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The Task Force on Coordination of Planning (TFCP) Response to Comments Received in the Open Process posting of revised A-10 *Classification of Bulk Power System Elements*.

The TFCP would like to thank those who provided comments on the proposed revisions to the A-10 which was posted from May 17, 2019 to July 1, 2019. TFCP responses to individual comments are provided below.

Comments from ISO-NE:

ISO New England appreciates the opportunity to comment on the draft revisions to NPCC Document A-10.

Comments on Overall Approach to BPS Classification:

1. ISO-NE has previously expressed concerns with the performance-based approach to BPS testing, both before and during CP-11's most recent efforts to update the A-10 methodology and process.

These concerns included the extreme sensitivity of the test's outcomes to small changes in system conditions, inconsistencies between testing assumptions and outcomes in different NPCC Areas, and the amount of time and analysis required to perform the classification tests. While the core of the BPS classification process (the three-phase fault, uncleared locally) has not changed in the draft revision to A-10, we acknowledge that the changes proposed as part of this revision help to address many of those concerns.

Our concerns regarding the identification of critical facilities to which specific criteria should be applicable have been partially addressed by the new approach to Directory 1 applicability.

In addition, the consistency of test application has been partially addressed through the revisions to system conditions used for testing. We feel that better and simpler options for classification may exist, such as bright-line voltage-based determinations. However, the proposals for revisions to the three-phase locally uncleared fault test are an improvement to the existing A-10 methodology and process for identifying facilities for NPCC Directory applicability.

TFCP responses to Open Process comments on A-10

TFCP Response:

Thank you for the comment. The CP-11 working group explored a number of Directory 1-specific classification methods, including flow-based, bright-line, topology-based, and interface-based approaches. CP-11 found that many of these methods either under- or over-classified buses as part of the Bulk Power System, and some of these methods also were even more sensitive to system conditions and other input assumptions than the existing test. Additionally, none of these methods applied equally well to all NPCC Areas. More details on these methodologies can be found in CP-11's Phase I and Phase II reports.

TFCP acknowledges the ongoing concerns expressed in the comment and will consider further improvements upon the next review of the A-10.

Comments on Section 3.1, System Conditions

2. ISO-NE strongly supports the addition of the specific requirements in this draft of A-10 for system conditions simulated in BPS classification testing. The requirements in this section help to address the concerns brought up, by ISO-NE and by others, regarding the lack of consistency of application of the BPS classification test.

In particular, ISO-NE supports the requirement for stressing interfaces to the 98th percentile of historical flows. ISO-NE's experience has shown that the system conditions simulated can have major effects on the BPS test results. By specifying system conditions based on a percentile of historical flows, the A-10 procedure will ensure that each Area is applying a consistent but reasonable minimum level of conservatism in BPS classification. Additionally, the use of historical data rather than interface limits in stressing cases will lead to more reasonable outcomes and less over-classification of BPS buses. In New England, many major interfaces are rarely operated at or near their limits. Testing interfaces at excessively high levels of flow would lead to BPS classification, and expenditures on protection system design and system planning, to protect for system conditions that rarely occur.

Finally, analysis has shown a significant decrease in the sensitivity of results to small changes in system conditions when testing at the proposed interface transfer levels, rather than testing at interface limits.

ISO-NE supports the requirement to test for BPS classification at multiple load levels, including a light load level. With the growth of distributed energy resources and energy efficiency programs, lower load levels are already becoming more and more common. Testing for BPS classification only at peak load levels, as has been the practice in some NPCC Areas in the past, concentrates on a system condition that occurs very rarely and neglects other system conditions that are far more likely to occur.

Additionally, this examines the system's performance with fewer synchronous resources online, which (in some cases) can be a more severe condition for stability performance.

ISO-NE suggests that the voluntary recommendation concerning the use of the 98th percentile of flows during light load hours in the light load cases, and the 98th percentile of flows during peak load hours in the peak load cases, be stated as a requirement rather than a recommendation. For interfaces in generation- or load-heavy areas, it may be impossible to reach the year-round 98th percentile of flow under light load or peak load conditions. The language that allows for adjustments to the 98th percentile of flow for known future changes should remain, in order to keep prevent unrealistic dispatches from being required.

TFCP Response:

Thank you for the comment. The members of the CP-11 working group considered this suggestion as part of the testing efforts in Phase II of their work. Ultimately, it was determined that a hard requirement to separate hours into light and peak load hours, and calculate 98th percentile flows accordingly, was not feasible for all Areas. Setting interface flows in this manner would result in non-feasible dispatches in some cases, and was not considered a viable approach for all NPCC Areas.

