



MRO Copyright 2007

STANDARDS COMMITTEE  
MIDWEST RELIABILITY ORGANIZATION

# Standard Application Guide PRC-005-2

MRO PRC-005-2 Subject Matter Expert Team  
April 8, 2015

Promoting RELIABILITY and Mitigating  
RISKS to the Bulk Power System



### Disclaimer

The Midwest Reliability Organization (MRO) Standards Committee (SC) is committed to providing training and non-binding guidance to industry stakeholders regarding existing and emerging Reliability Standards. Any materials, including presentations, were developed through the Standards Committee by Subject Matter Experts from member organizations within MRO.

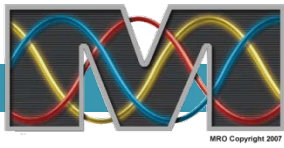
The materials have been reviewed by MRO staff and provide reasonable application guidance for the standard(s) addressed. Ultimately, demonstrating compliance depends on a number of factors including the precise language of the standard, the specific facts and circumstances, and quality of evidence.

These documents may be reproduced or distributed to any person or entity only in its entirety.



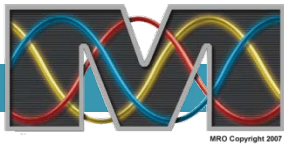
# Topics

- **Purpose**
- **Definitions**
- **Facilities: Protection Systems included or excluded**
- **Acceptable Maintenance Activities for each element of Protection System**
- **Acceptable Maintenance Activities for UFLS/UVLS equipment**
- **Performance Based Maintenance**
- **Implementation Plan**
- **References**



# Purpose

- This is a guidance document that is intended to assist entities to meet the requirements of and maintain compliance with NERC Reliability Standard PRC-005-2 – Protection System Maintenance.
- The team has also prepared this presentation and example documentation from their utilities to provide a Standards Application Guide (SAG) overview and help guide entities on applicability of Bulk Electric System (BES) Facilities to the Standard.



## PRC-005-2

- **Merges and retires the following NERC Reliability Standards**
  - PRC-005-1
  - PRC-008-0
  - PRC-011-0
  - PRC-017-0
- **Addresses FERC directives from Order 693, including that NERC establish maximum allowable maintenance intervals**
- **No basis required**



## PRC-005-2

- **Specific maintenance activities and intervals. Dependent on**
  - Equipment type
  - Type of Monitoring used
  - Time based or performance based
- **Performance-Based (any component beside DC supply)**
- **No grace periods that would exceed maximum intervals**
- **No exceptions**



# Topics

- Purpose
- **Definitions**
- **Facilities: Protection Systems included or excluded**
- **Acceptable Maintenance Activities for each element of Protection System**
- **Acceptable Maintenance Activities for UFLS/UVLS equipment**
- **Performance Based Maintenance**
- **Implementation Plan**
- **References**



# “Protection System” 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.**

Source: [Glossary of Terms](#) used in NERC Reliability Standards.





# “Protection System Maintenance Program (PSMP)” Definition

An ongoing program by which Protection System, Automatic Reclosing (PRC-005-3), and Sudden Pressure (PRC-005-4) 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:



# “Protection System Maintenance Program (PSMP)” Definition (cont’d)

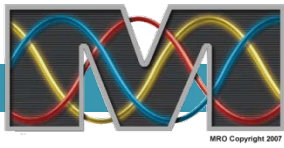
- **Verify** — Determine that the Component is functioning correctly.
- **Monitor** — Observe the routine in-service operation of the component.
- **Test** — Apply signals to a component to observe functional performance or output behavior, or to diagnose problems.
- **Inspect** — Examine for signs of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

Source: [Glossary of Terms](#) used in NERC Reliability Standards.



# Topics

- Purpose
- Definitions
- **Facilities: Protection Systems included or excluded**
- Acceptable Maintenance Activities for each element of Protection System
- Acceptable Maintenance Activities for UFLS/UVLS equipment
- Performance Based Maintenance
- Implementation Plan
- References



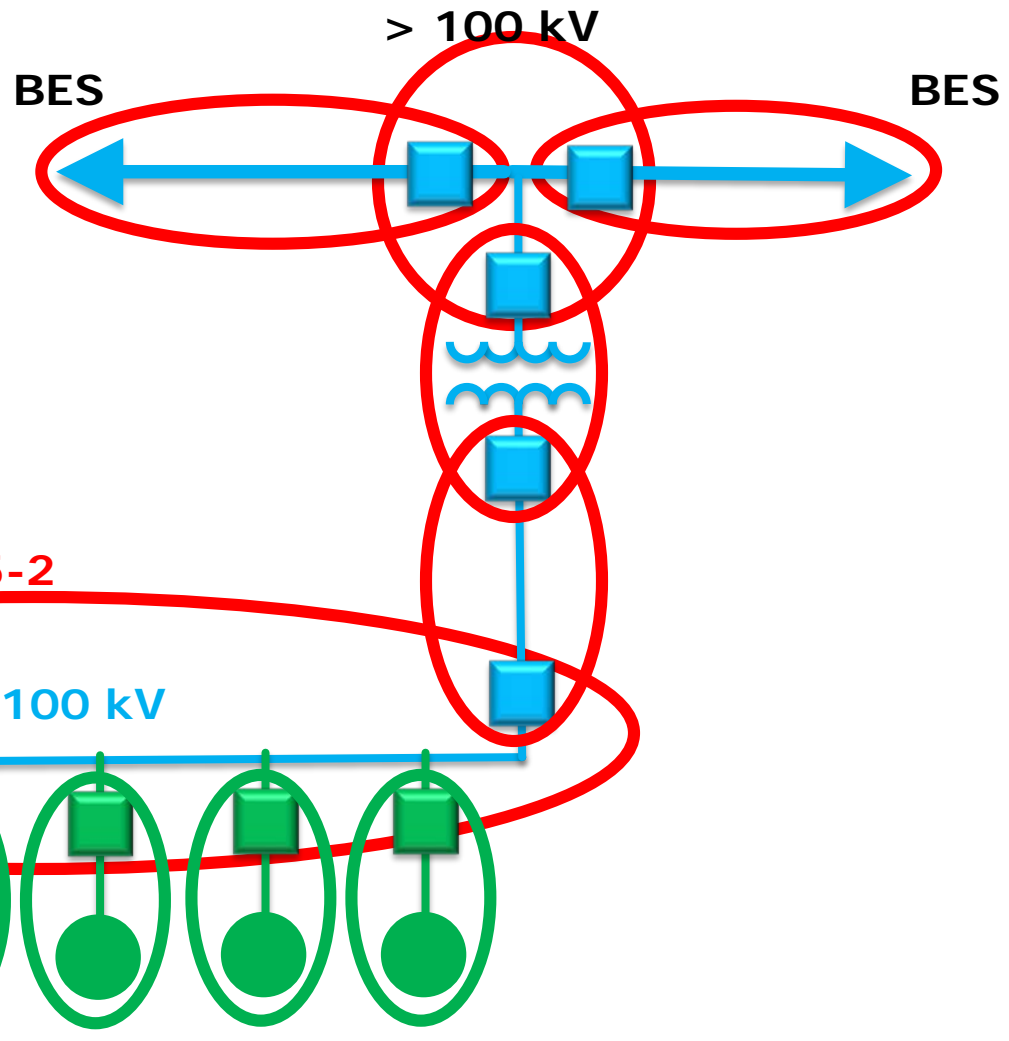
# Protection Systems Included

- 1. Protection Systems that are installed for the purpose of detecting Faults on BES Elements (lines, buses, transformers, etc.) PRC-005-2, §4.2.1.**

**Note:** This does not include out of step tripping or blocking

# The Outage Of Any One Element That Would Cause The Outage Of > 75 MVA Of Generation

Aggregated generation directly connected to the BES through a low voltage system



**Total Generation > 75 MW**

The MRO Standards Committee is an industry stakeholder committee which includes subject matter experts from MRO member organizations in various technical areas. Any materials, guidance, and views from stakeholder committees are meant to be helpful to industry participants; but should not be considered approved or endorsed by MRO staff or its board of directors unless specified.

