Appendix A

Clarification to the FRCC Bulk Electric System (BES) Definition for Radial Transmission Elements or Systems Exclusion

This is a clarification to the FRCC BES definition exclusion list regarding the exclusion of radial Transmission Elements / System. Since it is impractical to document every situation for exclusion of radial Transmission Elements / System, examples are provided for general clarification.

The exclusion states: "Radial Transmission Element or System connected from one transmission source to load serving Elements and/or generation resources not included in 1) above …", in general, unregistered generation[1], "… where a loss of the radial Elements or System will not result in an Adverse Reliability Impact".

There are a few principles that are applied in determining if radial Elements / Systems are excluded:

- Radial System can be a collection of parallel Elements as long as the radial System originates at one transmission source and that the System does not connect to a second transmission source under normal operations.
    - FRCC considers normal operations (i.e. normal system configuration) in determining whether Elements / Systems are radial and does not consider alternate configurations. For instance, entities may install normally open switches between radial Elements/ Systems and operate the switches in a 'make-before-break' fashion to allow for system reconfiguration to maintain continuity of electrical service to customers.
- One transmission source is a contiguous bus configuration (e.g. ring bus, breaker-and-a-half scheme, etc.) comprised of one or more BES Elements operated at one voltage level 100kV or higher.
- Adverse Reliability Impact is as defined in the NERC Glossary of Terms. Studies are necessary to determine if an Adverse Reliability Impact can result from the loss of a radial Element / System if the peak loads or generation resources within the radial Element / System exceed one-half of the largest single loss of source contingency in the FRCC region. Studies will be performed by the responsible entity and approved by the FRCC Planning Committee.

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[1] Unregistered generation means that generation that does not meet the registration criteria described in NERC's Statement of Compliance Registry Criteria.

The following examples are provided for clarification of where the boundary between BES and radial exclusions are located.

Example One:

In this example:

- Lines 1 & 2, breaker 'A' and the associated buses (> 100kV) are part of the BES.
    - The > 100 kV bus is the single transmission source.
- Radial Exclusion:
    - Both transformers and the illustrated switches are radial and excluded from the definition of the BES as long as the loss of the < 100 kV bus does not result in an Adverse Reliability Impact.
- The border between BES and non-BES is at the bus (source) side of the > 100 kV transformer switches.

Example Two:

In this example:

- Lines 2, 3 and 4 are networked lines and part of the BES.
- Radial Exclusion:
    - Line 1 and associated switch are radial and are not part of the BES, as long as the loss of the radial system or portions thereof does not cause an Adverse Reliability Impact.
    - The transformer and associated switch are not part of the BES.
- The border between BES and the radial exclusion would be at bus (source) side of the Line 1 switch.
- If Switch A at the top of Line 1 does not exist then the BES/non-BES dashed line moves down to the source side of Switch B connected to Line 1.

Example Three:

In this example:

- Lines 1 and 2 and substation 1 are part of the BES.
- Radial Exclusion:
  - Lines 3 and 4, substation 2, and the transformers comprise the radial system since it serves only load and unregistered generation and is excluded from the BES as long as the loss of the radial system, or portions thereof (e.g., loss of all generation without loss of load, visa versa, or loss of the entire radial system) does not cause an Adverse Reliability Impact.
- The border between BES and the radial exclusion would be at bus (source) side of the Line 3 & 4 line switches at substation 1.

Example Four:

- Line 1, Line 2 and the ring bus comprised of breakers A, B, C and D are part of the BES.
- Radial Exclusion:
  - The transformers, the ring bus comprised of breakers E, F, G and H and the radial Elements serving only load emanating from that ring bus comprise the radial system as long as the loss of the radial system does not cause an Adverse Reliability Impact.
- The border between BES and the radial exclusion would be at bus (source) side of the transformer switches on the high side of the transformers.

Example Five:

In this example:

- Line 1 is a network line supplying a tapped substation, and the line, including the tapped segment to the radial substation, is part of the BES since the entire line is operated as a single BES Element.
- Radial Exclusion:
  - The tap substation is radial and not part of the BES as long as the loss of the radial system or portions thereof does not cause an Adverse Reliability Impact.
- The boundary between the BES and the radial exclusion is at the line (source) side of the switch at the tapped substation.

Example Six:

In this example:

- Lines 1, 2, 3 & 4 and Substations 1 and 2 are part of the BES.
- Radial Exclusion:
  - Line 5 & 6 and the associated switches are radial and are not part of the BES as long as the loss of the radial systems or portions thereof does not cause an Adverse Reliability Impact.
  - The transformer and associated switch are not part of the BES.

Note: 'Make-before-break' switching to change the source from Substation 1 to Substation 2 does not void the radial exclusion.

- The border between BES and the radial exclusion would be at bus (source) side of the Line 5 & 6 line switches at Substations 1 & 2 respectively.