3. Section 3.1.3 refers to “more conservative dispatches.” It would be helpful to provide more guidance on what this phrase means. For example, it may be more conservative to fully load a smaller number of generating units (especially in light load cases), rather than keeping a larger number of units online and partially loading each one.

TFCP Response:

Thank you for the comment. Discussion at the CP-11 group has revealed that a single strategy for dispatching cases may not be “more conservative” for every bus under test. While the example given may be true for some buses, it may not be true in all circumstances. Therefore, no specific examples are provided in the document.

Comments on Section 3.3, Performance Requirements

4. It is unclear whether a system separation that is contained entirely within an Area, but affects other NPCC Areas, is considered a failure of the performance requirements (even if another NPCC Area is completely islanded). To address this, ISO-NE suggests an addition to footnote 3, reading “When cascading crosses to a neighboring Area, or results in a neighboring Area being isolated from the rest of its interconnection, the affected Area....”

TFCP Response:

Comment accepted. It is agreed that the proposal addresses a possible major impact that could be an outcome of a cascading event. The proposed language has been incorporated into footnote 3.

5. In footnote 2, the mere presence of an undamped oscillatory response should not be considered to have a significant impact on other NPCC Areas, and thus should not be considered to be a failure of the BPS performance requirements. For example, oscillations at a single generating facility with a size much smaller than an Area's loss of source threshold would likely not have any impact on other NPCC Areas. The performance requirements should allow for this, rather than considering any undamped oscillation as an automatic failure.

TFCP Response:

Comment accepted. Additional language has been incorporated into footnote 2 to allow for oscillatory responses of a limited size. This limit reflects the fact that oscillatory responses on larger generating units may cause inter-Area oscillations that could not be fully captured by existing power system models. The size limit was chosen based on the requirements for including dynamic models for generating units. Specifically, units of this size have no NERC requirement to provide models, so the risk of an oscillatory response from these units has already been accepted and deemed to be low.

6. The wording of the third bullet, in combination with footnote 4, would suggest that an Area that claims to have no limit on allowable loss of source or loss of load would have no requirement to review this determination with its neighbors. Even if a threshold truly does not exist, there must be an opportunity for that determination to be reviewed by neighboring areas (both inside and outside of NPCC) who may be impacted by large source or load losses inside the Area in question.

TFCP Response:

Comment accepted. A requirement to present the lack of a loss of source or loss of load threshold has been added to footnote 4. We acknowledge that this may result in additional workload for justification. However, this would provide an opportunity for inter-Area coordination concerning loss of load and loss of source thresholds.

7. A requirement for TFSS approval of loss of source and loss of load thresholds is not the most effective way to guarantee inter-area coordination. A disagreement at TFSS that is unable to be resolved should not stand in the way of an Area performing BPS classification tests. Additionally, impacts on neighboring areas outside of NPCC need to be considered. TFSS includes representation only from companies within NPCC, and thus is not the appropriate body to review impacts on systems outside of NPCC. ISO-NE suggests a requirement for the values to be "... presented to and reviewed by neighboring and other impacted systems, both within and outside of NPCC." This requirement could be partially satisfied by TFSS review, but may also need to include coordination with non-NPCC entities. (The capitalized and bolded term "Area" in this footnote should be

used carefully, as some neighboring entities may not be a part of an NPCC Area as defined in the NPCC Glossary of Terms.)

TFCP Response:

Thank you for your comment. In accordance with the concerns above, and in recognition of the increased workload and time commitment involved in a requirement for TFSS approval, the requirement has been changed to presentation to and review by TFSS. However, the venue for presentation and review will remain TFSS, rather than the language proposed above. A requirement for review by areas outside of NPCC is viewed as overly burdensome, especially considering that these areas would be unfamiliar with the entire concept of NPCC's BPS classification process. Additionally, the sentence before the modified sentence already references "due consideration" to neighboring areas outside of NPCC, and later sentences cover loss of load or source that crosses into neighboring areas.

8. There is an inconsistency in the requirements for Task Force approval of the loss of source/loss of load limits. Footnote 4 in section 3.3 requires TFSS approval, while the last paragraph of Technical Rationale 1 states that both TFSS and TFCP approval are required.

TFCP Response:

Comment accepted. This inconsistency has been addressed, with both section 3.3 and Technical Rationale 1 referencing only TFSS.

Comments on Section 3.4, Testing Strategy:

9. The use of the word "downstream" throughout this section is unclear for networked systems, as the direction of flow could be variable depending on system conditions. This is especially true with the growth of distributed energy resources, where "downstream" may not be clear even for radial portions of the power system. ISO-NE suggests replacing "downstream buses" with "buses beyond the first observed non-BPS bus" or "buses not adjacent to BPS buses."