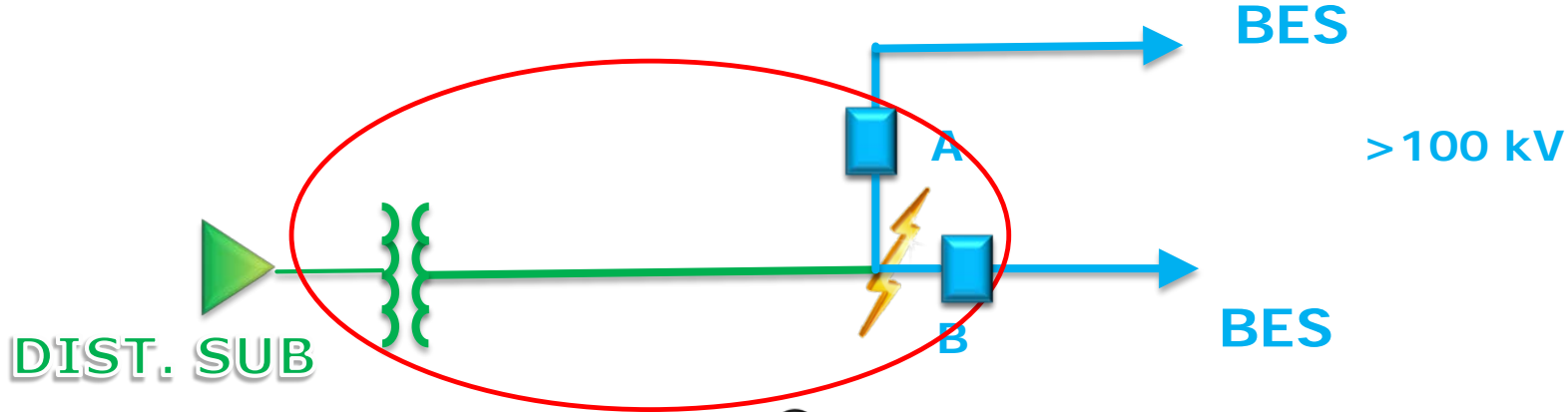


# Protection Systems Included (continued)

2. **If a protection zone encompasses BES and non-BES elements, then this protection is covered by PRC-005-2.**
  - a) Transformer Protection that is connected to CT's on a BES-breaker (i.e., ring bus or breaker and a half). This protection system not only protects the transformer, but also protects a BES-bus and detects Faults on BES Elements (BES-bus).
  - b) Radial lines directly connected to BES ring bus or breaker and a half bus.

# Distribution Transformer Protection connected to CTs on BES breakers

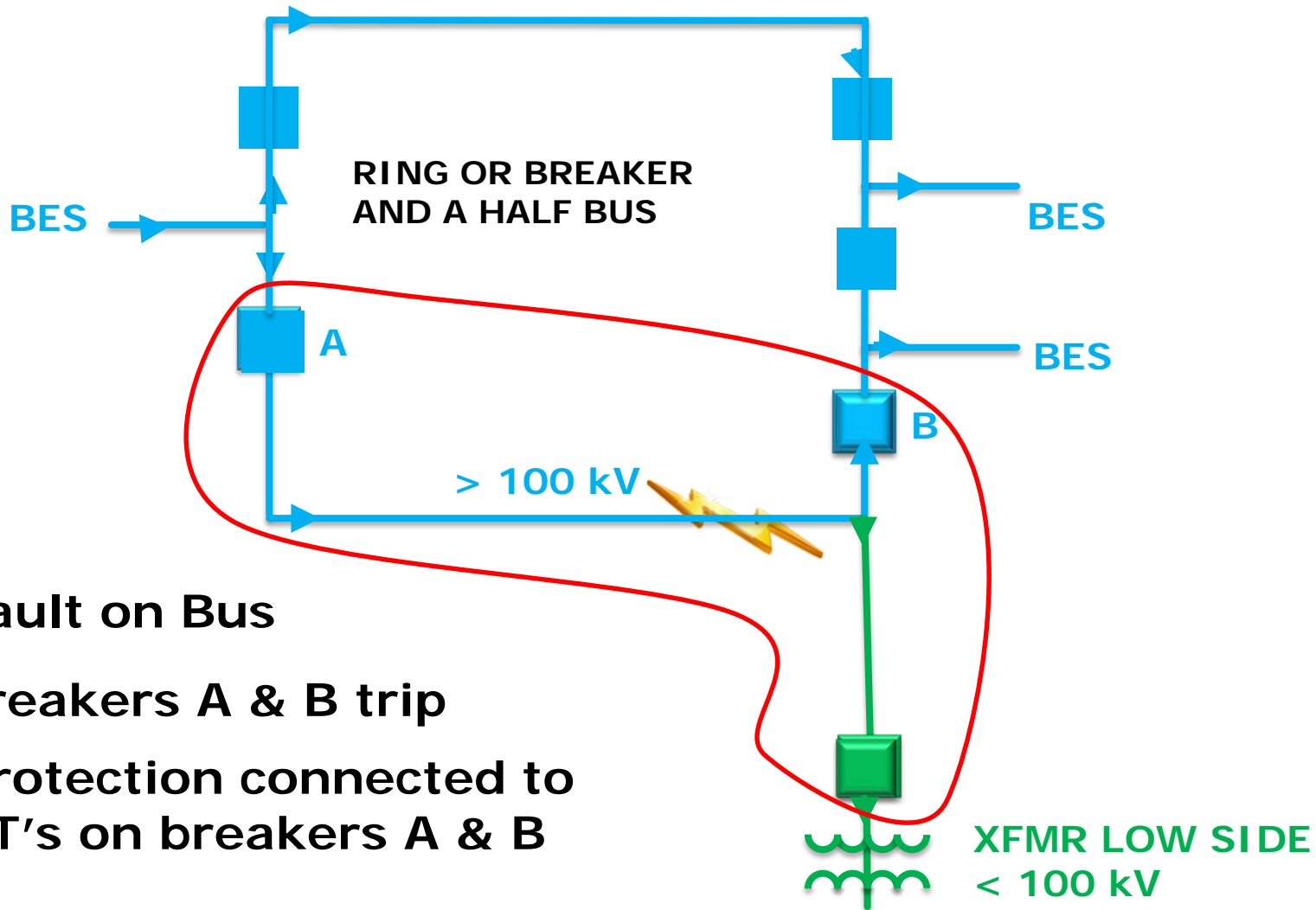
Protection Included in PRC-005-2: per §4.2.1



- 1
  - 2
- FAULT ON BUS**
- 2
- BREAKERS A AND B OPERATE**

**NOTE:** Transformer Differential Protection is connected to CTs on breakers A and B. The purpose of the protection includes the **BES** bus between breakers A and B, and detects faults on either the **BES** bus or the **NON-BES** line and transformer (**Zone of protection circled in Red**).

# Radial Transmission Line Protection connected to CTs on BES breakers



- 1 Fault on Bus
- 2 Breakers A & B trip
- 3 Protection connected to CT's on breakers A & B

**NOTE:** Radial Line Protection is connected to CTs on breakers A and B. The purpose of the protection includes the BES bus between breakers A and B, and detects faults on either the BES bus or the NON-BES radial line (Zone of protection circled in Red).



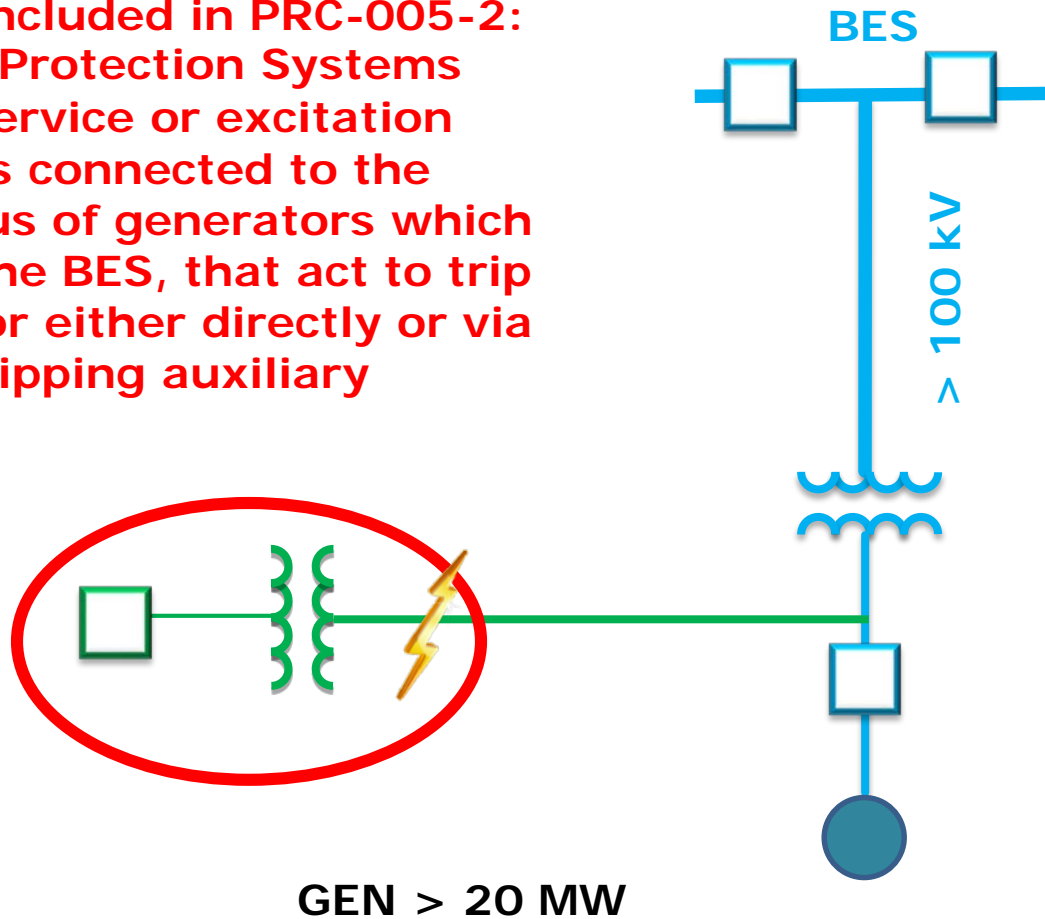


# Protection Systems Included (continued)

- 3. Protection Systems for station service or excitation transformers connected to the generator bus of generators which are part of the BES, that act to trip the generator either directly or via lockout or tripping auxiliary relays. (PRC-005-2, §4.2.5.4).**

# Station Service Transformer Protection System trips BES generator

Station service transformer Protection Included in PRC-005-2: per §4.2.5.4 Protection Systems for station service or excitation transformers connected to the generator bus of generators which are part of the BES, that act to trip the generator either directly or via lockout or tripping auxiliary relays.



