, for component types that use monitoring to extend the intervals, the appropriate monitoring attributes as specified in Requirement R1, Parts 1.1 through 1.4.

M2. Each Transmission Owner, Generator Owner, and Distribution Provider that uses a performance-based maintenance program shall have evidence that its current performance-based maintenance program is in accordance with Requirement R2, which may include but is not limited to equipment lists, dated maintenance records, and dated analysis records and results.

M3. Each Transmission Owner, Generator Owner, and Distribution Provider shall have evidence that it has implemented the Protection System Maintenance Program and initiated resolution of identified Maintenance Correctable Issues in accordance with Requirement R3, which may include but is not limited to dated maintenance records, dated maintenance summaries, dated check-off lists, dated inspection records, or dated work orders.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

Regional Entity

1.2. Compliance Monitoring and Enforcement Processes:

Compliance Audits

Self-Certifications

Spot Checking

Compliance Violation Investigations

Self-Reporting

Complaints

1.3. Data Retention

The Transmission Owner, Generator Owner, and Distribution Provider shall each keep data or evidence to demonstrate compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

For Requirement R1, the Transmission Owner, Generator Owner, and Distribution Provider shall each keep its current dated Protection System Maintenance Program including the documentation that specifies the type of maintenance program applied for each Protection System component type.

For Requirement R2 and Requirement R3, the Transmission Owner, Generator Owner, and Distribution Provider shall each keep documentation of the two most recent performances of each distinct maintenance activity for the Protection System **components**, or all performances of each distinct maintenance activity for the Protection System component since the previous scheduled audit date, whichever is longer.

Component – *A component is any individual discrete piece of equipment included in a Protection System, including but not limited to a protective relay or current sensing device. The designation of what constitutes a control circuit component is very dependent upon how an entity performs and tracks the testing of the control circuitry. Some entities test their control circuits on a breaker basis whereas others test their circuitry on a local zone of protection basis. Thus, entities are allowed the latitude to designate their own definitions of control circuit components. Another example of where the entity has some discretion on determining what constitutes a single component is the voltage and current sensing devices, where the entity may choose either to designate a full three-phase set of such devices or a single device as a single component.*

The Compliance Enforcement Authority shall keep the last periodic audit report and all requested and submitted subsequent compliance records.

1.4. Additional Compliance Information

None.

2. Violation Severity Levels

Requirement Number	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	The responsible entity's PSMP failed to specify whether one component type is being addressed by time-based or performance-based maintenance, or a combination of both. (Part 1.2)	The responsible entity's PSMP failed to address one component type included in the definition of 'Protection System' (Part 1.1) OR The responsible entity's PSMP failed to specify whether two component types are being addressed by time-based or performance-based maintenance, or a combination of both. (Part 1.2)	The responsible entity's PSMP failed to address two component types included in the definition of 'Protection System' (Part 1.1) OR The responsible entity's PSMP failed to include station batteries in a time-based program (Part 1.2) OR The responsible entity failed to include all maintenance activities or intervals relevant for the identified monitoring attributes specified in Tables 1-1 through 1-5 and Table 2. (Part 1.3 and 1.4)	The responsible entity has not established a PSMP. OR The responsible entity's PSMP failed to address three or more component types included in the definition of 'Protection System' (Part 1.1) OR The responsible entity failed to specify whether three or more component types are being addressed by time-based or performance-based maintenance, or a combination of both. (Part 1.2).
R2	The responsible entity uses performance-based maintenance intervals in its PSMP but has: 1) Failed to reduce countable events to less than 4% within three years OR 2) Failed to annually document program activities, results, maintenance dates, or countable events for 5% or less of components in any individual segment	NA	The responsible entity uses performance-based maintenance intervals in its PSMP but has failed to reduce countable events to less than 4% within four years.	The responsible entity uses performance-based maintenance intervals in its PSMP but has: 1) Failed to establish the entire technical justification described within R2 for the initial use of the performance-based PSMP OR 2) Failed to reduce countable events to less than 4% within five years OR 3) Failed to annually document program activities, results, maintenance dates, or countable

Requirement Number	Lower VSL	Moderate VSL	High VSL	Severe VSL
				events for over 5% of components in any individual segment OR 4) Maintained a segment with less than 60 components OR 5) Failed to: • Annually update the list of components, OR • Perform maintenance on the greater of 5% of the segment population or 3 components, OR • Annually analyze the program activities and results for each segment.
R3	The responsible entity has failed to implement and follow scheduled program on 5% or less of total Protection System components. OR The responsible entity has failed to initiate resolution on 5% or less of identified maintenance correctable issues.	The responsible entity has failed to implement and follow scheduled program on greater than 5%, but no more than 10% of total Protection System components OR The responsible entity has failed to initiate resolution on greater than 5%, but less than or equal to 10% of identified maintenance correctable issues.	The responsible entity has failed to implement and follow scheduled program on greater than 10%, but no more than 15% of total Protection System components OR The responsible entity has failed to initiate resolution on greater than 10%, but less than or equal to 15% of identified.	The responsible entity has failed to implement and follow scheduled program on greater than 15% of total Protection System components OR The responsible entity has failed to initiate resolution on greater than 15% of identified maintenance correctable issues.