TFCP Response:

Comment accepted. CP-11 has proposed the use of the word "connected" rather than "downstream" to eliminate the implication of a flow direction.

10. As currently written, Section 3.4 requires testing of buses that are not adjacent to BPS buses if they have slower clearing times, higher short-circuit current levels, or "any other factors that may produce a non-contiguous bulk power system result." The use of "any other factors" in this sub-bullet is unclear, and a requirement to test certain buses should not be based on a vague statement like this one. This language also undermines efforts to bring more consistency to the BPS classification process.

TFCP Response:

Comment accepted. Changes have been made to this section to clarify that the first two factors (slower clearing times and higher short-circuit current levels) are part of the minimum set of buses that must be tested. The notion of a non-contiguous bulk power system result is still included in a new sentence below the bulleted list.

Comments on the Directory 1 Applicability and Exclusion Process:

11. ISO-NE supports the use of a separate process to identify specific elements that are or are not critical for Directory 1 applicability. ISO-NE can understand the use of the three-phase locally uncleared fault test for the application of Directory 4. However, as TFCP identified and communicated to CP-11, there is no reason that Directory 1 should automatically apply to every element at a bus identified by that stability test (whether radial or networked). Other methodologies may exist for the identification of critical facilities for Directory 1 applicability. While the element-by-element exclusion test appears to be the consensus position at this point in time, ISO-NE and others have suggested other methods, such as a bright-line approach to Directory 1 applicability. ISO-NE would encourage a re-examination of Directory 1 applicability during the next review of A-10, after the exclusion process has been applied and used in all NPCC Areas. The use of this process may reveal other less labor intensive and more consistent approaches to Directory 1 applicability.

TFCP Response:

Thank you for the comment.

TFCP acknowledges the ongoing concerns expressed in the comment and will consider further improvements upon the next review of the A-10.

Comments on Other Changes to Document A-10

12. ISO-NE supports the requirement in section 5 for a periodic re-assessment of BPS bus statuses at least once every five years. We have observed many instances of buses being added or removed from the BPS list based on the cumulative impacts of many small changes, including changes outside of the Area containing the bus under test. A lack of periodic review could lead entities to overlook certain buses which have become more critical without any large changes in the immediate vicinity of the bus.

TFCP Response:

Thank you for the comment.

13. ISO-NE supports the removal of the use of fast clearing due to DCB schemes. It is possible for a single component failure at the bus under test to disable fast clearing for a

DCB scheme, by sending a blocking signal to the remote terminal without clearing the fault locally. The testing currently required for buses where DCB schemes are present is very labor-intensive and complex, both for the individuals running the test and for protection engineers providing the relay reach and clearing time data. Prohibiting the use of fast clearing by DCB schemes entirely avoids the reliability risk associated with a lack of high speed fault clearing and the risk associated with any misinterpretations or misuse of protection system data.

TFCP Response

Thank you for the comment.

14. In section 4.2, all single-terminal elements are stated to be excluded from Directory 1 applicability provided that their protection is consistent with section 4.1. Rather than a reference to section 4.1 (which mentions high-speed fault clearing but does not explicitly require it), it is suggested that there be an explicit requirement for high-speed fault clearing on single-terminal elements in order for them to be excluded from Directory 1 applicability. Without this, there is no guarantee that a slow-clearing fault on a single-terminal element would not have widespread impacts.

TFCP Response

Thank you for the comment. The sections in question have been edited to address the concern listed above. The Directory 1 exclusion for single-terminal elements is now limited to elements that have two protection groups providing high-speed fault clearing. This meets the intent of the suggested revisions above.

Editorial Comments

15. The first paragraph of section 2.2 reads "... failure of the protection systems... for the bus under test." The word "for" should be changed to "at," as all protection systems at the bus under test must be assumed to fail regardless of what equipment they are protecting. Additionally, this language could be interpreted to mean that protection systems that are located remotely but provide protection for the bus under test (for example, zone 2 protection at a remote station) would be assumed to have failed. This would lead to no remote clearing at all for the bus under test, which is far more conservative than intended. This change also should be made in the second paragraph of section 3.5.

TFCP Response

Comment accepted. The suggested modification has been made.

16. In the third paragraph of section 2.2, the reference to bus A in Figure 2 is unclear (due to the addition of other examples in Figure 2).

TFCP Response

Comment accepted. Additional labels have been added to Figure 2 to clarify this reference.

17. Section 3.1 reads “Subsequent, non-Area wide, bulk power system classification assessments may use the same system conditions previously approved by TFSS.” This section only requires TFSS review of the original system conditions, rather than approval. Additionally, system conditions may need to be changed to reflect upcoming system changes that are driving the need for the testing (for example, the addition of a new generator). The wording in this sentence should be changed to read “... previously presented to TFSS, with any changes required to reflect the changes driving the need for the re-assessment.”