GEN > 20 MW



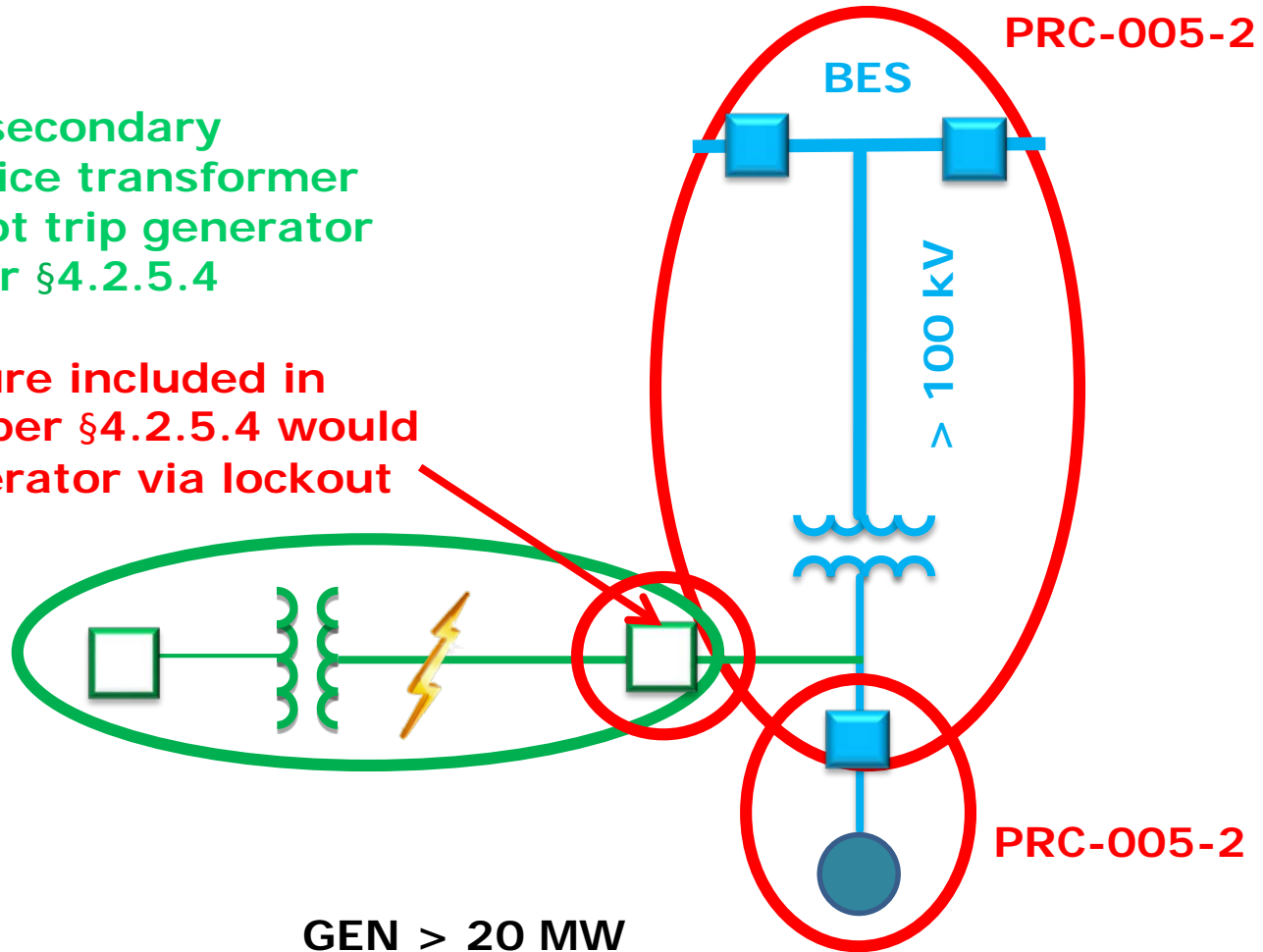
# Protection Systems Included (continued)

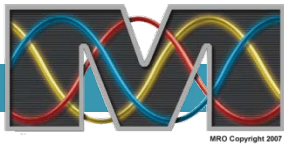
- 4. Any breaker failure relay that detects the failure of a breaker that is defined as a BES breaker, or non-BES breaker that trips a single BES generator or an aggregate of BES generators.**

# Station Service Transformer Protection System does not trip BES generator

Primary or secondary station service transformer that does not trip generator excluded per §4.2.5.4

Breaker failure included in PRC-005-2: per §4.2.5.4 would trip the generator via lockout relay.

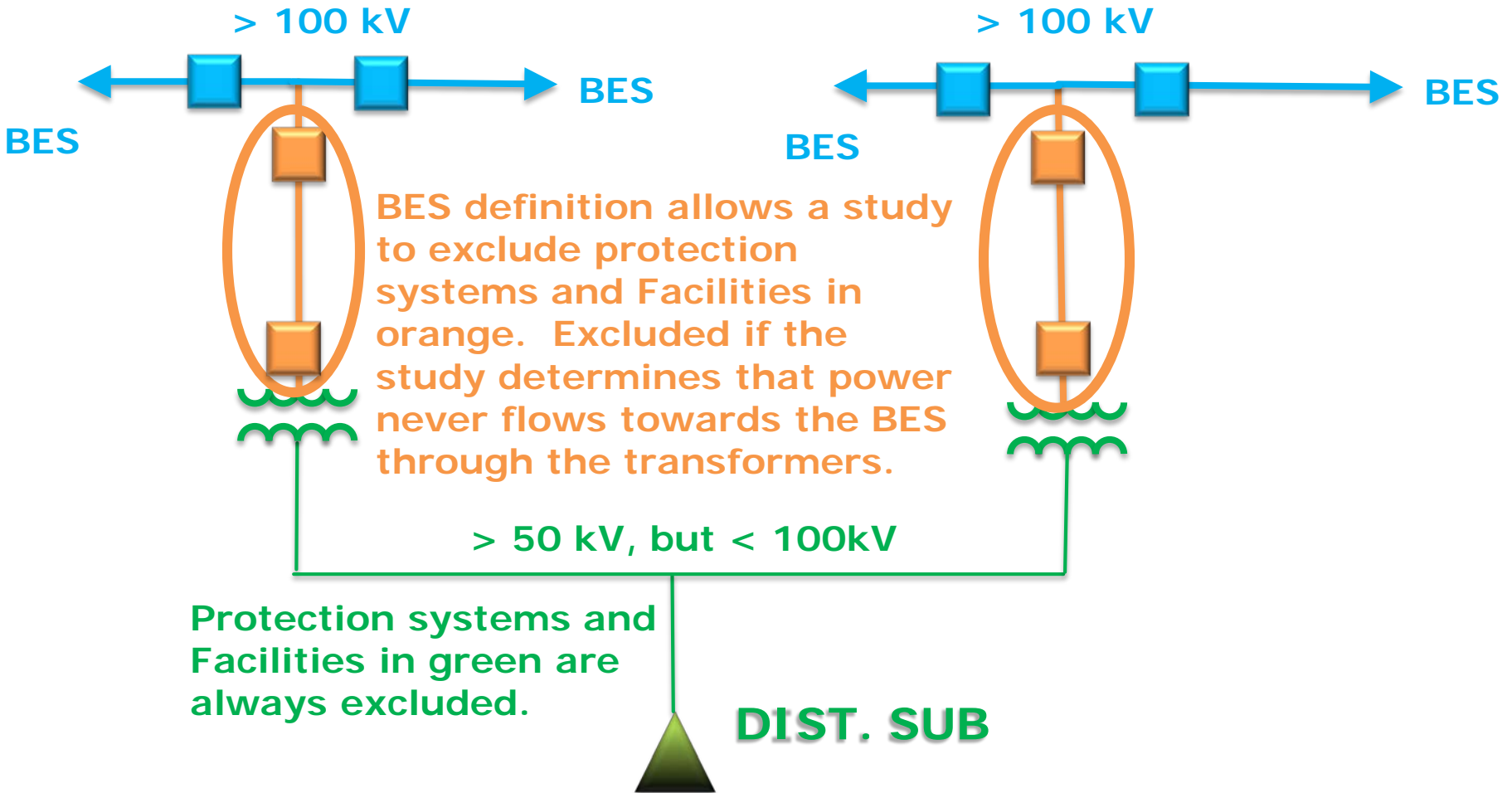




# Protection Systems Included, unless study is done to show it should be excluded

- A study can be done to exclude Facilities and their protection systems. The study to exclude this Facility and protection system should determine if power never flows in the reverse direction through the transformer into the BES under any scenario or contingency(s), or actual power flow through the transformer is measured and has not been shown to flow into the BES.