E. Regional Variances

None

F. Supplemental Reference Document

The following documents present a detailed discussion about determination of maintenance intervals and other useful information regarding establishment of a maintenance program.

1. PRC-005-2 Protection System Maintenance Supplementary Reference and FAQ — February 2011.

Version History

Version	Date	Action	Change Tracking
2	TBD	Complete revision, absorbing maintenance requirements from PRC-005-1, PRC-008-0, PRC-011-0, PRC-017	Complete revision

Table 1-1 Component Type - Protective Relay		
Component Attributes	**Maximum Maintenance Interval**[1]	**Maintenance Activities**
Any unmonitored protective relay not having all the monitoring attributes of a category below.	6 calendar years	Verify that settings are as specified For non-microprocessor relays: • Test and, if necessary calibrate For microprocessor relays: • Verify operation of the relay inputs and outputs that are essential to proper functioning of the Protection System. • Verify acceptable measurement of power system input values.
Monitored microprocessor protective relay with the following: • Internal self diagnosis and alarming (see Table 2). • Voltage and/or current waveform sampling three or more times per power cycle, and conversion of samples to numeric values for measurement calculations by microprocessor electronics. • Alarming for power supply failure (see Table 2).	12 calendar years	Verify: • Settings are as specified. • Operation of the relay inputs and outputs that are essential to proper functioning of the Protection System. • Acceptable measurement of power system input values.

[1] For the tables in this standard, a calendar year starts on the first day of a new year (January 1) after a maintenance activity has been completed. For the tables in this standard, a calendar month starts on the first day of the first month after a maintenance activity has been completed.

Monitored microprocessor protective relay with preceding row attributes and the following: • Ac measurements are continuously verified by comparison to an independent ac measurement source, with alarming for excessive error. (See Table 2) • Some or all binary or status inputs and control outputs are monitored by a process that continuously demonstrates ability to perform as designed, with alarming for failure. (See Table 2) • Alarming for change of settings. (See Table 2)	12 calendar years	Verify only the unmonitored relay inputs and outputs that are essential to proper functioning of the Protection System.

Table 1-2
Component Type - Communications Systems

Component Attributes	Maximum Maintenance Interval	Maintenance Activities
Any unmonitored communications system necessary for correct operation of protective functions, and not having all the monitoring attributes of a category below.	3 calendar months	Verify that the communications system is functional.
	6 calendar years	Verify that the channel meets performance criteria pertinent to the communications technology applied (e.g signal level, reflected power, or data error rate). Verify essential signals to and from other Protection System components.
Any communications system with continuous monitoring or periodic automated testing for the presence of the channel function, and alarming for loss of function. (See Table 2)	12 calendar years	Verify that the channel meets performance criteria pertinent to the communications technology applied (e.g signal level, reflected power, or data error rate). Verify essential signals to and from other Protection System components.

Any communications system with continuous monitoring or periodic automated testing for the performance of the channel using criteria pertinent to the communications technology applied (e.g. signal level, reflected power, or data error rate, and alarming for excessive performance degradation). (See Table 2)	No periodic maintenance specified	None.

Table 1-3
Component Type - Voltage and Current Sensing Devices Providing Inputs to Protective Relays

Component Attributes	Maximum Maintenance Interval	Maintenance Activities
Any voltage and current sensing devices not having monitoring attributes of the category below.	12 calendar years	Verify that current and voltage signal values are provided to the protective relays.
Voltage and Current Sensing devices connected to microprocessor relays with AC measurements are continuously verified by comparison of sensing input value as measured by the microprocessor relay to an independent ac measurement source, with alarming for unacceptable error or failure (see Table 2).	No periodic maintenance specified	None.

Table 1-4(a) Component Type – Protection System Station dc Supply Using Vented Lead-Acid (VLA) Batteries		
Component Attributes	**Maximum Maintenance Interval**	**Maintenance Activities**
Protection System Station dc supply using **Vented Lead-Acid (VLA) batteries** not having monitoring attributes of Table 1-4(f). Protection System Station dc supply for distribution breakers for UFLS or UVLS are excluded (see Table 1-4(e)).	3 Calendar Months	Verify: • Station dc supply voltage Inspect: • Electrolyte level • For unintentional grounds
	18 Calendar Months	Verify: • Float voltage of battery charger • Battery continuity • Battery terminal connection resistance • Battery intercell or unit-to-unit connection resistance Inspect: • Cell condition of all individual battery cells where cells are visible – or measure battery cell/unit internal ohmic values where the cells are not visible • Physical condition of battery rack
	18 Calendar Months -or- 6 Calendar Years	Verify that the station battery can perform as designed by evaluating the measured cell/unit internal ohmic values to station battery baseline. -or- Verify that the station battery can perform as designed by conducting a performance, service, or modified performance capacity test of the entire battery bank.