TFCP Response

Comment accepted. Language similar to the suggestion above has been added to section 3.

18. In section 3.2.2, ISO-NE suggests that the second bullet point read “...models based on actual system testing (taking load-serving tap-changing transformers into account).” Without this addition, it is not clear that the parenthetical does not refer to networked transmission transformers.

TFCP Response

Comment accepted. The word “load-serving” has been added to this sentence.

19. In section 5, the list of the items that should be documented and included in a presentation to TFSS should include the assumptions on system conditions in the scope (as described in section 3.1).

TFCP Response

Comment accepted. The first bullet in the first list in section 5 has been modified to include the system conditions described in section 3.1.

20. Technical Rationale 6 states (both near the bottom and the top of page 26) that all breaker failures at BPS buses would continue to be tested as part of Directory 1 analysis, even if all elements tripped by the breaker failure contingency are excluded from Directory 1 applicability. This may technically be true due to the requirement to test a bus section (for example, the bus section connecting an excluded element to the rest of the substation) with a breaker failure, but this is not immediately obvious or clear. It should be explicitly stated, either in Document A-10 or Directory 1, that these breaker failure contingencies shall still be tested even if the elements that they trip have been excluded from Directory 1 applicability.

TFCP Response

Thank you for the comment. TFCP will recommend an addition to Directory 1, in the next round of review of that document, that clarifies that these breaker failures shall still be tested.

Comments from National Grid:

21. The overall proposed classification methodology is an improvement to the existing methodology. The optional exclusion process might lead to inconsistencies across the different Areas, but National Grid believes consistency can be managed within each Area.

TFCP Response

Thank you for the comment. The exclusion process was modeled largely after the process for Directory 1 studies. As such, it is not anticipated that any inconsistencies will be more pronounced than in Directory 1 planning studies. Today, exclusions of this nature are covered by the “small or radial portions of the system” language in Directory 1; the new exclusion process is more consistent and more well-defined than this provision in Directory 1, and will continue to be managed within each Area.

Comments from IESO:

The IESO respectfully submits its comments on the subject draft document which was posted on May 17, 2019 for public review and comments.

The IESO offers the following general and specific comments for consideration by the Task Force on Coordination Planning and CP-11 Working Group:

General Comments

We support the revised version of the NPCC Document A-10 “Classification of Bulk Power System Elements”. Overall, the revised draft is an improvement over the current one as it provides greater clarity, is more concise, and is consistent with the recommendations of the Phase 2 Final Report.

The IESO actively participated in the CP-11 Working Group and commends the group for the open and thoughtful discussion. All issues raised were considered and the group made every effort to reach consensus through deliberation of each issue.

Thank you for the comment.

Specific Comments

22. Section 2.2

In order to avoid having to revise this document again in the near-term, we propose that the term ‘Special Protection Systems (SPS)’ be replaced and/or include the term ‘Remedial Action Schemes (RAS)’, where applicable throughout the document.

TFCP Response

Thank you for the comment. At this point in time, discussions regarding the use of the terms “SPS” and “RAS” are still ongoing in many NPCC forums. A coordinated decision will need to be made for all NPCC documents, and TFCP/CP-11 would prefer not to pre-suppose what this decision will be. In light of the ongoing work on this issue, the document will continue to use the term “SPS” until a coordinated NPCC-wide change is made.

23. Section 3.1.2

It would be beneficial if added guidance is provided on how major intra-Area interfaces should be defined (e.g. an interface is considered a major interface if the A-10 test outcome depends on the flow across the interface; an interface is also considered a major interface if the transfer limits for that interface are classified as IROLs).

TFCP Response

Thank you for the comment. The CP-11 working group has thoroughly discussed options for the definition of a major interface, but was unable to reach agreement on a definition that was acceptable to all NPCC Areas. An opportunity to review each Area’s selection of major interfaces exists at TFSS, which will provide for inter-Area coordination on this determination.

24. Section 3

The performance criteria allow cascading or instability to cross into neighbouring areas provided that it is contained within a well-defined region. The assessment of whether or not this criteria is met will depend on how the neighbouring system is dispatched in the simulation and will depend on the voltage/thermal/transient criteria used to assess the impacts on the neighbouring area. There is very little guidance in the revised A-10 on how the neighbouring systems should be modelled during these tests. The only guidance is contained in footnote 3 on page 7, which requires the neighbouring area to be consulted. This could lead to inconsistency and disagreement.

We suggest adding additional guidance on how neighbouring systems should be modeled and assessed when completing the A-10 tests.