# > 100 kV Radial Lines Connected By A Looped Subtransmission System

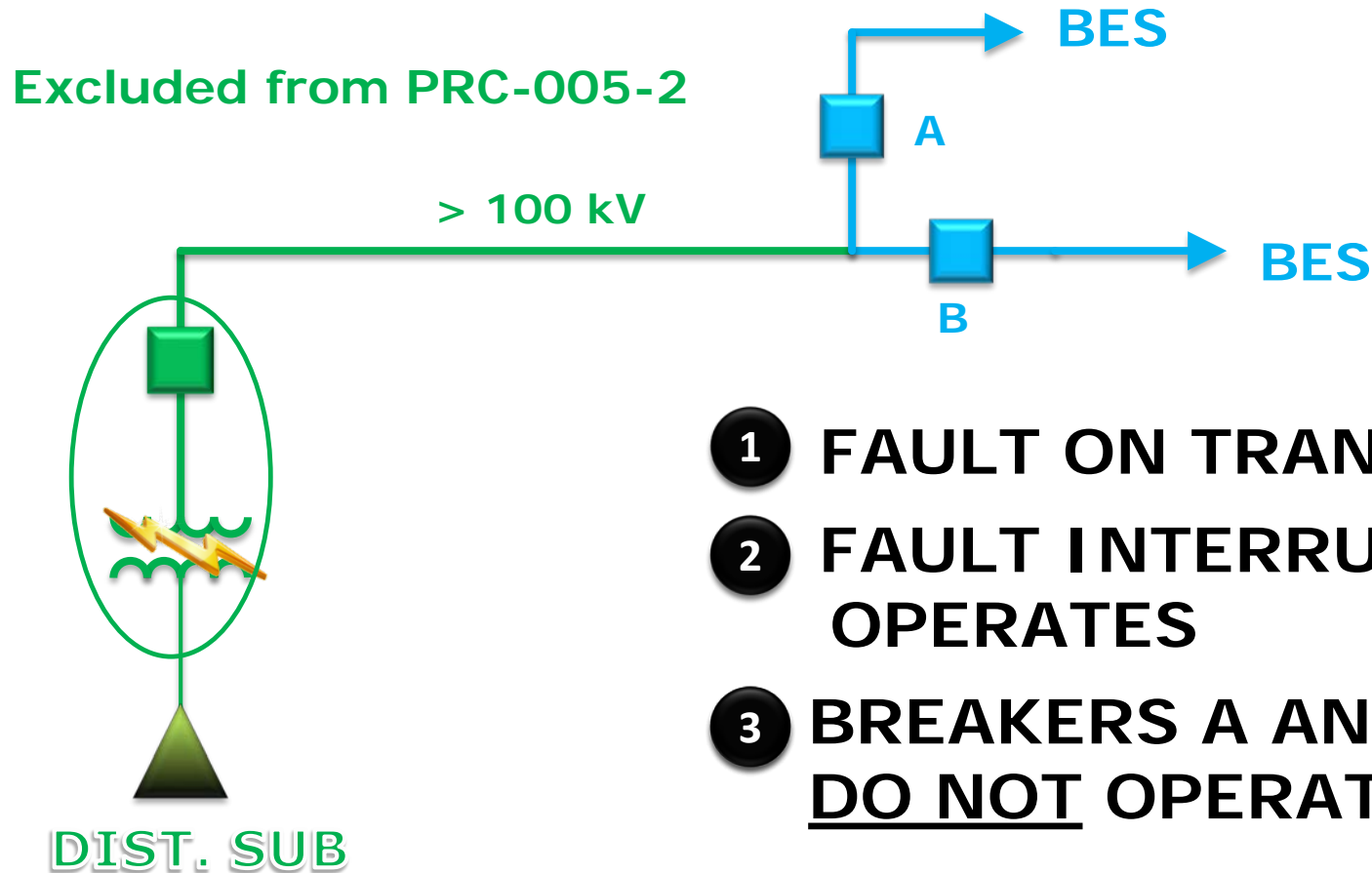




# Protection Systems Excluded

- 1. If the protection zone covers only non-BES elements, then the protection scheme is not covered by PRC-005-2.**

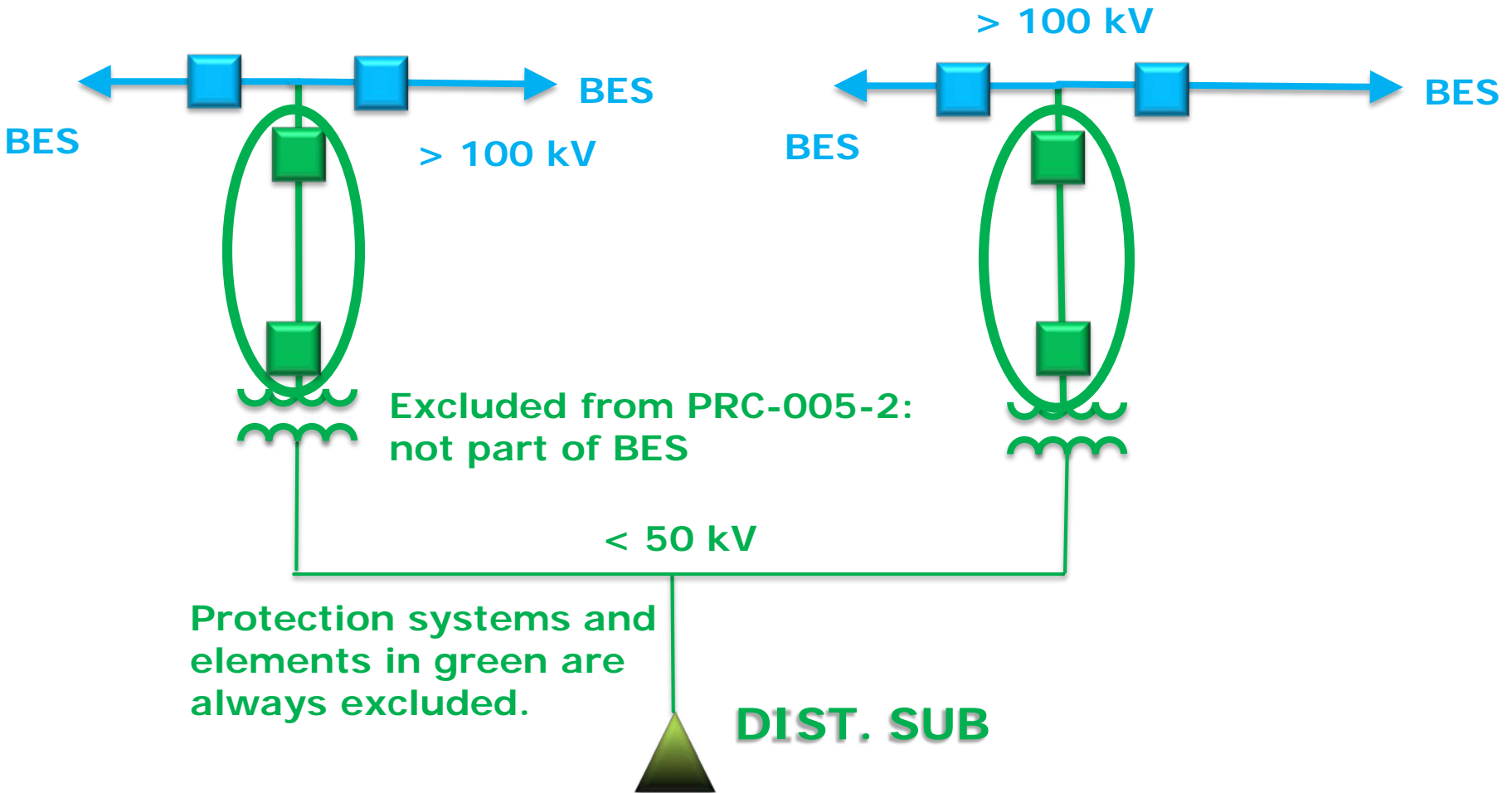
# Distribution Transformer protection connected to CTs on Non-BES breaker