Table 1-4(b) Component Type – Protection System Station dc Supply Using Valve-Regulated Lead-Acid (VRLA) Batteries		
Component Attributes	**Maximum Maintenance Interval**	**Maintenance Activities**
Protection System Station dc supply **with Valve Regulated Lead-Acid (VRLA) batteries** not having monitoring attributes of Table 1-4(f). Station dc supply for distribution breakers for UFLS or UVLS are excluded (see Table 1-4(e)).	3 Calendar Months	Verify: • Station dc supply voltage Inspect: • For unintentional grounds
	6 Calendar Months	Inspect: • Condition of all individual units by measuring battery cell/unit internal ohmic values.
	18 Calendar Months	Verify: • Float voltage of battery charger • Battery continuity • Battery terminal connection resistance • Battery intercell or unit-to-unit connection resistance Inspect: • Physical condition of battery rack
	6 Calendar Months -or- 3 Calendar Years	Verify that the station battery can perform as designed by evaluating the measured cell/unit internal ohmic values to station battery baseline. -or- Verify that the station battery can perform as designed by conducting a performance, service, or modified performance capacity test of the entire battery bank

Table 1-4(c) Component Type – Protection System Station dc Supply Using Nickel-Cadmium (NiCad) Batteries		
Component Attributes	**Maximum Maintenance Interval**	**Maintenance Activities**
Protection System Station dc supply **Nickel-Cadmium (NiCad) batteries** not having monitoring attributes of Table 1-4(f). Station dc supply for distribution breakers for UFLS or UVLS are excluded (see Table 1-4(e)).	3 Calendar Months	Verify: • Station dc supply voltage Inspect: • Electrolyte level • For unintentional grounds
	18 Calendar Months	Verify: • Float voltage of battery charger • Battery continuity • Battery terminal connection resistance • Battery intercell or unit-to-unit connection resistance Inspect: • Cell condition of all individual battery cells. • Physical condition of battery rack
	6 Calendar Years	Verify that the station battery can perform as designed by conducting a performance service, or modified performance capacity test of the entire battery bank.

Table 1-4(d) Component Type – Protection System Station dc Supply Using Non Battery Based Energy Storage		
Component Attributes	**Maximum Maintenance Interval**	**Maintenance Activities**
Any Protection System station dc supply not using a battery and not having monitoring attributes of Table 1-4(f). Protection System Station dc supply for distribution breakers for UFLS, UVLS and SPS are excluded (see Table 1-4(e)).	3 Calendar Months	Verify: • Station dc supply voltage Inspect: • For unintentional grounds
	18 Calendar Months	Inspect: Condition of non-battery based dc supply
	6 Calendar Years	Verify that the dc supply can perform as designed when ac power is not present.

Table 1-4(e) Component Type – Protection System Station dc Supply for non-BES Interrupting Device		
Component Attributes	**Maximum Maintenance Interval**	**Maintenance Activities**
Any Protection System dc supply for tripping only non-BES interrupting devices as part of a UFLS, UVLS or SPS system and not having monitoring attributes of Table 1-4(f).	When control circuits are verified (See Table 1-5)	Verify: • Station dc supply voltage

Table 1-4(f) Exclusions for Protection System Station dc Supply Monitoring Devices and Systems		
Component Attributes	**Maximum Maintenance Interval**	**Maintenance Activities**
Any station dc supply with high and low voltage monitoring and alarming of the battery charger voltage to detect charger overvoltage and charger failure. (See Table 2)	No periodic maintenance specified	No periodic verification of station dc supply voltage is required.
Any battery based station dc supply with electrolyte level monitoring and alarming in every cell (See Table 2)		No periodic inspection of the electrolyte level for each cell is required.
Any station dc supply with unintentional dc ground monitoring and alarming (See Table 2)		No periodic inspection of unintentional dc grounds is required.
Any station dc supply with charger float voltage monitoring and alarming to ensure correct float voltage is being applied on the station dc supply (See Table 2)		No periodic verification of float voltage of battery charger is required
Any battery based station dc supply with monitoring and alarming of battery string continuity (See Table 2)		No periodic verification of the battery continuity is required.
Any battery based station dc supply with monitoring and alarming of the intercell and/or terminal connection detail resistance of the entire battery (See Table 2)		No periodic verification of the intercell and terminal connection resistance is required.
Any lead acid battery based station dc supply with internal ohmic value monitoring, and evaluating present values relative to baseline internal ohmic values for every cell/unit (See Table 2)		.No periodic measurement and evaluation relative to baseline of battery cell/unit internal ohmic values is required to verify the station battery can perform as designed .
Any Valve Regulated Lead-Acid (VRLA) station battery with monitoring and alarming of each cell/unit internal Ohmic value. (See Table 2)		No periodic inspection of the condition of all individual units by measuring battery cell/unit internal ohmic values of a station VRLA battery is required.