TFCP Response

Thank you for your comment. The intent was for much of the potential for inter-Area impact to be captured by the loss of load and loss of source thresholds in the performance requirements. These thresholds must be presented to and reviewed by TFSS, which offers an opportunity for other Areas to address any concerns with impacts on their Area. Additionally, the footnote referenced in the comment offers another opportunity for inter-Area review when direct impacts on another Area are observed. It is assumed that other Areas would provide input and guidance on case setup within their Areas during these opportunities for review. To better address this comment, a footnote has been added to section 3.1 to encourage the use of the latest external system models available at the time of study.

25. Section 3.5, 1b) Step 2- Steady State Test

One of goals of the new methodology was to make it consistent across NPCC's footprint. The sentence "*In cases where a power flow solution is not obtained, other techniques shall be used to assess the impact of the event on the power system*" is too broad and may fail to achieve that objective. Please provide guidance on what other techniques are acceptable.

TFCP Response

Comment accepted. This sentence is in the existing approved version of A-10, and is necessary to clarify that a non-converged power flow solution does not automatically designate a bus as a part of the bulk power system. For further clarity, some examples of these techniques have been added to the document.

26. Section 4.1

The following statements are made in the revised A-10 document that specifies protection operating time design requirements:

- *"For single-terminal elements connected to bulk power system buses, two independent protection groups will provide high speed fault clearing for close-in faults at the bulk power system bus."*
- *"For multi-terminal elements with bulk power system buses at all terminals, Directory 4 will apply to all terminals of the element."*
- *"If one or more of the non-bulk power system terminals of a multiple-terminal bulk power system element are not designed to meet Directory 4 requirements, the protection system design at the bulk power system terminal(s) must ensure that the failure of any protection system component, with the exceptions of non-redundant components as specified in Directory 4, does not result in a violation of the performance requirements in section 3.3 of this document. To accomplish this objective, either one of two methods shall be followed..."*

The IESO understands that Section 5.5 of Directory #4 – Operating Times, mentions that protection clearing times will be determined based on Directory #1 studies, and therefore, for BPS element excluded from Directory #1, CP-11 determined it was necessary to provide the protection clearing times.

However, we have three concerns with the way this is framed. First, the rationale for including these requirements is not clear. Second, the A-10 document should not contain requirements on how to design protection systems (A-10 should only focus on applicability). Third, the revised A-10 does not provide protection clearing times for multi-terminal elements with bulk power system buses at all buses that are excluded from Directory 1.

To address these concerns the IESO suggests that we remove the abovementioned references to protection operating time design requirements from Section 4.1 and instead, include the following in Section 4.2:

“A BPS element cannot be excluded from Directory #1 applicability unless the protection systems associated with that excluded element have two independent protection groups that provide high speed fault clearing for close-in faults at the bulk power system bus or provide a clearing time no less than what was assumed in the Directory #1 exclusion test.

The rationale for this exclusion condition is the reference in Section 5.5. of Directory#4 to Directory #1 for protection operating time. Without an assessment through Directory #1 for an excluded element, alternative protection operating time requirements are necessary. If the abovementioned protection operating time requirements cannot be met, the element may not be excluded from Directory #1 applicability.”

TFCP Response

Thank you for the comment. The sections in question have been edited to address the three concerns listed above. Instead of a hard requirement on clearing times for single-terminal elements, the Directory 1 exclusion is now limited to elements that have two protection groups providing high-speed fault clearing. This meets the intent of the suggested revisions above, and treats different types of elements consistently with regards to clearing time requirements. Multi-terminal networked elements are expected to be analyzed in the study-based exclusion process, which will ensure that clearing times are sufficiently fast.

To further alleviate any concerns, TFSP has agreed to make a conforming change to Directory 4 to state that Directory 1 studies or Directory 1 exclusion studies shall be used to determine required protection operating times.

27. Section 4.2

The draft document requires that *“If an entity becomes aware of specific outage conditions in consultation with system operations that are beyond the testing above and*

could result in a violation of performance requirements in section 3.3., then additional testing of events as defined in Directory 1 Table 3, for the specific outage conditions should be evaluated.”

One could interpret this requirement to mean that as part of day to day outage management we must assess the elements that were excluded from Directory 1 to determine if Directory 1 should apply.

However, our understanding is that this was not the intent. This is a requirement to consult with operations only at the time of testing to determine if there are outage conditions that should be considered. If our understanding is correct, and in order to eliminate any confusion, we are proposing to remove this statement and add a third bullet under the testing requirements to read as follows:

Testing shall evaluate the loss of a critical facility with no system adjustments followed by a Category 1 event as defined in Directory 1 Table 1. The selection of the critical facilities and Category 1 events for this test are based on critical events related to the candidate **element**.