- 1 FAULT ON TRANSFORMER
- 2 FAULT INTERRUPTER OPERATES
- 3 BREAKERS A AND B DO NOT OPERATE



# > 100 kV Radial Lines Connected By A Looped Subtransmission System



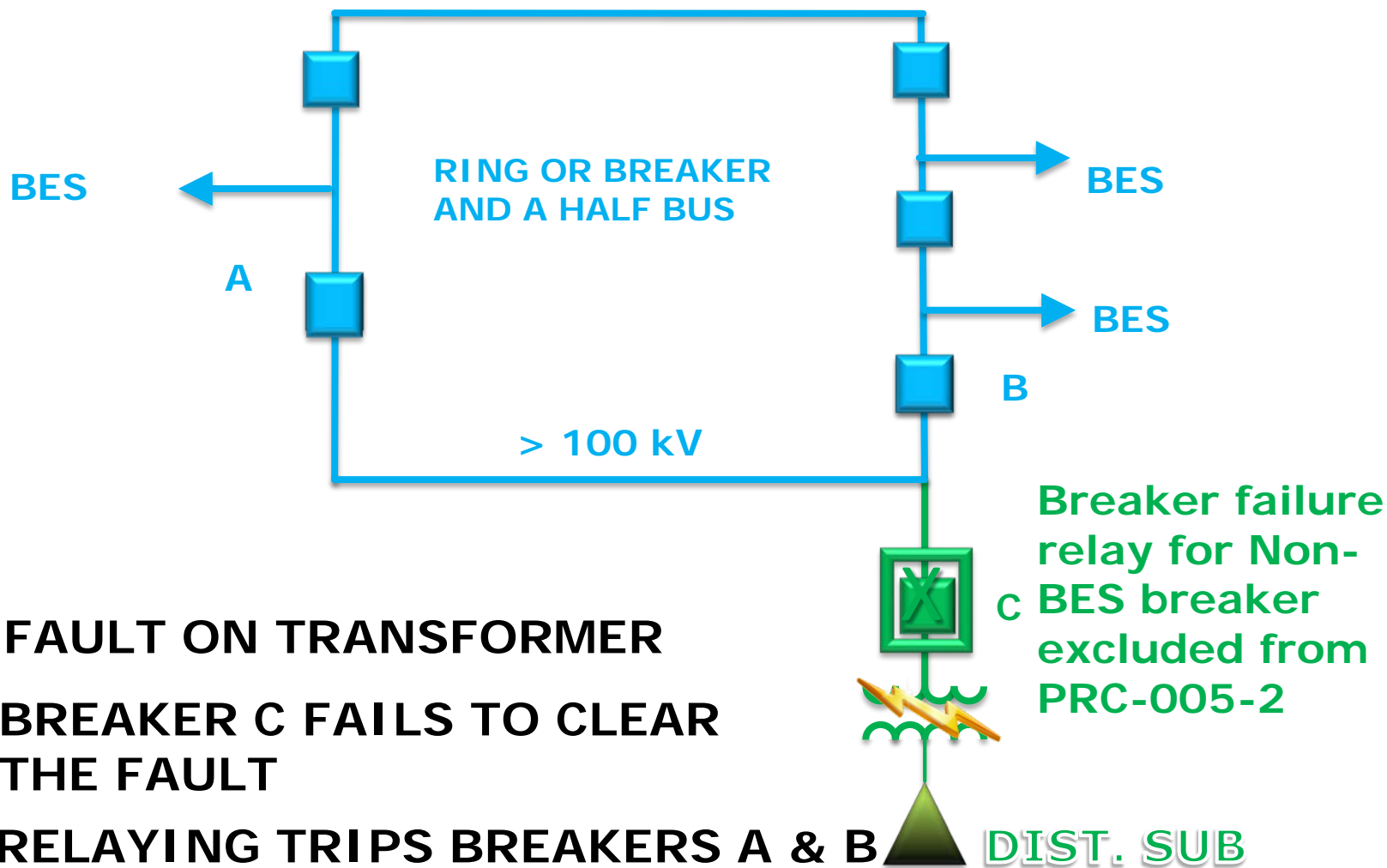


# Protection Systems Excluded (continued)

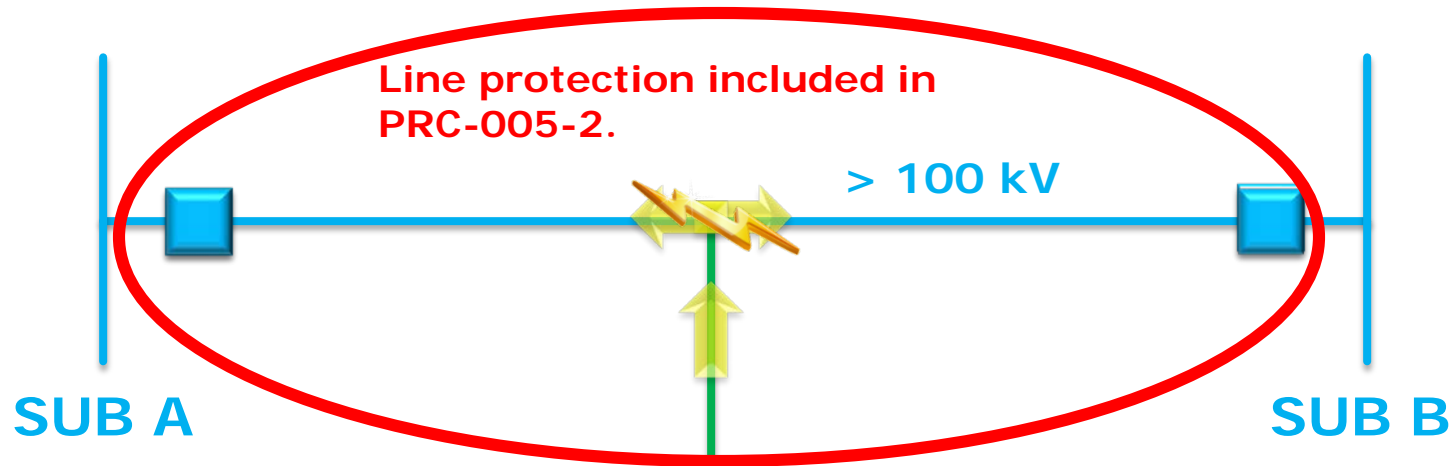
- 2. Any breaker failure relay for a breaker that is defined as a non-BES breaker, unless that breaker fail relay trips a BES generator. (i.e., the high-side or low-side breaker of a non-BES transformer connected to a BES bus.)**

**Note:** Even though this relay may detect Faults on BES Element (the BES bus), the purpose of the relay is to detect current flowing through the failed non-BES breaker.

# Transformer Breaker Failure Protection for Non-BES Breaker



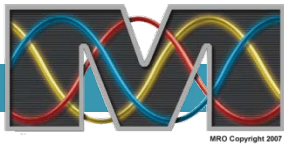
# Breaker Failure W/ Transfer Trip



**Note:** Excluded from PRC-005-2 even if breaker failure relaying protecting transformer from failed Non-BES interrupter can detect BES fault current. Its purpose is to detect any current flowing through Breaker C.