Table 1-5 Component Type - Control Circuitry Associated With Protective Functions **Note:** Table requirements apply to all Control Circuitry components of Protection Systems, UVLS and UFLS Systems, and SPSs except as noted.		
Component Attributes	**Maximum Maintenance Interval**	**Maintenance Activities**
Trip coils or actuators of circuit breakers, interrupting devices, or mitigating devices (excluding UFLS or UVLS systems).	6 calendar years	Verify that each trip coil is able to operate the circuit breaker, interrupting device, or mitigating device.
Trip coils of circuit breakers and interrupting devices in UFLS or UVLS systems.	No periodic maintenance specified	None.
Electromechanical lockout and/or tripping auxiliary devices which are directly in a trip path from the protective relay to the interrupting device trip coil.	6 calendar years	Verify electrical operation of electromechanical trip and auxiliary devices.
Unmonitored control circuitry associated with protective functions.	12 calendar years	Verify all paths of the control and trip circuits.
Control circuitry whose continuity and energization or ability to operate are monitored and alarmed (See Table 2).	No periodic maintenance specified	None.

Table 2 – Alarming Paths and Monitoring In Tables 1-1 through 1-5, alarm attributes used to justify extended maximum maintenance intervals and/or reduced maintenance activities are subject to the following maintenance requirements		
Component Attributes	**Maximum Maintenance Interval**	**Maintenance Activities**
Any alarm path through which alarms in Tables 1-1 through 1-5 are conveyed from the alarm origin to the location where corrective action can be initiated, and not having all the attributes of the "Alarm Path with monitoring" category below. Alarms are reported within 24 hours of DETECTION to a location where corrective action can be initiated.	12 Calendar Years	Verify that the alarm path conveys alarm signals to a location where corrective action can be initiated.
Alarm Path with monitoring: The location where corrective action is taken receives an alarm within 24 hours for failure of any portion of the alarming path from the alarm origin to the location where corrective action can be initiated.	No periodic maintenance specified	No periodic maintenance specified.

PRC-005 — Attachment A

Criteria for a Performance-Based Protection System Maintenance Program

Purpose: To establish a technical basis for initial and continued use of a performance-based Protection System Maintenance Program (PSMP).

To establish the technical justification for the initial use of a performance-based PSMP:

1. Develop a list with a description of components included in each designated segment of the Protection System component population, with a minimum **segment** population of 60 components.
2. Maintain the components in each segment according to the time-based maximum allowable intervals established in Tables 1-1 through 1-5 until results of maintenance activities for the segment are available for a minimum of 30 individual components of the segment.
3. Document the maintenance program activities and results for each segment, including maintenance dates and countable events for each included component.
4. Analyze the maintenance program activities and results for each segment to determine the overall performance of the segment and develop maintenance intervals.
5. Determine the maximum allowable maintenance interval for each segment such that the segment experiences **countable events** on no more than 4% of the components within the segment, for the greater of either the last 30 components maintained or all components maintained in the previous year.

> **Segment** – *Protection Systems or components of a consistent design standard, or a particular model or type from a single manufacturer that typically share other common elements. Consistent performance is expected across the entire population of a segment. A segment must contain at least sixty (60) individual components.*

> **Countable Event** – *A component which has failed and requires repair or replacement, any condition discovered during the maintenance activities in Tables 1-1 through 1-5 which requires corrective action, or a Misoperation attributed to hardware failure or calibration failure. Misoperations due to product design errors, software errors, relay settings different from specified settings, Protection System component configuration errors, or Protection System application errors are not included in Countable Events.*

To maintain the technical justification for the ongoing use of a performance-based PSMP:

1. At least annually, update the list of Protection System components and segments and/or description if any changes occur within the segment.
2. Perform maintenance on the greater of 5% of the components (addressed in the performance based PSMP) in each segment or 3 individual components within the segment in each year.
3. For the prior year, analyze the maintenance program activities and results for each segment to determine the overall performance of the segment.

4. Using the prior year's data, determine the maximum allowable maintenance interval for each segment such that the segment experiences countable events on no more than 4% of the components within the segment, for the greater of either the last 30 components maintained or all components maintained in the previous year.
5. If the components in a Protection System segment maintained through a performance-based PSMP experience 4% or more countable events, develop, document, and implement an action plan to reduce the countable events to less than 4% of the segment population within 3 years.