- A critical facility would include a transmission circuit, transformer, series or shunt compensating device, generator or single pole of a direct current facility.
- System conditions that are typically used for Directory 1 Table 1 **contingency** testing as a part of **Area** Transmission Reviews shall be utilized for this evaluation.
- **In consultation with system operation, additional testing of events as defined in Directory 1 Table 3 shall be utilized for specific outage conditions that the operations are aware of and that could result in a violation of performance requirements in section 3.3.**
- The action of the following **SPSs** are simulated:
 - o **SPSs** that would be armed under the all-**elements**-in-service for the system conditions studied.
 - o **SPSs** that would be automatically armed with the critical facility out of service.

TFCP Response

Comment accepted. The suggested revision has been made.

28. Section 5.1

Currently the NPCC Document C-43 provides the framework for the integration of new BPS facilities at the TFCO. Given the statement in the draft:

“Within three months of an element being identified as a bulk power system element to which Directory 1 applies, a plan for incorporating the element into Directory 1 analysis shall be provided to the NPCC TFCP and the TFCO for review and acceptance”

The IESO is seeking clarification as to whether the CP-11 Working Group intends to develop such a document.

TFCP Response

Thank you for the comment. We acknowledge that NPCC Document C-43 addresses the energization of new facilities and the necessary operational coordination that takes place prior to placing a facility in service for the first time.

However, from a Planning perspective, NPCC Directory#1 Appendix B (Guidelines and Procedures for NPCC Transmission Reviews) currently requires that any changes in system facilities, bulk power system elements and loads since the most recent Comprehensive Review be detailed in the format of the presentation.

Therefore, the existing Directory#1 Appendix B language governing Area Transmission Reviews already addresses situations where a new BPS element has been approved, and a separate NPCC document is not required.

Comments from Hydro One:

29. Section 3.4 Testing Strategy

Suggest re-wording the 2nd bullet.

Is there an assumption that *bus* starts as BPS? Because the phrase says "...Once a non-bulk power system result is obtained, it is permitted to forgo testing..."

With the proposed wording there could be misinterpretation.

TFCP Response

Comment accepted. To clarify that the intent is for the higher-voltage buses to be tested first, and for those results to inform the choice of 50-200 kV buses to test, the bulleted list has been replaced with a numbered list.

30. Section 4.1 Single Terminal/Multi Term Elements

Consider combining "single-terminal BPS Elements" and "multi-terminal BPS Elements – Where All Terminals are BPS Buses" subsections because all terminals of those elements are BPS and have the same D4 applicability rules.

Rationale: In application of Directory 4, it only matters if a terminal is BPS or non-BPS.

TFCP Response

Comment accepted. Changes made to the document to address other comments have restructured this section of the document, making this change no longer necessary.

31. Section 4.1 Single Terminal/Multi Term Elements

The 2nd paragraph in the Single-Terminal subsection can be repeated in the 2nd paragraph of the Multi-Terminal BPS Elements – Where All Terminals are BPS Buses.

Rationale: the same action is taken for both types of elements including high-speed fault clearing terminology.

TFCP Response

Comment accepted. Changes made to the document to address other comments have restructured this section of the document, making this change no longer necessary.

32. Section 4.1 Multi-Terminal BPS Elements Where One Or More Terminals are Non-BPS Buses (a)

Referring to: "...at least 70% apparent impedance of the transmission line..."

We have typically set zone 1 reach to 80% positive sequence line impedance for transmission lines. For 70% apparent impedance we will have to check and verify. This would pertain to POTT schemes and DCB schemes where "high speed fault clearing" is very dependent on telecom media.

General Comment is that entities may need to check and verify settings where their practice has been to use positive sequence line impedance instead of apparent impedance. The apparent impedance check may require an entity to run an actual Cape/Aspen fault study.

TFCP Response

Thank you for the comment. We acknowledge that this provision may require additional work to confirm that the reach of high-speed fault clearing exceeds 70% of the line's apparent impedance. The option also still exists to run a bulk power system classification test at intermediate points along the line, in the event that checking the apparent impedance is too burdensome.

33. Section 4.1 Multi-Terminal BPS Elements Where One Or More Terminals are Non-BPS Buses (a) *Footnote*

The footnote implies that a differential scheme without instantaneous zone 1 does not qualify as "...high speed fault clearing, without relying on any communication or lack of

communication from remote buses” and hence is not acceptable for meeting method a), and results in having to do a partial element test according to method b).

Please clarify.

TFCP Response

Thank you for the comment. The intent was for differential schemes without instantaneous zone 1 protection not to qualify as meeting method a). However, the paragraph containing this provision begins with a statement that it only applies when the non-BPS terminal of the element in question is not designed to Directory 4 standards. In the event that two of these schemes independently protect the element, and the non-BPS terminal is designed to meet Directory 4 standards, neither a) nor b) would need to be satisfied.