**Non-BES SUB w/ distributed generation backfeed**

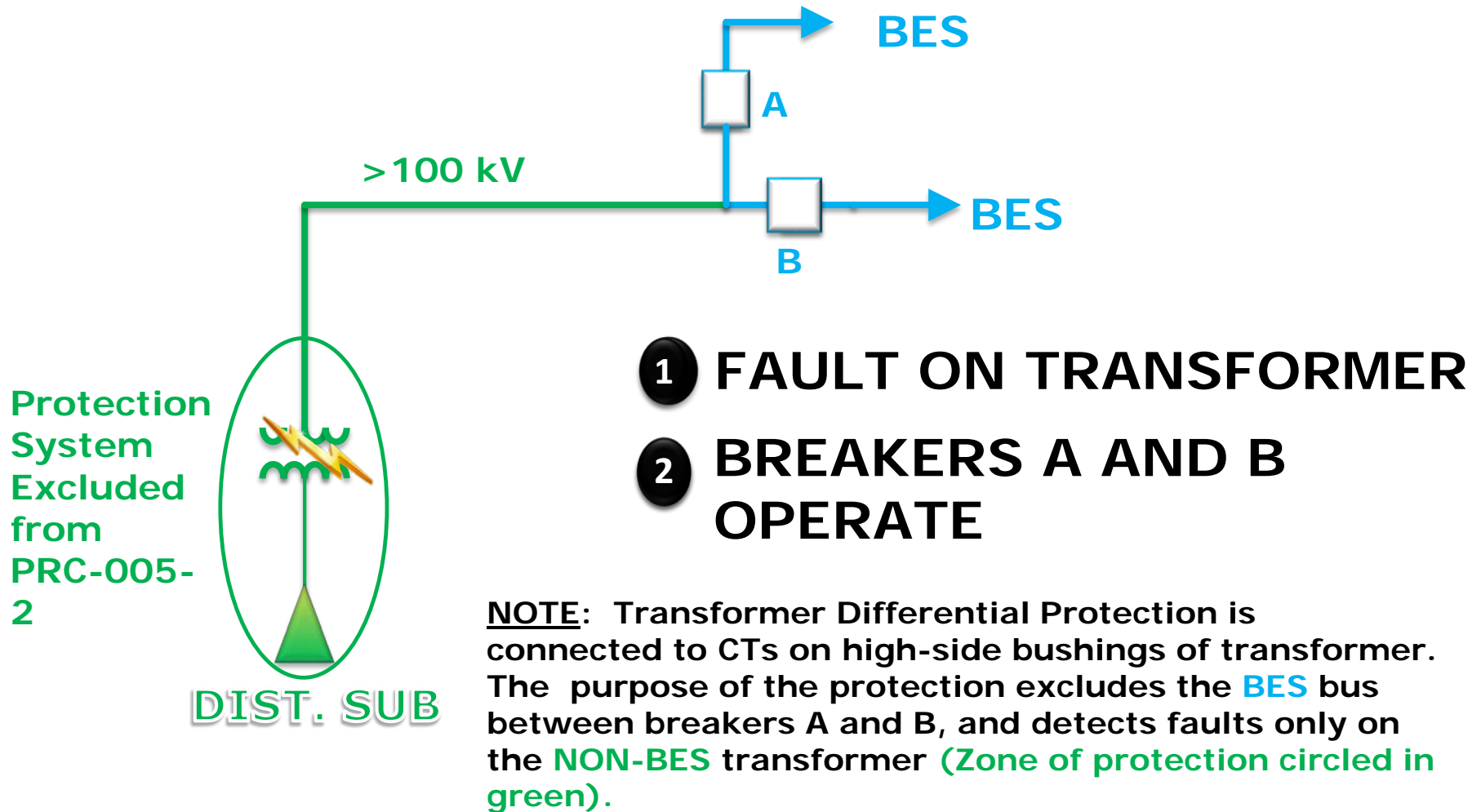
- 1 Fault on **BES** line
- 2 **Non-BES Breaker C** fails to clear fault
- 3 Transfer Trip sent to **Sub A** & **Sub B** is excluded



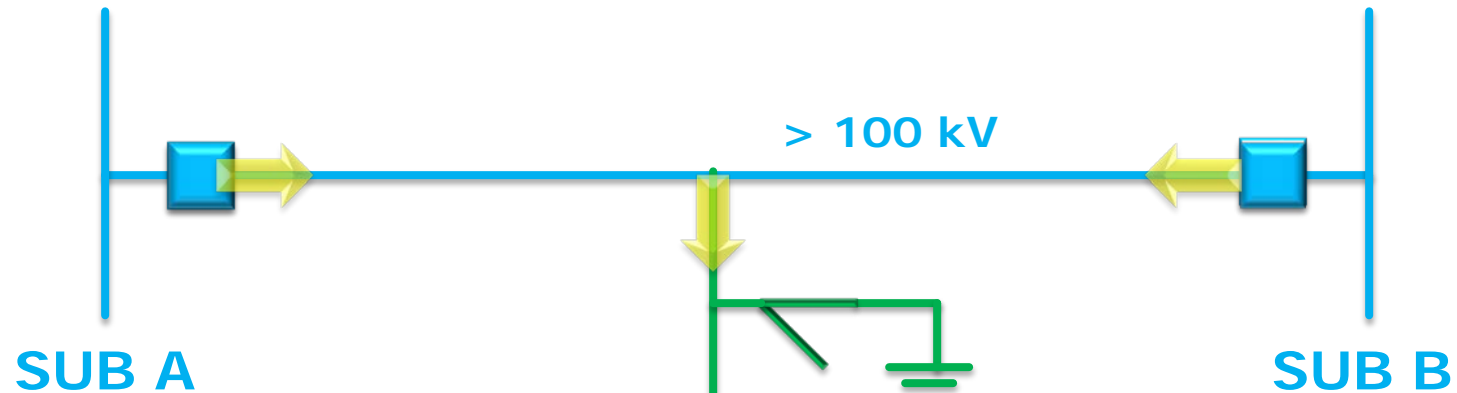
# Protection Systems Excluded (continued)

- 3. Any protection system installed for the purpose of detecting Faults on only non-BES Elements regardless of the actions of that protection system opening or disconnecting a BES element.**

# Distribution Transformer protection connected to CTs on Non-BES transformer



# Protective Relay Operated Grounding Switch

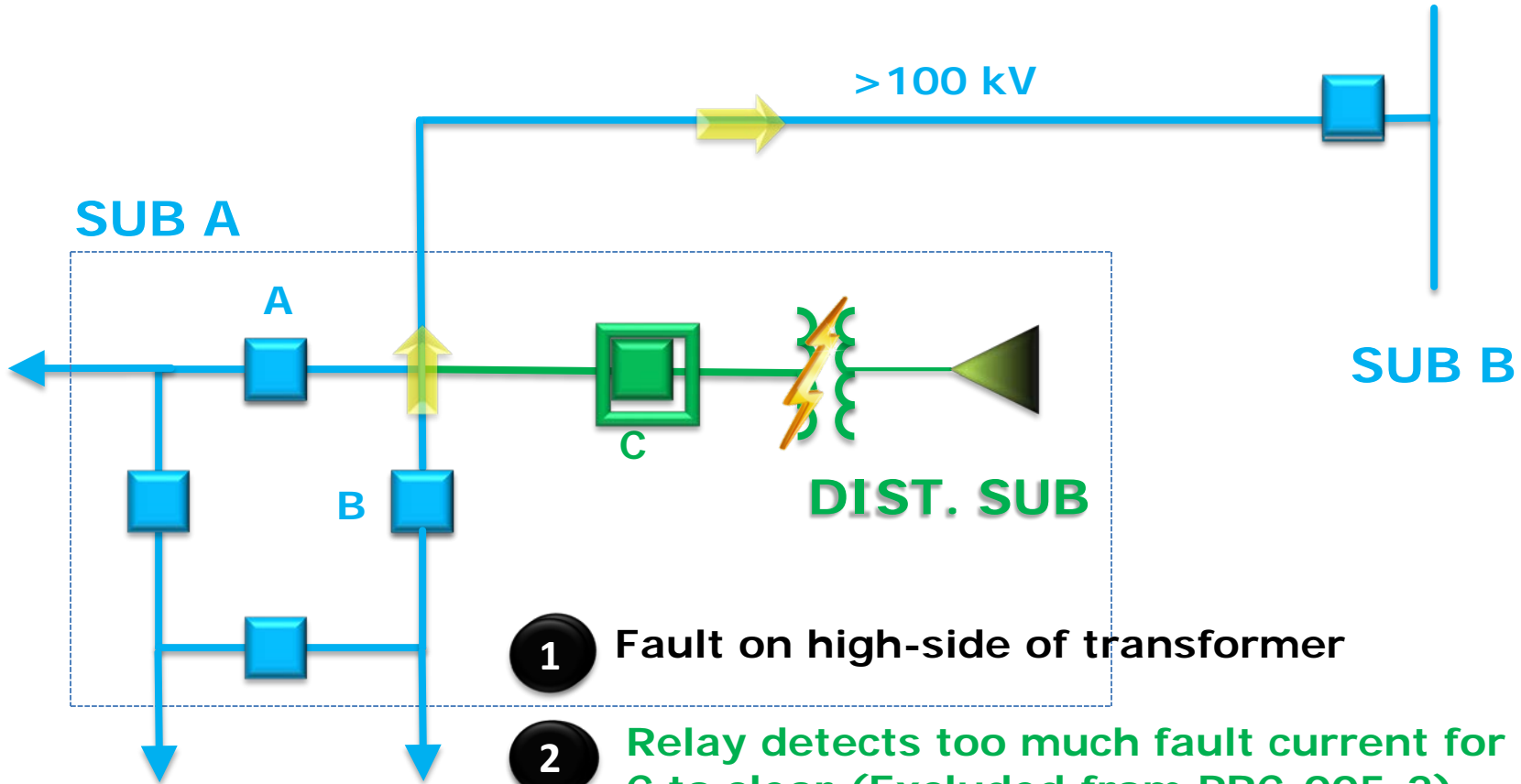


**1** FAULT ON LOW-SIDE OF TRANSFORMER

**2** Distribution relay closes ground switch (Protection Excluded). Its purpose is to protect Non-BES transformer

**3** RELAYS AT SUB A & SUB B DETECT GROUND FAULT (Protection included)

# Transfer Trip



- 1 Fault on high-side of transformer
- 2 Relay detects too much fault current for C to clear (Excluded from PRC-005-2)
- 3 Relaying trips A/B & sends Transfer Trip to SUB B