34. Section 4.1 Multi-Terminal BPS Elements Where One Or More Terminals are Non-BPS Buses (a)

Referring to: “...or 70% of the positive sequence impedance of the transformer...”

Is this only applicable for transformers directly connected to the BPS bus and are not applicable to transformers tapped from a transmission line?

TFCP Response

Thank you for the comment. The intent was for this to only apply to transformers directly connected to the BPS bus; a footnote has been added to clarify this intent.

35. Section 4.2

Consider combining the “All single-terminal **elements** that are connected to **bulk power system buses** are automatically ...” paragraph with the “All radial multi-terminal **elements** that re connected to **bulk power system buses** are automatically excluded...”.

Rationale: The same rule is applies to both.

TFCP Response

Comment accepted. The two paragraphs have been combined.

36. Technical Rationale 6 – Directory 1 Applicability and Exclusions

Automatic Exclusion of Single-Terminal Elements

Missing the word “two” in the 2nd paragraph: “Based on Section 4.1 of this document, it is expected that **two** independent protection systems....”

TFCP Response

Comment accepted. The suggested revision has been made.

37. Technical Rationale 6 – Directory 1 Applicability and Exclusions

Automatic Exclusion of Radial Multi-Terminal Elements

Missing the word “two” in the 2nd paragraph: “Based on Section 4.1 of this document, it is expected that **two** independent protection systems....”

TFCP Response

Comment accepted. The suggested revision has been made.

Comments from Avangrid (CMP, NYSEG, RG&E, UI)

AVANGRID opposes the new A-10 methodology due to the complexity of the proposed exclusion methodology and its optional nature both of which undermine the goal of improved consistency and study efficiency.

Our understanding is that the proposed study-based exclusion methodology cannot be applied at 345kV or above and when applied eliminates virtually all 115kV elements from Directory #1 applicability.

Based on this understanding, we question the need or value of this new and complex addition over a simple bright line or automatic exclusion methodology. Following is a summary of our concerns:

38. The exclusion test is listed as “optional” which inherently invites inconsistency. If an entity chooses not to apply this exclusion process it will naturally invite stakeholder challenges to the need for proposed projects.

TFCP Response

Thank you for the comment. The exclusions for single-terminal and multi-terminal radial elements is automatic, and thus is consistent and efficient. Although the study-based exclusion test for multi-terminal networked elements is optional, it does provide a consistent base level of reliability (only those elements that can be excluded are excluded, while elements with the potential for inter-Area impact are not excluded). The optionality would allow an Area to refrain from excluding elements, resulting in a higher level of localized reliability. However, the choice to exclude or not exclude an element would not have any significant impact on the reliability risk to NPCC as a whole.

39. It appears that the combined outcome of the proposed A-10 methodology (with optional exclusion methodology used) would essentially eliminate much of the underlying 115kV/230kV system from D1 applicability. AVANGRID is concerned that this exclusion methodology has been purposefully refined to ensure this outcome at the cost of increased study complexity, ambiguity, and likely inconsistencies. If this outcome is deemed reasonable then why not simplify the methodology (e.g. automatic or bright line)

TFCP Response

Thank you for the comment. The CP-11 working group explored a number of Directory 1-specific classification methods, including flow-based, bright-line, topology-based, and interface-based approaches (additional details can be found in CP-11’s Phase I and Phase II reports). TFCP acknowledges the concerns regarding the efficiency of the exclusion testing, specifically that the exclusion methodology requires a significant amount of testing. TFCP believes that the A-10 methodology should be revisited after more experience has been gained with the methodology currently proposed.

40. The study based exclusion methodology is open to interpretation and will likely result in inconsistent outcomes.

TFCP Response

Thank you for the comment. The exclusion process was modeled largely after the process for Directory 1 studies. As such, it is not anticipated that any inconsistencies will be more pronounced than in Directory 1 planning studies. Today, exclusions of this nature are covered by the “small or radial portions of the system” language in Directory 1; the new exclusion process is more consistent and more well-defined than this provision in Directory 1.

41. If the proposed exclusion methodology remains, we do not achieve one of the stated objectives of the A-10 revision which was to improve study efficiency. Instead the study will become more complex than the previous A-10 methodology.

TFCP Response

Thank you for the comment. Many of the concerns expressed by TFCP in CP-11’s scope of work were related to the relationship between A-10 and Directory 1; to adequately address these concerns, an additional study-based process needed to be introduced. The introduction of automatic exclusions for single-terminal and radial multi-terminal elements will increase efficiency. Finally, the efficiency of the full set of studies required by NPCC may be improved by the introduction of the exclusion test. Once an element or group of elements is excluded from Directory 1, all subsequent analyses (planning studies, Area Transmission Reviews, operating studies, etc.) will not have to analyze those element(s).