# Control Systems Excluded (continued)

- 4. A control system that acts to trip the generator is excluded from PRC-005-2. A control system is not considered a protection system.**

**Subject Matter Expert Team (SMET) considers these as protection systems:**

- loss of field
- reverse power

**And these as control system examples:**

- exciter controls
- capacitor controls



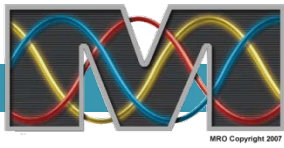
# Topics

- Purpose
- Definitions
- Facilities: Protection Systems included or excluded
- **Acceptable Maintenance Activities for each element of Protection System**
- Acceptable Maintenance Activities for UFLS/UVLS equipment
- Performance Based Maintenance
- Implementation Plan
- References



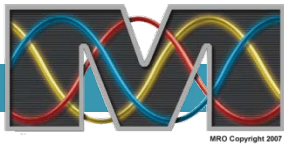
# Protective Relay Maintenance Activities (Table 1-1 and Table 2)

- **Verify that settings are as specified:**
  - A check box stating the relay settings were verified
  - Pass/Fail or Yes/No/NA relays setting verification stated in relay test report



# Protective Relay Maintenance Activities (Table 1-1 and Table 2) (continued)

- **For non-microprocessor relays:**
  - Test and, if necessary calibrate (only activity that requires more than a check box)
- **Relay test report**
  - Date
  - Relay identification
  - Tester ID (not required, but is a good control)
  - Test results proving the test was performed (lock out relay (LOR) and auxiliary relays are tested per Table 1-5 for Control Circuitry)
  - Pass/Fail-is auditor friendly but not required



# Protective Relay Maintenance Activities (Table 1-1 and Table 2) (continued)

**Note:** Relay calibration is not required to be documented, but this may be helpful for asset renewal.



# Protective Relay Maintenance Activities (Table 1-1 and Table 2) (continued)

- **For microprocessor relays:**
  - Verify operation of the relay inputs and outputs that are essential to proper functioning of the Protection System.
    - ✓ A check box stating the essential relay outputs/inputs were verified
    - ✓ Pass/Fail essential relay outputs/inputs verification stated in relay test report
    - ✓ A check box stating the relay monitoring alarms were verified
    - ✓ Pass/Fail essential relay monitoring alarm verification stated in relay test report



## Protective Relay Maintenance Activities (Table 1-1 and Table 2) (continued)

**Note:** Verify the actual operation of the output contact (i.e., test continuity at test switch, trip LOR, or trip breaker). Viewing an event report does not confirm the output actually closed; it only proves the logic to actuate the output picked up. Inputs can be confirmed via event reports.





# Protective Relay Maintenance Activities (Table 1-1 and Table 2) (continued)

- **For microprocessor relays:**

- Verify acceptable measurement of power system input values.
  - ✓ A check box stating during the CT/PT testing, if there is another CT/PT value to be compared to. (i.e. if you compare the energized system metered values within the primary relay to the secondary relay. This would satisfy both your AD convertor testing and PT/CT testing.)
  - ✓ A check box stating currents or voltages measured by an independent meter were accurately measured within the relay.
  - ✓ A check box stating known currents or voltages were injected from a test set and verified to be accurately measured within the relay.
  - ✓ A test report showing known currents or voltages were injected from a test set and verified to be accurately measured within the relay.





# Sample Tests for a Protective Relay

- **Electro-Mechanical or Solid-State**



Adobe Acrobat  
Document

- **Microprocessor**



Adobe Acrobat  
Document



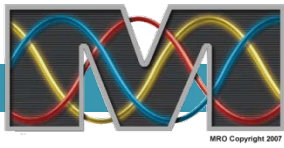
# Microprocessor Relay Test Example

<b>Verified A/D accuracy:</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unk
<b>Provided as left A/D test file:</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unk
<b>Verified outputs:</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unk
<b>Verified inputs:</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unk
<b>DC Voltage Supply:</b>	129.5 volts
<b>Verified metering:</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unk
<b>Verified settings:</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unk
<b>Provided as left metering file:</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unk
<b>Notes/Comments:</b>	Alarms tested



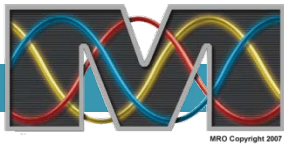
# Communication Systems Maintenance Activities (Table 1-2 and Table 2)

- 1. Verify that the communications system is functional, by verifying a signal initiated at the sending end results in correct receiver output at the remote end.**
- 2. Verify operation of communications system inputs and outputs that are essential to proper functioning of the Protection System.**
- 3. Verify that the alarm path conveys alarm signals to a location where corrective action can be initiated (Table 2).**



# Communication Systems Maintenance Activities (Table 1-2 and Table 2)

- A check box stating the verification of each required maintenance activity of Communication Systems above.
- Verify that the communications system meets performance criteria pertinent to the communications technology applied (e.g., signal level, reflected power, or data error rate).



# Tests for Communication

## • Communication test report

- Date
- Communication equipment identification or associated relay identification
- Check box stating transmitted/received levels were adequate or record transmitted/received levels (for power line carrier, tone, and microwave only). Not applicable to digital
- Check box stating reflective power was adequate or record Reflective power levels (for power line carrier, tone, and microwave only). Not applicable to digital
- Record propagation and/or data error rate (for fiber/digital only), unless monitored
- Pass/Fail-is auditor friendly but not required

Sample Carrier



Adobe Acrobat  
Document

Sample Digital



Adobe Acrobat  
Document



# Voltage and Current Sensing Devices Maintenance Activities (Table 1-3 and Table 2)

- A check box stating verify that current and voltage signal values are provided to the protective relays.
- A meter command from a microprocessor
- Pass/Fail verify that current and voltage signal values are provided to the protective relays stated in test report
- Measured current or voltage values recorded



# Sample Test for Voltage and Current

- **CTs/PTs**



Adobe Acrobat  
Document





# Station DC Supply Maintenance Activities (Table 1-4 and Table 2)

- All required battery maintenance activities and documentation are fairly straight forward.
- In order to verify battery continuity you could turn off battery charger, and clamp onto the battery load terminals and verify current is flowing to station DC load. This can be documented by either a check box or pass/fail of battery continuity verified.
- Note: If an entity decides not to do load testing, the entity must have a station battery baseline for impedance testing.
- Table 1-4(e) requires the DC Voltage to be measured for an unmonitored SPS tripping non-BES breakers, non-distributed UFLS systems, or non-distributed UVLS systems every 12 calendar years. This can be documented by either a check box or pass/fail of DC voltage verified, or the recording of the measured value.
- Table 1-4(f) does enable exclusions from maintenance activities for monitored Station DC supplies.





# Sample Tests for DC Supply

- **4 month**



Adobe Acrobat  
Document

- **18 month**



Adobe Acrobat  
Document

- **6 year**



Adobe Acrobat  
Document



# Control Circuitry Maintenance Activities (Table 1-5)

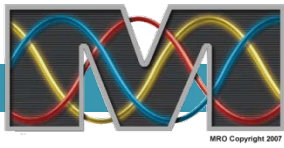
- **Any test below is acceptable**
  - A check box stating the verification of any required maintenance activity of Control Circuitry
  - Highlighted schematics or one-lines
  - A detailed list of each trip path for a breaker, auxiliary relay, or LOR that is signed and dated



# Control Circuitry Maintenance Activities (Table 1-5)

- For lockout testing PRC-005-2 requires a functional trip. As an example, a test using a relay output and station battery DC to trip the LOR is adequate.
- Any breaker that is determined to be non-BES does not have to be tripped, even if it is tripped by a BES protective relay or UFLS/UVLS relay that is considered included within PRC-005.

**Note:** Supplementary reference and FAQ Section 15.3



# Sample Tests for Control Circuitry

- **A list of trip paths signed and dated**



Adobe Acrobat  
Document

- **A check box**



Adobe Acrobat  
Document



# Topics

- Purpose
- Definitions
- Facilities: Protection Systems included or excluded
- Acceptable Maintenance Activities for each element of Protection System
- **Acceptable Maintenance Activities for UFLS/UVLS equipment**
- Performance Based Maintenance
- Implementation Plan
- References



## Under Frequency Load Shedding (UFLS)/ Under Voltage Load Shedding (UVLS)

- If the UFLS/UVLS is non-distributed you must follow maintenance activities and intervals in Tables 1-1 through 1-3, Table 1-4(e), and Table 1-5.
  - If the UFLS/UVLS is distributed you must follow maintenance activities and intervals in Table 3.
- After thorough review of UFLS/UVLS activities in PRC-005-2 Tables, the SME Team has determined there is no difference between the maintenance activities of a distributed or non-distributed UFLS/UVLS system.