Comments from NYISO

42. On May 30, 2018 RCC approved the TFCP criteria for evaluating existing and alternative A-10 methodologies.

Among the guiding principles provided from TFCP to the CP-11 working group was Principle No. 3 – Simplicity.

The first criteria listed under Principle No. 3 is that the developed methodology is efficient in the use of engineering hours to perform. As a participant in the CP-11 working group the NYISO evaluated the proposed methodologies impact on New York buses BPS identification. The NYISO review showed that the amount of buses identified as BPS has decreased while the amount of engineering hours to complete the review significantly increased (the estimated increased time is greater than double the time previous for full Area-wide assessments). The increased amount of time required to perform the assessments is primarily due to the revisions to the proposed system conditions, including the requirement to stress each Area's major interfaces. Due to the significant increased amount of time needed to complete the evaluation (primarily due to required stressing of the major interfaces at or above the 98th percentile of flow) the proposed methodology does not meet Principle No. 3.

Furthermore, the inclusion of the required stressing criteria did not have any impact on New York BPS buses identified.

The NYISO recommends removing the requirement to set interface transfer levels at or above the 98th percentile of historical flow. Instead, the NYISO recommends that the requirement be revised to set the expected dispatch in the study models to the projected planned future system flows irrespective of historical conditions.

TFCP Response

Thank you for the comment. Although we acknowledge that the new requirement for stressing interfaces will lead to an increase in engineering effort in some Areas, this will help satisfy Principles 1 and 2 that were included in the document referenced in the comment. These principles, which were correct identification of critical buses and consistency between NPCC Areas, have been improved by more specific guidelines on stressing major interfaces. Although the results of testing in New York did not show a significant change in the classification of buses, other NPCC Areas were shown to be fairly sensitive to interface flows, and the lack of a specific guideline on stressing major interfaces could lead to major changes in the BPS list in those Areas.

The proposed language in Document A-10 also includes a provision to adjust the 98th percentile of historical flows to reflect known future system changes, such as generator

retirements or additions. This will allow for adjustments as requested in the last paragraph of this comment.

43. Additionally, the proposed revision now requires that the system conditions included in the A-10 assessment be presented to NPCC TFSS.

Although this is a new requirement, CP-11 did not provide justification in the technical rationale as to why the working group determined this requirement necessary to the successful completion of A-10 assessments.

Further, the proposed revision states that non-Area wide A-10 assessments (which would include interconnection assessments) may use the conditions previously approved by the TFSS. As the Area wide assessment is only required to be completed every five years, and non-Area wide A-10 assessments, including interconnection assessments occur more frequently, it seems that each Area would be obligated to present their system conditions each year to TFSS, with little benefit.

As such, the NYISO recommends removing the requirement for TFSS approval.

TFCP Response

Comment accepted. The presentation of these conditions to TFSS was a way of adding an opportunity for inter-Area coordination and consistency, without creating requirements in Document A-10 that may not apply equally well to all Areas.

Changes have been made in section 3.1 to change the requirement for TFSS approval to a presentation to, and review by, TFSS. Additionally, there is now a provision in section 3.1 that allows for changes to system conditions to reflect the purpose of the non-Area-wide assessment.

Comments raised during review of Open Process comments

44. In the event that all elements connected to a BPS bus are excluded from Directory 1 applicability, would the bus itself be excluded from Directory 1 applicability as well? Are there any circumstances under which an entire bus would be excluded from Directory 1 applicability?

Thank you for the comment. The CP-11 working group has agreed that, in the event that all elements connected to a BPS bus are excluded from Directory 1, the bus itself can be excluded as well. If all elements connected to the bus can safely be excluded from Directory 1 applicability, all critical Directory 1 contingency events involving the bus in question have been tested already. Similarly, once Directory 4 has been applied at the bus, if overloads on the elements connected to the bus are not impactful to NPCC as a whole, then the bus itself can be assumed not to be impactful as well.

Language has been added to section 4.2 to address this comment.

45. For the system conditions provision where non-Area wide assessments may use the same system conditions previously presented to the TFSS, with any changes required to reflect the purpose of the assessment, based on the implementation plan schedule it could be a few years before an Area performs the assessment in the revised methodology. As such, it could then be a few years before something is presented to TFSS describing the system conditions. Do we have any perspective yet as to how the implementation plan will take this into account?

Thank you for the comment. TFCP will consider this issue as the implementation plan is finalized.