# UFLS/UVLS Maintenance Activities

- Relay maintenance same as Protection System Maintenance
- Communication maintenance is generally not applicable for non-distributed and not required for distributed
- Voltage Sensing Device maintenance same as Protection System Maintenance
- Station DC Supply maintenance: The DC Voltage is to be verified at the output(s) that trips the interrupting device(s) for a UFLS/UVLS system. Non-distributed Table 1-4(e) or distributed Table 3



# UFLS/UVLS Control Circuitry Maintenance (Table 1-5 or Table 3)

- Path from relay to LOR and/or auxiliary relay and essential supervisory logic
- Electrical operation of electromechanical lockout and/or auxiliary relay
- If it is a BES breaker, need to confirm DC circuitry from relay to breaker and trip breaker





# Sample Tests for UFLS

- **Relay**



Adobe Acrobat  
Document

- **All equipment**



Adobe Acrobat  
Document



# Topics

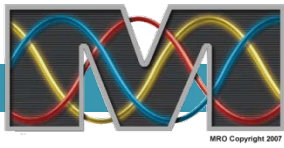
- Purpose
- Definitions
- Facilities: Protection Systems included or excluded
- Acceptable Maintenance Activities for each element of Protection System
- Acceptable Maintenance Activities for UFLS/UVLS equipment
- **Performance Based Maintenance**
- Implementation Plan
- References



# Performance Based Maintenance (Attachment A of PRC-005-2)

To establish performance based maintenance (PBM):

- 1. Determine the population of components in segment. Make sure that population exceeds 60.**
- 2. Maintain per Tables 1-1 through 1-5 and Table 3 (i.e. table 1-5 for breaker trip coils or LORs - 6 years) until maintenance activity results are available for 30 components.**
- 3. Document maintenance activities including maintenance dates and countable events .**
  - Countable event-failure requiring repair or replacement during maintenance
  - Countable event-misoperation due to hardware or calibration failure (i.e. for breakers: only hardware failure applies to trip coils)
- 4. Analyze program to determine maximum maintenance interval not to exceed a 4% failure rate/countable events.**
- 5. Countable events no more than 4% for the greater of either last 30 maintained or all maintained in last year.**



## Example Maximum PBM Interval calculation:

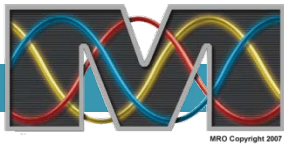
- 1,000 population
- 100 components tested
- 5 countable event

**Failure rate = countable events / components tested =  $5/100 = 5\%$**

**Minimum components tested at Maximum Interval to failure rate of 4%: countable events / (maximum failure rate of 4%) =  $5/.04 = 125$**

**Maximum Interval = population / Minimum components tested at Maximum Interval =  $1000/125 = 8$  years**

**Note:** If countable events = 0, then maintain 5% of population



# Performance Based Maintenance (Attachment A of PRC-005-2)

**To continue to use PBM the applicable entity must:**

- 1. Annually update components and segments.**
- 2. Prove they have tested at least 5% of the population annually.**
- 3. Calculate the maximum interval not to exceed a 4% failure rate/countable events.**
- 4. Analyze prior year data. If the percentage countable events exceed 4% for the greater of either last 30 maintained or all maintained in last year, create an action plan to reduce the countable events below 4% within 3 years.**
- 5. Do not exceed 4% countable events of segment tested for 3 consecutive years following the year the countable events first exceeded 4%.**



# Sample PBM for brand specific LOR

Year	Total Population	Tested	% Tested (must exceed 5%)	# of Failures	Maximum # of Failures (4%)	Maximum PBM Interval
2014	859	49	5.7%	0	1	Test 5%
2013	824	89	10.8%	1	3	32.96 Years
2012	824	62	7.5%	0	2	Test 5%
2011	824	140	17.0%	0	5	Test 5%
2010	824	266	32.3%	0	10	Test 5%
2009	824	205	24.9%	0	8	Test 5%



# Topics

- Purpose
- Definitions
- Facilities: Protection Systems included or excluded
- Acceptable Maintenance Activities for each element of Protection System
- Acceptable Maintenance Activities for UFLS/UVLS equipment
- Performance Based Maintenance
- **Implementation Plan**
- References





# Implementation (from shorter intervals)

- If an applicable entity has an existing maintenance interval that is shorter than the required maintenance intervals within PRC-005-2 and also includes all the maintenance activities within PRC-005-2, then the applicable entity can immediately transition to the new required maintenance intervals.
- If an applicable entity has an existing maintenance interval that is shorter than the required maintenance intervals within PRC-005-2, but does not include all the maintenance activities within PRC-005-2, then the applicable entity can immediately transition to the new required maintenance intervals and activities.





# Implementation (from longer intervals)

- If an applicable entity has an existing maintenance interval that is longer than the required maintenance intervals within PRC-005-2, the applicable entity can transition to the new required maintenance intervals and activities per the Implementation Plan Project 2007-17 Protection Systems Maintenance and Testing PRC-005-2.
  - During the implementation plan you must not exceed your existing (PRC-005-1) maintenance interval.

## PRC-005-2 R3 and R4 Implementation Timelines

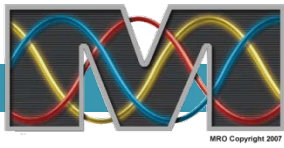
Max. Maintenance Interval	% Compliant	By
Less than 1 year	100%	Oct. 1, 2015 (1D/1Q 18 mo. following regulatory approval)
1–2 calendar years	100%	Apr. 1, 2017 (1D/1Q 36 mo. following regulatory approval)
3 calendar years	30%	Apr. 1, 2016 (1D/1Q 24 mo. following regulatory approval) <sup>1</sup>
3 calendar years	60%	Apr. 1, 2017 (1D/1Q 36 mo. following regulatory approval)
3 calendar years	100%	Apr. 1, 2018 (1D/1Q 48 mo. following regulatory approval)
6 calendar years	30%	Apr. 1, 2017 (1D/1Q 36 mo. following regulatory approval) <sup>2</sup>
6 calendar years	60%	Apr. 1, 2019 (1D/1Q 60 mo. following regulatory approval)
6 calendar years	100%	Apr. 1, 2021 (1D/1Q 84 mo. following regulatory approval)
12 calendar years	30%	Apr. 1, 2019 (1D/1Q 60 mo. following regulatory approval)
12 calendar years	60%	Apr. 1, 2023 (1D/1Q 108 mo. following regulatory approval)
12 calendar years	100%	Apr. 1, 2027 (1D/1Q 156 mo. following regulatory approval)

<sup>1</sup>Or, for generating plants with scheduled outage intervals exceeding two years, at the conclusion of the first succeeding maintenance outage.  
<sup>2</sup> Or, for generating plants with scheduled outage intervals exceeding three years, at the conclusion of the first succeeding maintenance outage.



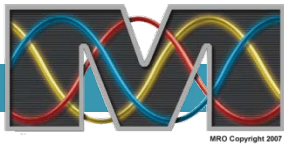
# Topics

- **Purpose**
- **Definitions**
- **Facilities: Protection Systems included or excluded**
- **Acceptable Maintenance Activities for each element of Protection System**
- **Acceptable Maintenance Activities for UFLS/UVLS equipment**
- **Performance Based Maintenance**
- **Implementation Plan**
- **References**



# References

1. NERC Reliability Standard PRC-005-2 – System Protection Maintenance
2. Supplementary reference and FAQ PRC-005-3 System Protection Maintenance
3. NERC Rules of Procedure Appendix 5C - Procedure for Requesting and Receiving an Exception from the Application of the NERC Definition of the BESNERC Glossary of Terms used in Reliability Standards
4. Bulk Electric System Reference Document
5. SMET test procedures



# Conclusion

- PRC-005-2 becomes effective on April 1, 2015 and entities must follow the Implementation Plan
- To be compliant, all entities must develop or revise their PSMP to address the revised PRC-005 Standard (either time-based or performance-based)
- Guidance is provided in this SAG to indicate Protection Systems included or excluded
- The SAG includes acceptable Maintenance Activities for each element of Protection System, including UFLS/UVLS equipment
- Ensure proper documentation is maintained to demonstrate compliance (Typical examples provided)



# For Additional Clarification

**Refer to MRO Standards Application Guide(SAG) posted on the MRO Website**

Send your questions to [mro-prc-sme@midwestreliability.org](mailto:mro-prc-sme@midwestreliability.org)

Website: [www.midwestreliability.org](http://www.midwestreliability.org)